System z Crypto User Experience

CRP11

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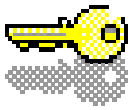
Agenda

- 5 cents about Cryptography
- Cryptographic Coprocessor Evolution
- Debit / Credit Card Authorization Process
- Banco Itaú Experience
- Summary

5 cents about Cryptography

Cryptographic System Components

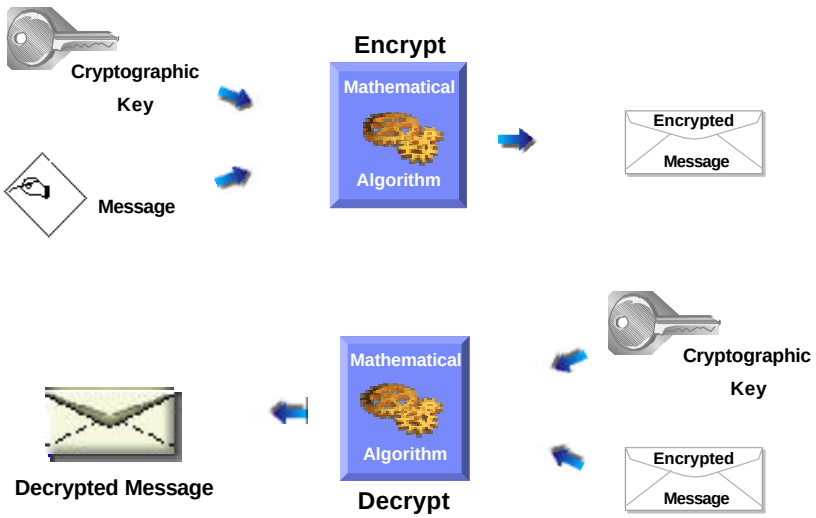
In mathematics, computing, linguistics, and related disciplines, an **algorithm** is a procedure (a finite set of well-defined instructions) for accomplishing some task which, given an initial state, will terminate in a defined end-state.



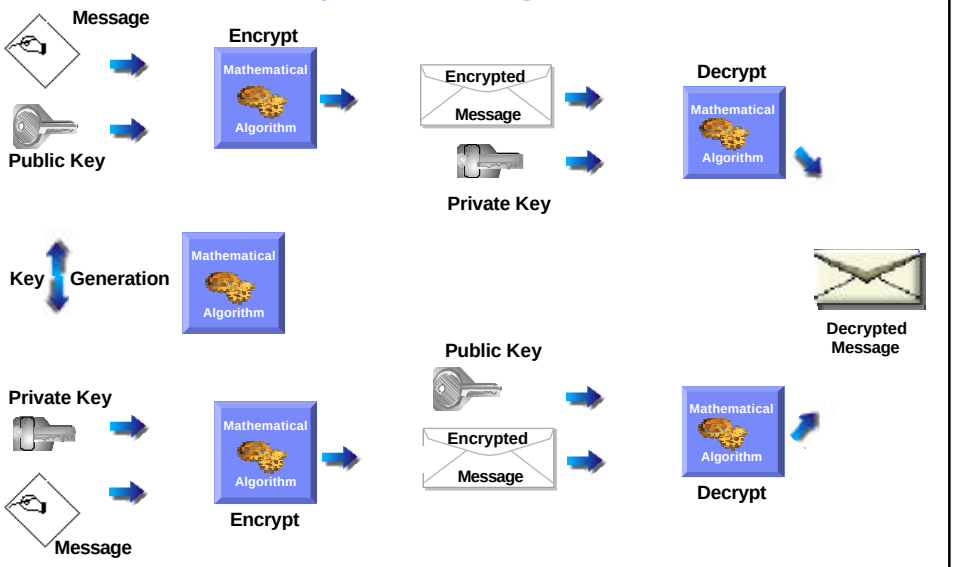
Cryptographic Key

The algorithms are publicly known. A **cryptographic key** is a piece of information that controls the operation of a cryptography algorithm. The keys are responsible for keeping the algorithm execution secret.

