

inside

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Inside

TEST TOOLS

welcome

Payments Cards and Mobile is delighted to welcome you to this first supplement on test tools – a sector that is frequently overlooked, although it is fundamental to the success of all card and mobile-based payments.

As time goes on and cards and mobile solutions become increasingly sophisticated and international, test tools will evolve alongside them to ensure interoperability – a benefit we largely take for granted – and security, which is of prime importance to everyone in the payments ecosystem, from merchants, to processors, issuers, banks and consumers.

Test tools have a third major function: keeping costs down. Card manufacturers need to produce high volumes of cards at low cost. Testing at every step is the key to achieving this. For example, according to Smart Card Alliance, 50% of all errors are introduced in the requirement and design phases, before any code is written at all. And did you know that the typical smartcard contains over 30,000 lines of software code?

The golden rule is that the sooner errors are identified and fixed, in smartcards, m-payments and terminals, the more economic and efficient the production cycle, which is beneficial to everyone.

We hope you enjoy this short guide to this most crucial and innovative aspect of our industry – test tools.

Annie Turner, Editor



contents

Mobile matters

4. Considerable time has been invested getting the standards in place for m-payments, now test tools are playing their part in accelerating the time to market for a range of applications.

Card sharp

8. Card manufacturers produce cards in large volumes, to strict deadlines, at the lowest possible cost and highest quality. At every stage, test tools play a crucial role in ensuring that these criteria are met.



STANDARDS START TO FLY

Testing times speed m-payments' progress

Setting the necessary standards to enable m-payments worldwide has taken time, but good progress has been made recently and the market should take big steps forward in the next 18 months. And the test tools sector is ready to help move it on.

by Annie Turner

Mobile payments are still in their infancy, but represent a huge opportunity for the payments industry.

The SIM card is, in effect, part of the mobile operator's network within the handset. It contains all the customer's contractual data, such as which network they can use, which tariff they are on and so on. It's central to operators' ability to differentiate their services.

Establishing the necessary standards to enable mobile payments has been a protracted process. This is largely because it is complex and so many parties are involved, but also because seamless interoperability is central to ensuring users embrace the technology and that the cost of deployment makes the entire enterprise economically feasible.

The focus is on the development and testing of three relatively new interfaces: that between the SIM card and the contactless (NFC) chip embedded in handsets (SWP);

between the SIM and the handset (USB HSP); the logical (as opposed to physical) interface between NFC and SIM chipsets (HCI).

Of late most of the attention has been on the Single Wire Protocol (SWP), which is under final review by the European Telecommunications Standards Institute (ETSI).

The GSMA, which represents GSM technologies-based network operators worldwide, put its full support behind ETSI's SWP last November. In September 2008, the GSMA signed a Memorandum of Understanding with EMVCo (run by JCB, MasterCard, Visa and American Express – see Card testing article on page 8) to share information.

Universal Service Bus High Speed Protocol (USB HSP) is the ETSI standard interface between the SIM and mobile phone to improve the speed of the radio network access for application management. Its addition is under consideration by the GSMA for use in SWP NFC handsets.



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Testing your payment application: a strategic decision



Why testing is so essential

Testing is vital for debugging, pre-certification, improved convenience and facilitates a care free roll-out of a payment project. Imagine a card issuer who needs to replace thousands of cards in the field and to which degree a quality issue could severely damage a vendor's image? Consider how a short period of system failure could easily lead to a significant amount of missed transactions and to millions of Euro loss of revenue for a payment processor. Or consider the impact of an EMV card cryptography breach on the entire payment industry? Testing helps to deliver the highest quality service, but even more importantly in today's financial turmoil: automated test solutions can actually help companies to generate money and to improve cost-efficiency.

Integri provides test tools and expertise and holds a wealth of experience gathered during the implementation of projects conducted with companies around the world. Our people have a profound knowledge of payment applications, smartcard technology, cryptography and standards such as EMV, PCI, SEPA, etc. Integri facilitates your business and ensures that your customers enjoy unparalleled levels of trust and convenience.

