



Contactless Payments Chip Design

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Manuel Albers

Director, Business Development & Sales North America

BU A&I – Sales & Marketing - Identification

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Agenda

1. NXP Semiconductors

2. Setting The Stage

3. Secure Chip Design

4. Secure Chip Environment

5. Secure Chip Evaluation and Certification

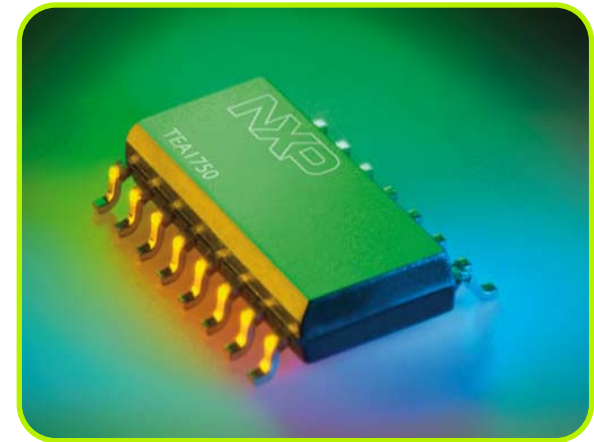
6. Conclusion



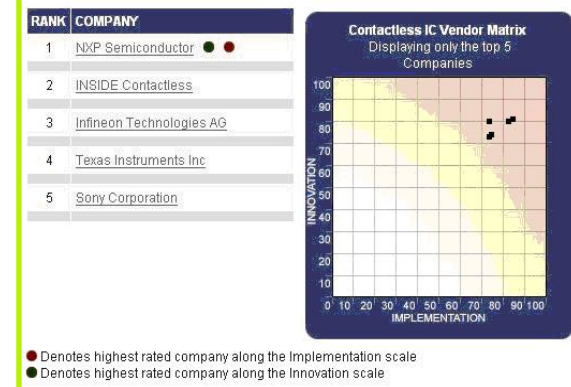
Company Profile

- ▶ **President & CEO:** Rick Clemmer
- ▶ **Headquarters:** Eindhoven, The Netherlands
- ▶ **Net sales:** \$5.4 billion in 2008 *)
- ▶ Established in 2006 (formerly a division of Philips)
- ▶ 50+ years of experience in semiconductors

- ▶ **Leadership positions in contactless & security**
 - **Banking solutions**
 - Supplied >500 million banking cards in 35 countries
 - **eGovernment solutions**
 - Supplying 80% of ePassport projects worldwide
 - **Public Transportation**
 - Mifare is used in >70% of the global transport infrastructure
 - **NFC solution**
 - Creator of NFC technology together with Sony
 - NXP products used in about 100 NFC trials worldwide



Contactless IC Vendor Matrix Top 5 Listing:



Source: ABI Research, 2008

*) These figures include the Mobile & Personal business which was largely part of the ST-NXP Wireless JV in 2008



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Setting the stage

Contactless Payment Chip Design - Objective

To meet or beat the customer's requirements in the application in terms of

- **Performance**

- Typically defined in the application specification
- Analog!

- **Security**

- Typically defined by the (end-) customer
- Often referencing standardized or non-standardized security criteria