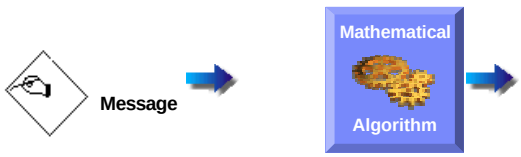
Symmetric Algorithms



Asymmetric Algorithms



Hash Algorithms
(One-Way Algorithms)



Bit String

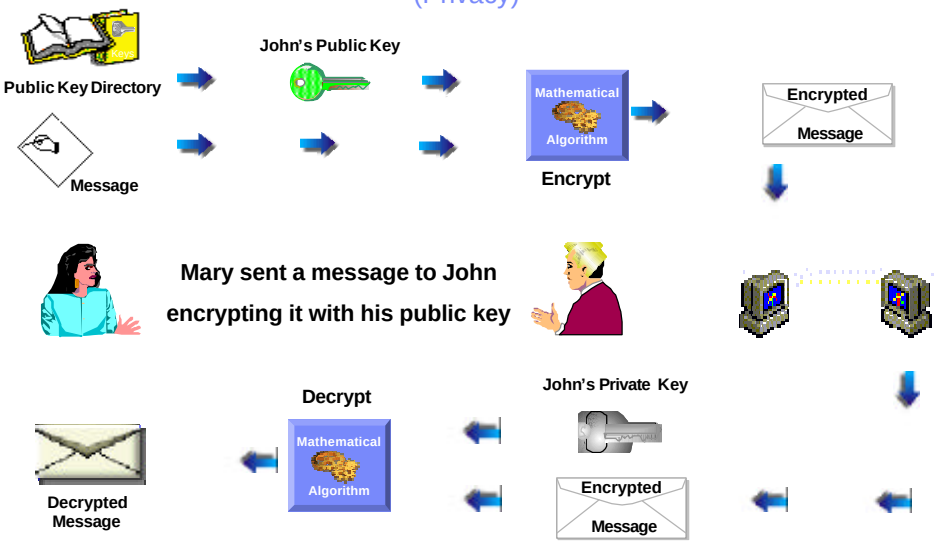
MD5 = 128 bits (16 bytes)
SHA-1 = 160 bits (20 bytes)
SHA-256 = 256 bits (32 bytes)

Pay US$ 100 to Vicente Ranieri = 5064c498576ec57e9e75fbb04ee8ccaa58c29c1a

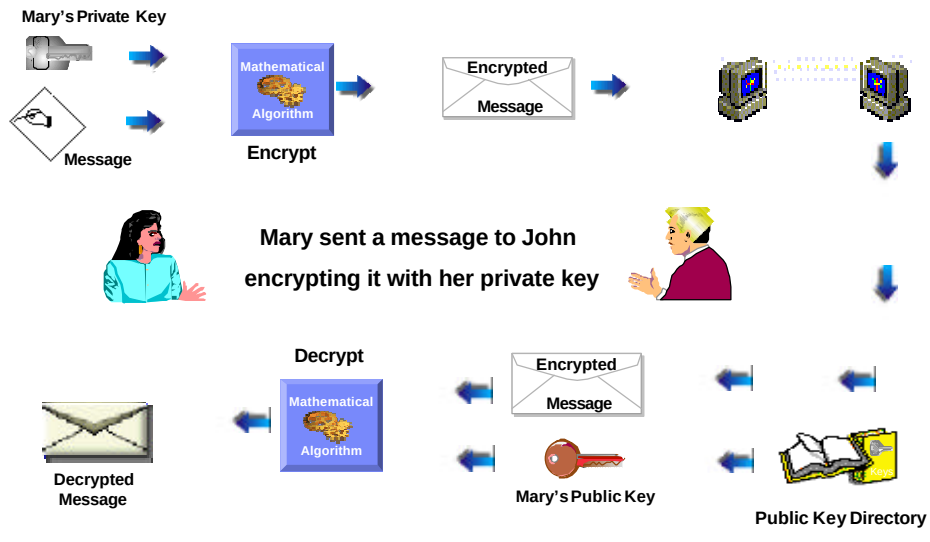
Pay US$ 100 to Vicente Ramieri = 83a8e63994fba9d9c927dd6fcf7c92ddc3185063

m = D4 (Hexadecimal) = 1101 0100 (Binary)
n = D5 (Hexadecimal) = 1101 0101 (Binary)