Automated Test Solutions

For companies striving to maintain and improve their competitive position, testing should become a fundamental pillar of their strategy. Ensuring the highest quality and compliance to the ruling standards of smart cards, terminals or host systems is impossible without the essential test technology.

Moreover, when using test solutions with a high level of automation, companies enjoy additional benefits:

- Reduced test costs up to 30%
- Improved cost-efficiency: no manual interaction
- Faster time-to-market: test runs are reduced from days to hours
- Accurate testing: excludes human errors and increases test coverage

Integri's test tools are built on the INQ® Open Tool Framework, that gives users the freedom to program simulators, customise, add new tests or even build proprietary test projects. It is a unique feature and the product is endorsed by industry leaders such as MasterCard, Visa, Giesecke & Devrient, Bank of America, ITSO, PBS, Atos Worldline, First Data and many others. Off-the-shelf test tools are available for industry standards such as: EMV, CPA, NFC, SWP, Contactless, ISO 8583,...

Expert Centre

Realising your next major payment project is a challenging activity for which you may need additional experienced staff with niche expertise to lead you through the often complex tasks. Integri's Expert Centre assists companies worldwide with professional services covering the various areas of the card payment market.

Our experts bring unsurpassed know-how gathered during international projects and can interact on both operational and strategic level. To have the unique ability to offer expertise with the matching test tools is a strong and vital asset.

The importance of testing

In today's challenging and complex payment environment, quality and cost-efficiency are critical. Testing the different components of the end-to-end payment chain eliminates costly modifications of infrastructures post launch, ensures the highest quality and improves the time-to-market of your new products.

At Integri we have the team, the knowledge and the products to meet your most stringent business requirements. We provide flexible, automated test technologies and payment expertise to the world's leading companies in the payment arena. A trusted partner for all your payment needs.



The ETSI standard host controller interface (HCI) manages the contactless applications running across the USB/SIM card interfaces. It has been adopted by the GSM for use in SWP NFC handsets.

Handset testing

Test equipment specialists, such as Comprion and Aspects, are tasked with writing specifications for the tests, in detailed consultation with ETSI. They then implement them on their test tools. The key consideration is that the technology must be interoperable with GSM-based and derived networks all over the world.

The Global Certification Forum (GCF) is responsible for handset certification. It decides what should be included in the certification process for handsets across a range of areas – test criteria, test tools and test cases.

Andreas Bertling, product manager, Comprion, explains, “We see the core specifi-

cations of the technology itself, such as SWP, then we create test cases. It is important that we handle different implementations from SIM and handset makers: we have to run test cases against their implementations to find errors in the test cases.

“Usually test specifications are written in prose, line by line, but this still means that they can be interpreted differently by various parties – typically no two implementations are the same – so it is essential that the testers see as many implementations as possible.

“As soon as more handsets are available, we will be able to build more test cases, and the more test cases we have, the more we can rule out errors sooner – find bugs at the beginning, not after deployment which means they have to be fixed in the field.”

The dearth of handsets led the GSMA to call for full NFC functionality – including SWP – to be built into commercially available mobile handsets from mid-2009.

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IMS Research reckons SWP NFC-enabled handsets will start to ramp up in 2010 before gaining significant penetration and volumes in 2011 and beyond (see full article on page 32 of March/April 2009 issue of *Payments Cards and Mobile*).

Bertling comments, "We also have to ensure that the payment applications running on the mobile phone are secure – Visa and MasterCard are also using contactless payments for cards as well – it's essential it works properly from the beginning or it will cost the card schemes and issuers.

"Also, end-users are always concerned about the security aspects of using debit and credit cards. They must be sure that the transactions are secure and that no third party has access to private information such as the card holder's card number and PIN. This means that the whole communication chain has to be very well tested."

Future applications

The field trials of contactless local payments have been small scale and local with NFC payment applications built into the mobile. In the longer term, applications will be added to run across the USB/SIM interfaces.

To address this, a working group within ETSI, the Smartcard Platform Working Group, is developing the means of managing the contactless applications running across the USB/SIM card interfaces, such as ticketing, and test cases will be developed.