- **Reliability**

- Supply
- Reputation

- **Cost**

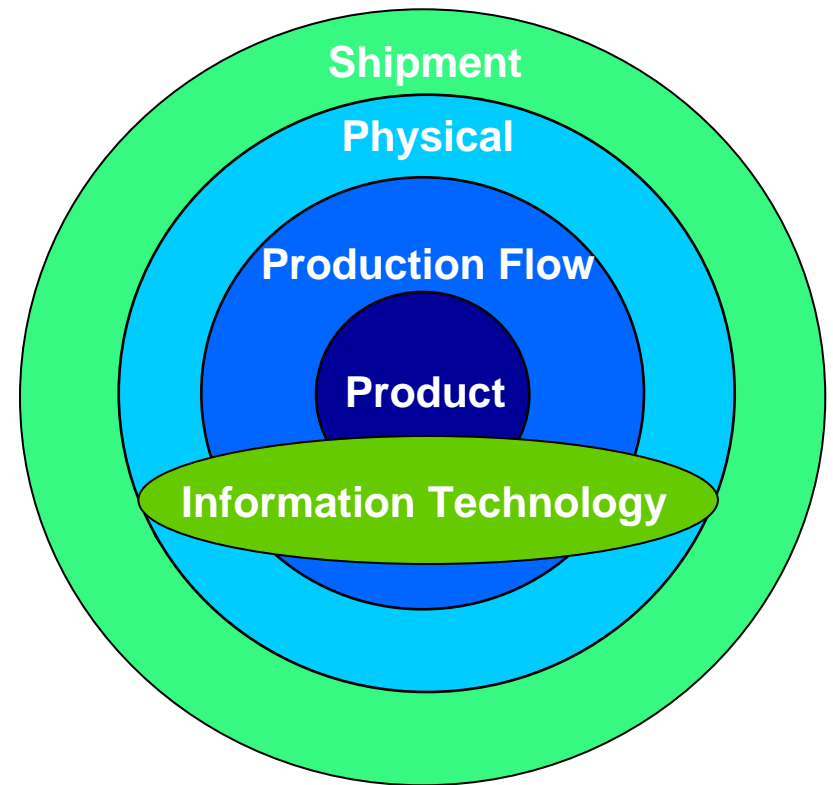
- Competitiveness



Product Security Assessment

General Approach

- ▶ **Product**
To meet the customer's security requirements in the final application.
- ▶ **Production Flow**
To prevent/ detect loss or manipulation of the security product.
- ▶ **Shipment**
To prevent/ detect loss or manipulation of security product.
- ▶ **Site Security**
 - Physical Security
To prevent unauthorized access to security data, products and facilities
 - Logical (IT) Security
To prevent loss of confidentiality and integrity of security objects/data



Product Security Evaluation & Certification

General Aspects