Exploiting Asymmetric Cryptography
(Privacy)

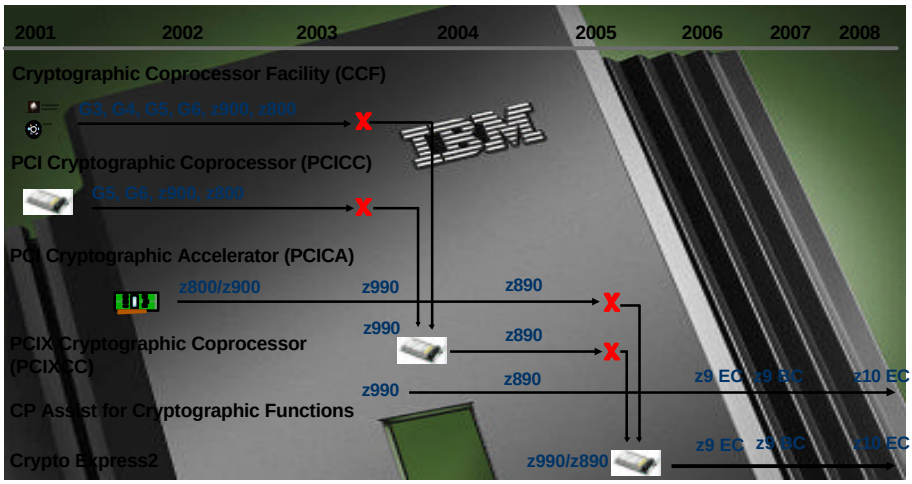


Exploiting Asymmetric Cryptography
(Digital Signature)