Bertling says, "In the longer term, people will want international payments to work like their mobile phones; now they can make phone calls wherever they go, in future they will want to be able to make payments as easily." All of which has big implications for interoperability testing.

Bertling dismisses any notion that test cases for terminals are more difficult than for cards

or mobile, saying, "We know what is required, we have a history of terminal testing, we understand the issues." Again, work to develop test cases for readers is being undertaken by the ETSI Working Group and test will evolve in parallel with developments there.

Future challenges for test

IMS Research argues that while SWP will account for most NFC shipments in the next four years, several companies are working on SIM-only NFC solutions, whereby the RF unit, microcontroller and secure element are all incorporated in the SIM card.

This remains a medium-term prospect, but IMS Research predicts that they will grow quickly accounting for 25% of the market in 2013 as operators work to maximise their position in the value chain. Again, testing will play a vital role in this evolution as well as the interaction between the handset and new generations of faster transmission infrastructure such as Long Term Evolution (LTE). ■



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AUTOMATION IS THE KEY

Test tools assure high volume alongside top quality

Card manufacturers typically need to produce cards in large volumes, to strict deadlines, keeping the cost down, while ensuring they are of high quality. At every stage, test tools play a crucial role in ensuring that these criteria are met.

by Annie Turner

The earlier the identification and fixing of faults, the more costs are reduced. The aim is always to avoid modifications of infrastructure post launch, as they are expensive and time-consuming, not to mention the damage done to the reputation of the card or terminal supplier and the card issuer.

The importance of testing (and the complexity involved) at every stage is demonstrated by these statistics:

- 50% of all errors are introduced before any code is written at all, in the requirement and design phases;
- errors discovered before or during unit tests, typically between one and three;
- errors discovered during testing: typically between five and ten;
- errors discovered during production: typically between ten and 100.

Global standard

EMV is the global standard for credit and debit payment cards based on chip card technology. EMV-based card systems are being phased in across the world, under names such as IC Credit and Chip and PIN.

EMVCo oversees the management, maintenance and evolution of EMV and is jointly run by MasterCard, Visa, JCB and, since February, American Express. EMVCo says there are 730 million EMV compliant smartcards and 9.9 million EMV terminals in use worldwide. It is also involved with other industry bodies that are developing standards for new technologies such as contactless and mobile.

The EMV standard defines the interaction at the physical, electrical, data and application levels between smartcards and smartcard processing devices.



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EMVCo launched Common Core Definitions (CCD) back in 2004, followed by the controversial Common Payment Application (CPA) specification in 2005 and its Card Type Approval (CTA) process for CPA compliant cards in February 2007. There has been criticism of CPA taking too long to be fully implemented.

Nevertheless, established standards and tools are available to check the mechanical and electrical aspects, in tandem with detailed testing of the card's software, with particular attention paid to possible error and recovery situations.

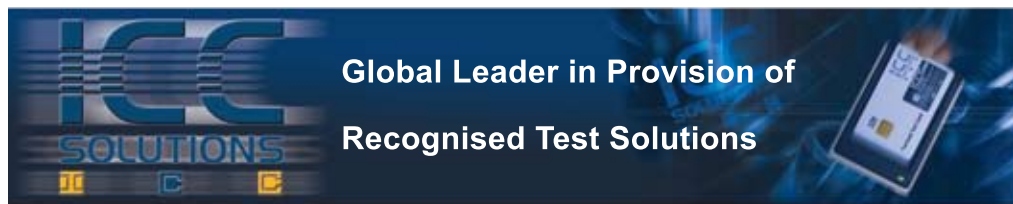
Typically smartcard software can run to more than 30,000 lines of complex software code. Pekka Mattila, VP, Visa Europe, comments, "Initially type approval was quite simple, but test cases and scripts are increasingly complex reflecting the growing sophistication of cards. The point is to guarantee interoperability for cards and all types of terminals."