- ▶ **Security** is defined as a state free from unacceptable risk.
- ▶ To obtain a **Security Certificate** for a Security Product (Chip), the evaluation comprises the following aspects.
 - **Chip related**
 - Evaluation of the design (including source code)
 - Tests to verify the design
 - Vulnerability Assessment
 - **Chip environment related**
 - Evaluation Audit of the Configuration Management
 - Evaluation Audits of the development environment at the concerned sites
 - Evaluation Audits of the production environment over the entire supply chain



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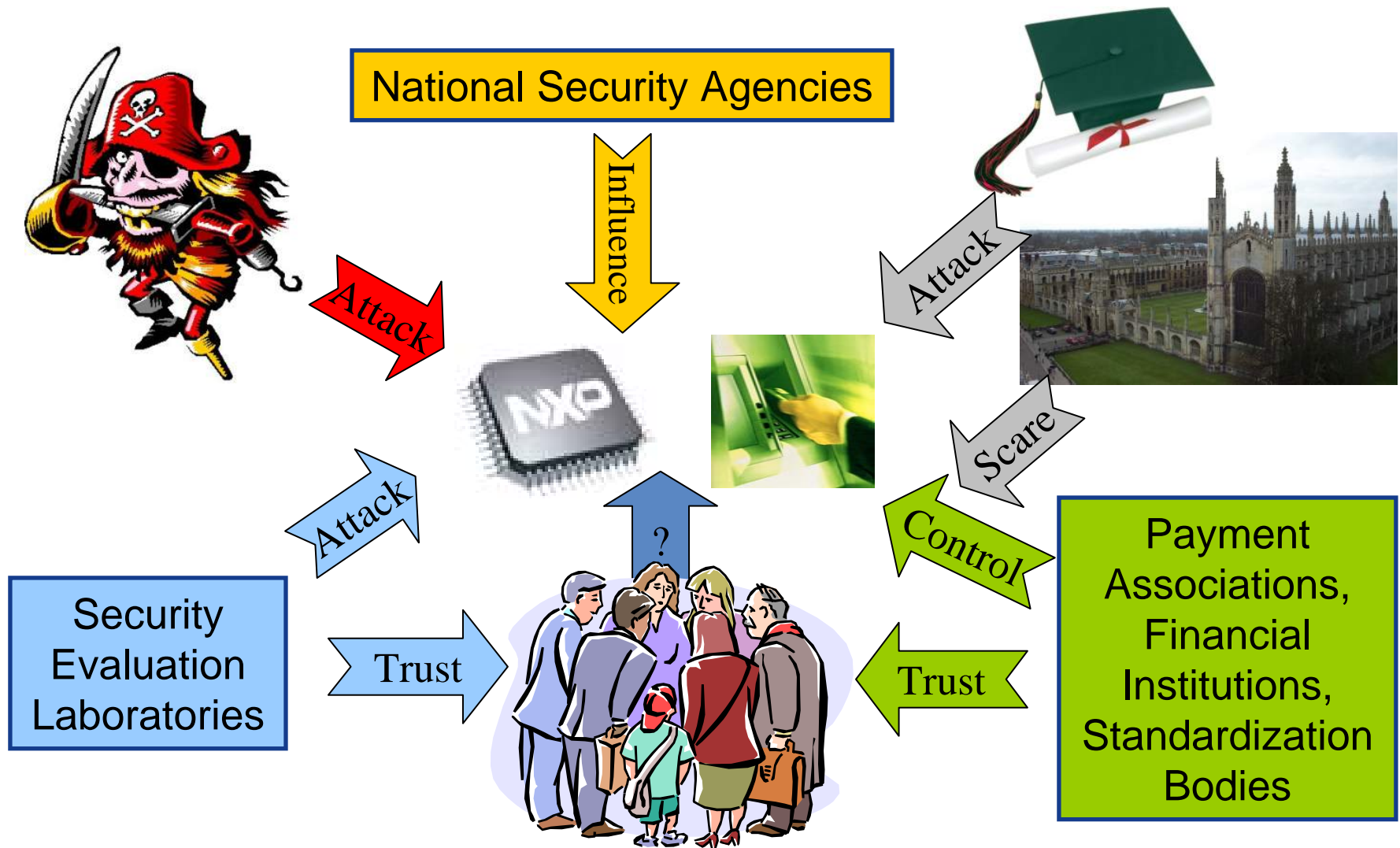
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The Battleground