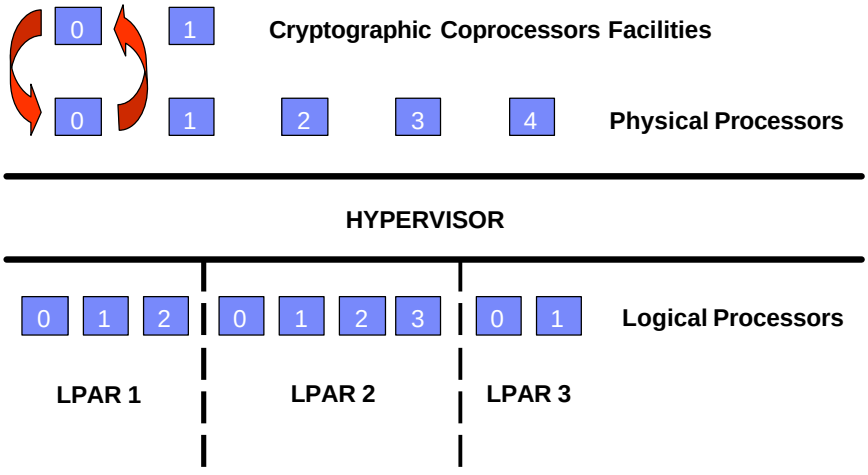


Cryptographic Coprocessor Evolution

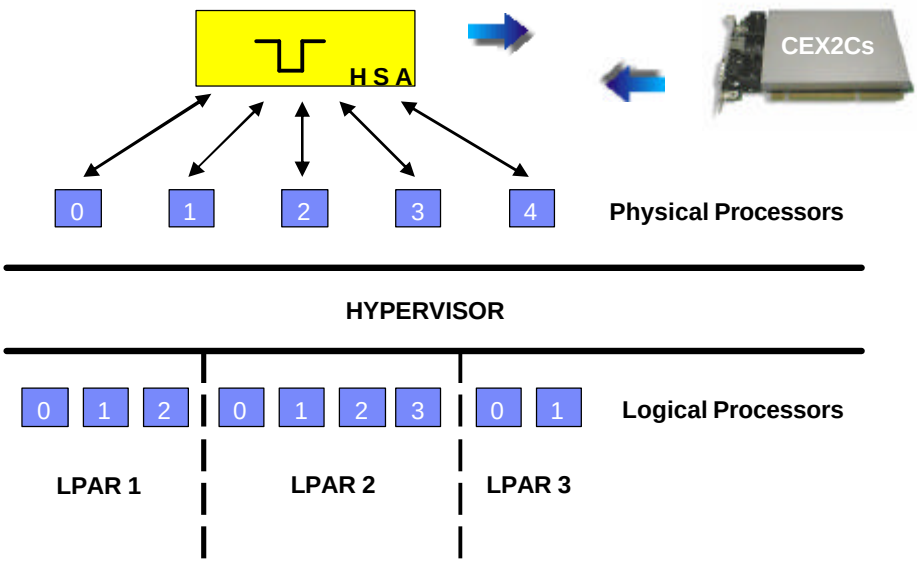
System z Crypto over time



z900 Secure Key Symmetric Processing



z990 Secure Key Symmetric Processing



Crypto Express2 Cards

- It is tamper-responding hardware validated at the highest level under the stringent FIPS PUB (Federal Information Processing Standards Publication) 140-2 Level 4.
- Specialized hardware that performs AES, DES, TDES, RSA, and SHA-1 cryptographic processes relieving the main processor from these tasks.
- Configurable as a coprocessor or as an accelerator.
- It is a very scalable solution, as System z supports up to 16 cryptographic coprocessors (8 Crypto Express2 features).

Debit / Credit Card Authorization Process

Payment Card Processing Roles

- **ISSUER**: Financial institution or its agent that issues the payment card to the cardholder. Responsible for responding to authorization requests.
- **CARDHOLDER**: Customer of the issuer using the payment card. Identified by a PAN (Personal Account Number).
- **ACQUIRER**: Financial institution or its agent that acquires the payment message related to a transaction and feed the data at interchange system.
- **CARD ASSOCIATION**: Owner of the payment card product. Responsible for the interchange system that exchanges transaction between acquirer and issuers.
- **MERCHANT**: Store or personal who is selling a good and will receive the payment.

Magnetic Stripe Card Withdraw Processing

Magnetic Stripe Card

stores financial information of cardholder

ATM

Read financial data of the cardholder

Add transaction detail (amount, currency)

Add business environment (Terminal ID, date, time)

Add digital envelop containing cardholder's PIN

Compute payment message

Issuer

Check whether the cardholder has enough funds in the account.