The use of test scripts means a high level of automation can be used, shortening the time the various test processes take (see panel on page 10). Test scripts should cover all possible variations, requests and scenarios. Kim Van Esbroeck, head of marketing, Integri, says, "Automation is important because it speeds things up that otherwise could take weeks or months, excludes human error and saves resources."

Who does what

The type approval process works like this: it is the card manufacturer's responsibility to send new products to one of the laboratories certified by card schemes around the world. There have to be clear specifications for the laboratories about which tools and processes are to be used. If the products are compliant, they are added to the type approval listing and the manufacturer receives certification, which it presents to the customer when they order cards.

Banks and other card issuers might personalise the cards either in-house, through a personalisation bureau or ask the card maker to do it for them.



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Whichever route is taken, a sample of the card is sent to the card schemes for the chip and the data it contains to be tested. Once the card scheme has done so and is satisfied, then the cards can be sent to the issuer.

Terminal trouble

Mattila comments, "Testing ensures all types of terminals are EMV-compliant – ATMs, POS, portable devices and so on, but there are frequently problems. Then we react and

work with acquiring banks and vendors to fix them. It's not that the technology is that complex, but payment infrastructure varies a good deal in different countries and even the banks don't have a 100% control over the accepting terminals."

Van Esbroeck adds, "The terminal is most difficult because it involves user interaction and several steps. We simulate this interaction by replacing the card with a simulation test, as well as the host and terminal interac-

tion for authentication and even the display on the terminal itself to see how the card holder and merchant interact with it. This is the hardest to do – we've just launched a new simulator to address this."

She concludes, "Tomorrow we will see dual processor cards entering the market and many new functions added, such as transport. Whenever a new standard or protocol is introduced, so there is a new test specification and test cases for us to meet." ■

The three phases of card testing

Test Analysis Phase

Test companies analyse the requirement specifications of the product such as the functional and interface specifications, and manuals. Once they have been established, the company develops an appropriate test plan, which defines the scope and the list of descriptive test cases. Every case's purpose is described, as well as the procedure involved and the pass criteria.

The test plan is discussed in detail with the customer and amended to ensure it meets the necessary quality levels. This is very important because there is a direct relationship between the number of test cases and the cost of executing them.

If the tests cannot be fully automated and manual intervention is needed (such as for a payment terminal or handset testing – see page 4), then it is up to the test company to strike the

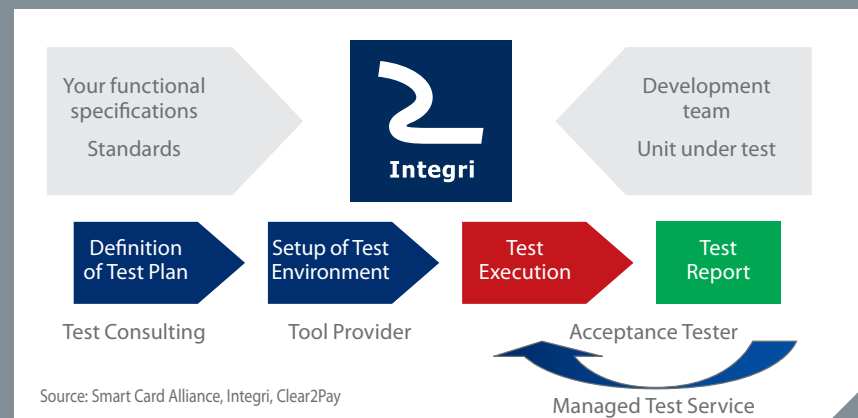
right balance between cost and quality.

Test Preparation Phase

Once the Test Plan is approved, the test company builds a dedicated test environment, including the development of simulators and programming test scripts. This preparation begins as soon as the test plan has been signed off and runs in parallel with the project to speed things up.

Test Execution Phase

As soon as units under test are available, testing begins. Test execution time is reduced to a minimum as the test environment allows full automation. Each component is submitted to functional unit testing, followed by an integration test phase and in some cases, a stress test phase. Test reports are generated based on the results, which stipulates a first analysis of any defects. ■



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