Introduction – Smartcard-based Systems

▶ The security of a system is a holistic property

- A system usually consists of many components, all of which contribute.
- The system is only as strong as its weakest link.

▶ Light-weight card systems

- Are based on relatively cheap cards (e.g. simple ASICs or standard OTS [Off-The-Shelf] CPUs), and a very strong back-end system.
- Typically used when the number of (to be) deployed consumables is very large (e.g., Public Transport).

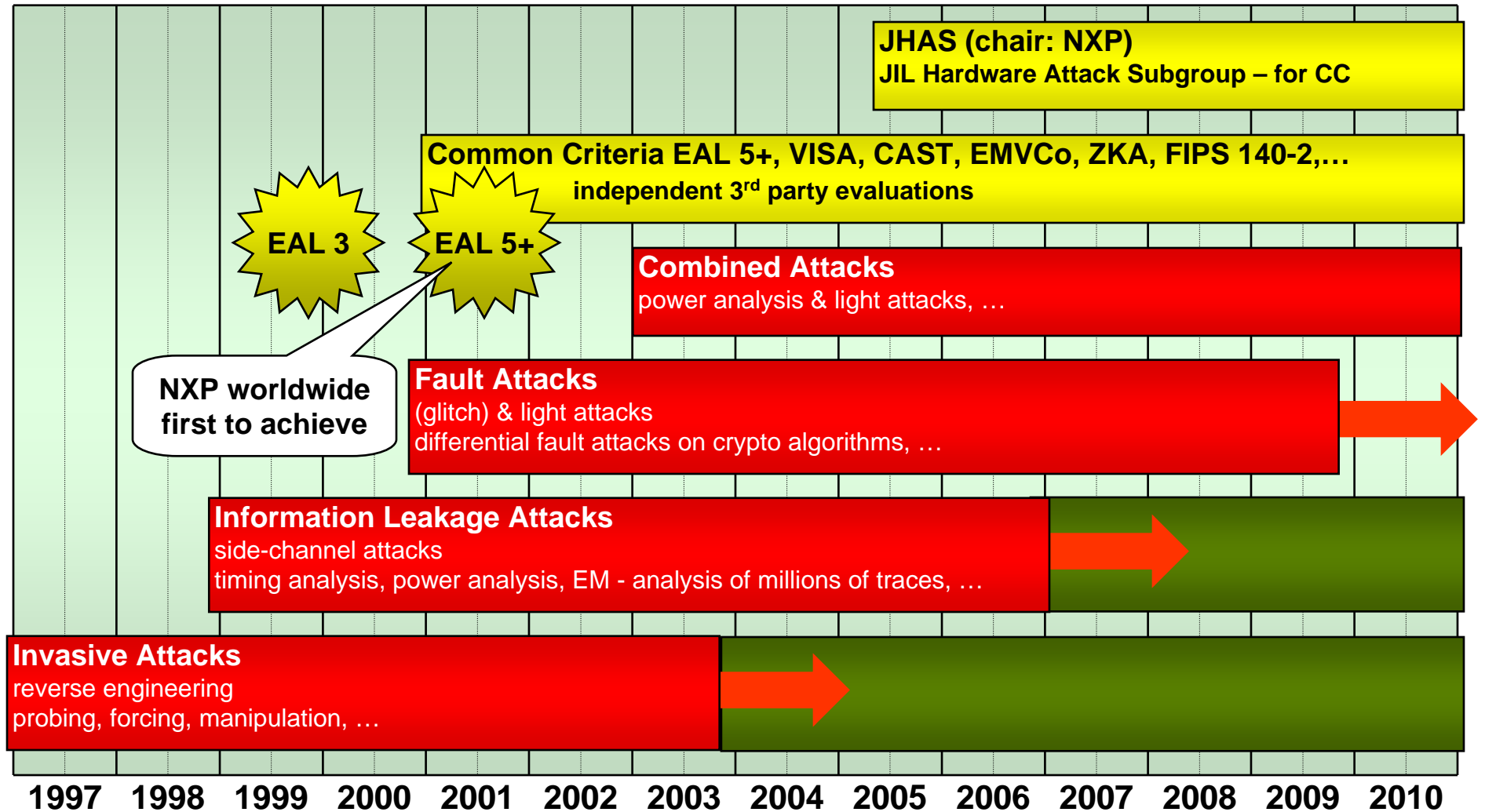
▶ Heavy-weight card systems

- Are based on more expensive, highly secure cards (containing a dedicated high-security CPU core and crypto coprocessors) that “can survive on their own” for a long time in a hostile environment.
- Typically used when the number of cards is not so large, or no back-channel exists (e.g., Banking, Access Control, eGovernment, Pay-TV).
- Typically certified with Common Criteria at EAL 4+, EAL 5, or EAL5+