Verify cardholders PIN

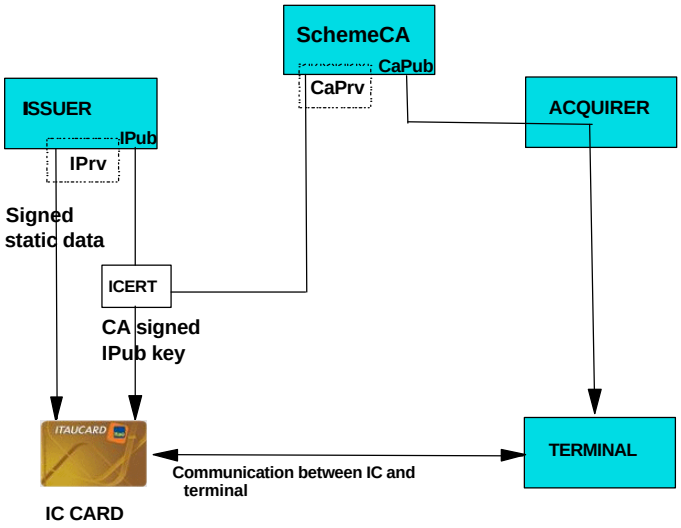
Approve or decline withdraw

Acquirer

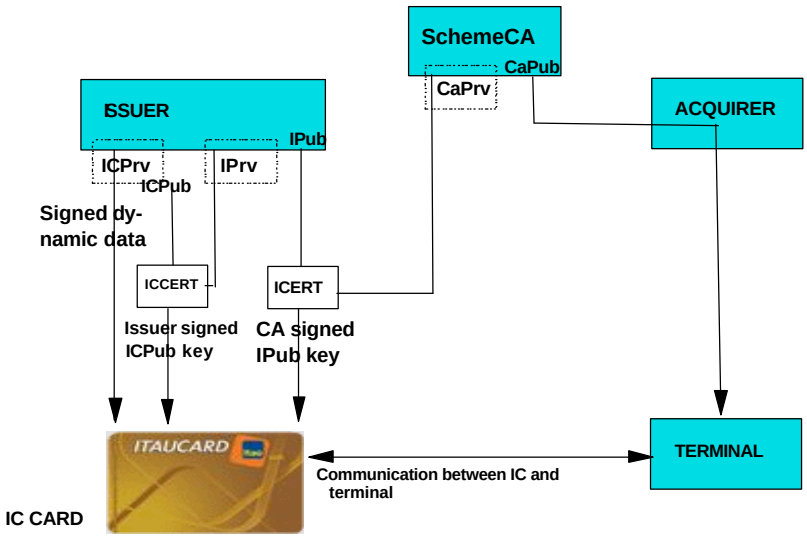
Create an authorization request from the payment message

Direct the authorization request to the issuer

Chip Card - Static Data Authentication



Chip Card - Dynamic Data Authentication



Banco Itaú Experience

Who is Banco Itaú ?

- Established in 1945 in São Paulo, Brazil.
- Privately owned bank with operations across North and South America, Europe and Asia.
- Currently the second largest private bank in Brazil.
- 15 million checking accounts and 9 million savings accounts.
- 3,000 branches
- 42,000 employees

Banco Itaú Problem

- Banco Itaú is migrating its debit and credit cards from magnetic strip technology to ICC (Integrated Circuit Card) also know as chip cards.
- Adoption of the new smart-card technology is successfully helping to protect customer accounts against frauds.
- Banco Itaú used to exploit external HSMs (Host Security Modules) to keep their cryptographic keys.
- As more and more customers switched over to the new cards, the bank realized that it would need a more scalable solution.
- The increasing load on its existing solution was beginning to cause problems with performance and reliability on its authentication systems.
- As the bank looked to replace all 15 million customer debit cards with the latest chip cards, it considered whether its existing authorization solution was up to the challenge.

Europay, MasterCard, Visa (EMV) Standard

- EMVCo LLC was formed in February 1999 by Europay International, MasterCard International and Visa International to manage, maintain and enhance the EMV™ Integrated Circuit Card Specifications for Payment Systems.
- With the acquisition of Europay by MasterCard in 2002 and JCB joining the organisation in 2004, EMVCo is currently operated by JCB International, MasterCard Worldwide and Visa, Inc.
- EMVCo's primary role is to manage, maintain and enhance the EMV Integrated Circuit Card Specifications to ensure interoperability and acceptance of payment system integrated circuit cards on a worldwide basis.
- EMV 2000 is the current standard

Banco Itaú Proof of Concept

- Banco Itaú was already an ICSF user for some very specific symmetric encrypt/decrypt requirements (CCF exploiter).
- Moving from an HSM solution to IBM crypto coprocessor requires application changes.
- HSMs are called through some specific commands and IBM crypto coprocessors are called through ICSF callable services.
- IBM loaned a PCICC card to Banco Itaú z900 machine for functionality and performance tests. Required for CSNBDKG (Diversified Key Generate) callable service.
- Close support during the P-O-C was instrumental in the successful implementation of the new solution.

Additional Tests Required

- Banco Itaú was a z900 customer when the Proof-of-Concept took place.
- Just after testing the solution, Banco Itau migrated from z900 to z990s.
- Cryptographic Coprocessor architecture changed dramatically at z990. All the secure key functions performed at CCF were moved to PCIXCC and then to Crypto Express2 cards.
- IBM experienced some performance impacts during this movement in other customers.
- Proof-Of-Concept had to be rerun for checking as some functions exploits MAC with Triple-DES.