Security Roadmap

Attacks on Smart Cards

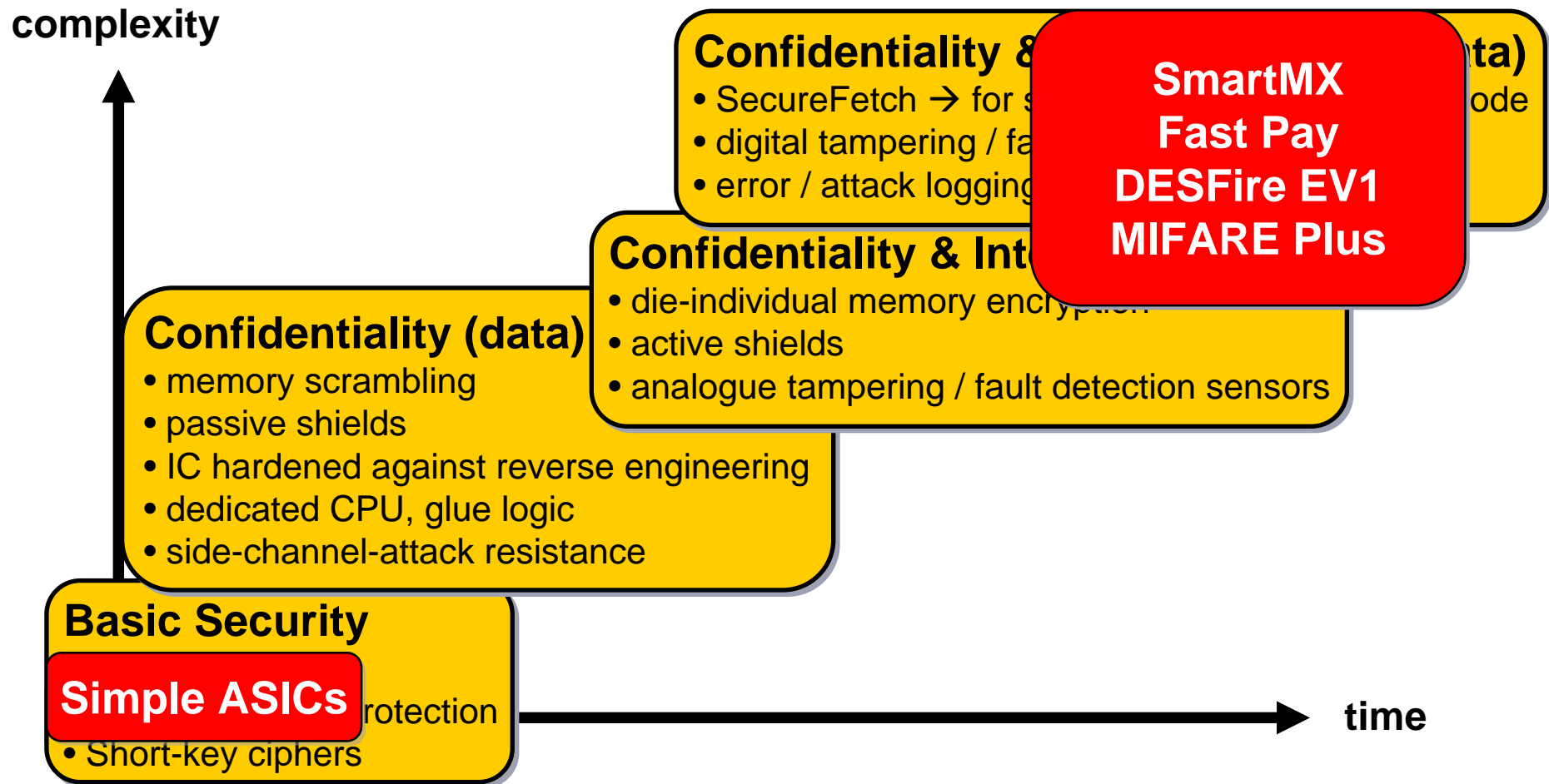


JHAS group in CC Scheme – ~30 Members



Security Roadmap

Evolution of Defences



Security threats landscape – SmartMX

NXP comprehensive Security Concept

More than **100 unique security features** harden the SmartMX.

Licensed Countermeasures against Differential Power Analysis (**DPA**).

Proven by third party security assessments and type approvals:

EMVCo security evaluation

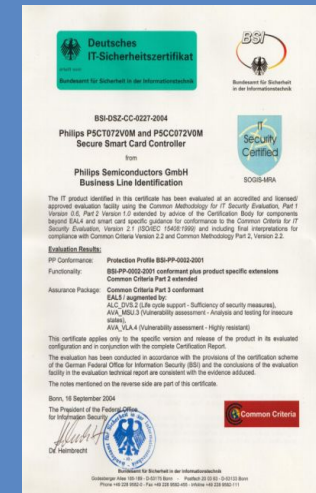
CAST

VISA

Common Criteria EAL5+

ZKA

Approval for German Signature Card



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Security Management System

Secure Chip Environment

► **Implementation of a Security Management System (SMS) minimizes the (unacceptable) risks of**

- Breach of Confidentiality (i.e. information leakage)
- Integrity (i.e. manipulation of information)
- Misuse (of information and resources)
- Economic damages
- Damage to Reputation

and supports a close, auditable relationship between Chip Maker, Suppliers, and (End-) Customers.



Security Management System (SMS)

General Requirement

- ▶ SMS Implementation throughout the entire development and production process
- ▶ Security Policy - Management Team Commitment and assigned responsibilities
- ▶ SMS Documentation as integrated part of the Quality System Documentation
- ▶ Sufficiency and effectiveness of the SMS need to be checked periodically by 3rd party evaluation site visits.
 - The SMS can e.g. follow security assurance requirements according to Common Criteria (ISO15408)