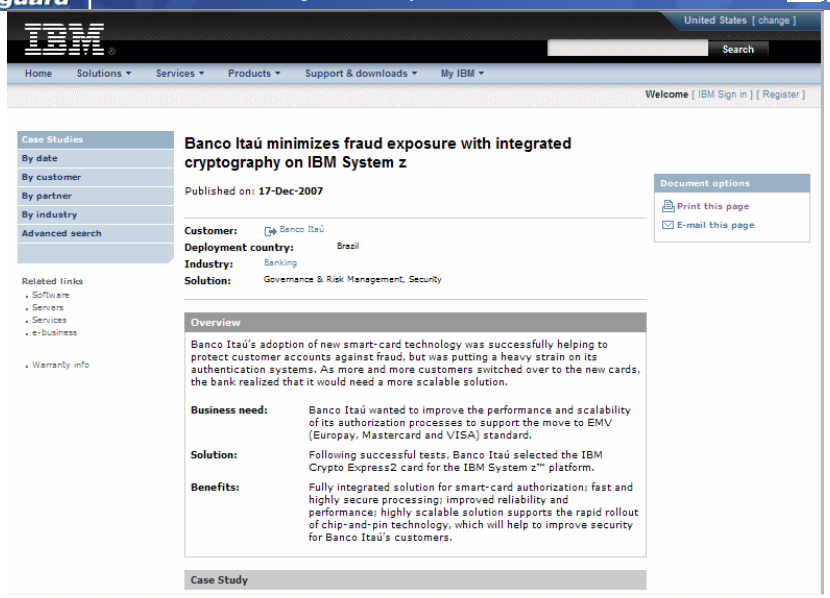
Simple, Safe and Scalable Solution

- The IBM Crypto Express2 solution for System z has met all of Banco Itaú's expectations in terms of performance, system simplification, reliability and availability.
- It also offers considerable scope for expansion and is expected to comfortably support all 15 million smart cards when the rollout is complete.
- By replacing a stand-alone proprietary solution, the Crypto Express2 card has reduced maintenance and operational costs for Banco Itaú
- The solution simplified its network architecture. Moving the authorization processes into the System z environment, Banco Itaú has eliminated a whole level of external network connections and increasing significantly reliability and security. The IBM solution has also eliminated a potential external point of failure, moving authentication onto the highly reliable mainframe platform.

Summary

Summary

- Banco Itaú concludes that it sees the IBM solution as a reliable, integrated security system that helps the bank reduce its risk and offer better protection against fraud to its customers.
- The new smart cards have helped to give its customers more confidence in the security of the bank's transactions, and the System z platform plays an important part in enabling Banco Itaú to offer this benefit to its customers.



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Banco Itaú minimizes fraud exposure with integrated cryptography on IBM System z

Published on: 17-Dec-2007

Customer: Banco Itaú
Deployment country: Brazil
Industry: Banking
Solution: Governance & Risk Management, Security

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Overview

Banco Itaú's adoption of new smart-card technology was successfully helping to protect customer accounts against fraud, but was putting a heavy strain on its authentication systems. As more and more customers switched over to the new cards, the bank realized that it would need a more scalable solution.

Business need:	Banco Itaú wanted to improve the performance and scalability of its authorization processes to support the move to EMV (Europay, Mastercard and VISA) standard.
Solution:	Following successful tests, Banco Itaú selected the IBM Crypto Express2 card for the IBM System z™ platform.
Benefits:	Fully integrated solution for smart-card authorization; fast and highly secure processing; improved reliability and performance; highly scalable solution supports the rapid rollout of chip-and-pin technology, which will help to improve security for Banco Itaú's customers.

Case Study

http://www-01.ibm.com/software/success/cssdb.nsf/CS/STRD-79YEWB?OpenDocument&Site=

QUESTIONS