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Security Evaluation

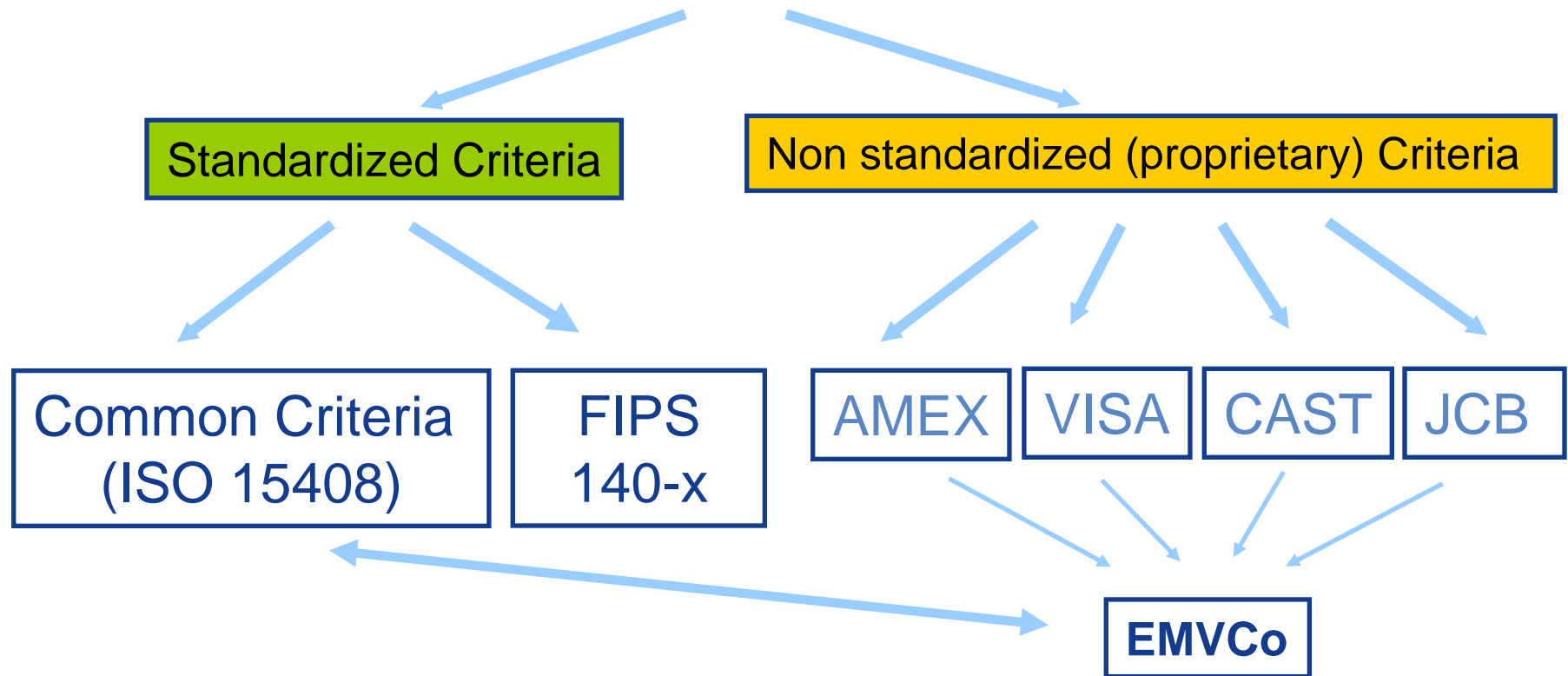
Current situation

- ▶ Different requirements for different applications
 - Common Criteria
 - German Sig. Law, Passport, Healthcard, Tachograph
 - French banking applications or health card
 - Market driven criteria (banking applications)
 - VISA / MC (CAST) / JCB
 - EMVCo
 - ZKA
 - FIPS 140-2
 - E.g. US Government requirements
 - MULTOS
- ▶ Several evaluations of the same HW
 - Time consuming, expensive

Security Evaluation

Current situation

Security Evaluation Criteria



EMVCo approval = H/W approval, Basis for Type Approval

Relevant Formal Card Testing Processes

Example: MasterCard & Visa Type Approval

▶ **Pre-requisite:** EMVCo. (H/W) Approval

▶ **MasterCard**

- Analog Interface Testing
 - Electro-magnetic behavior
- Digital and Application Testing
- Performance Testing
- Combination Testing
 - Card – Reader interaction
- Card Quality Management
 - Audit of the manufacturing site(s)
- Compliance Assessment & Security Testing (CAST)
 - Security evaluation of the chip, the OS, and the application

▶ **Visa**

- Chip Hardware Security Evaluation Process
 - Not applicable for MSD 1.4.2
- Functional Testing
 - Analog and Digital Testing
 - magnetic field characteristics
 - timing, anti collision, and protocol
 - Application and/ or Visa GlobalPlatform Testing
- Risk Testing
 - Security evaluation of the chip, the OS, and the application



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Conclusion

- ▶ Design of a (secure) Contactless Payment Chip is a very **involved** and **resource-intensive** process.
- ▶ Time to market and cost of security evaluations and certifications will continue to drive the **consolidation of non-standard security criteria** to standard security criteria such as Common Criteria.
- ▶ Chip Security is a moving target (a race). Market participants contribute to constantly raising the bar for secure chip design. Continuous investments into both **Secure Chip Design Processes** and a holistic **Security Management System** have proven to be a successful and sustainable approach.

Thank You for your attention!

Q & A

manuel.albers@nxp.com

(C) +1 (401) 359-4999

