Biometric Sensor and Match-On-Card Evaluation platform

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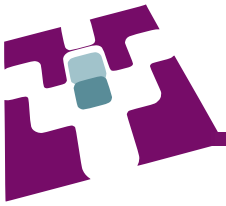
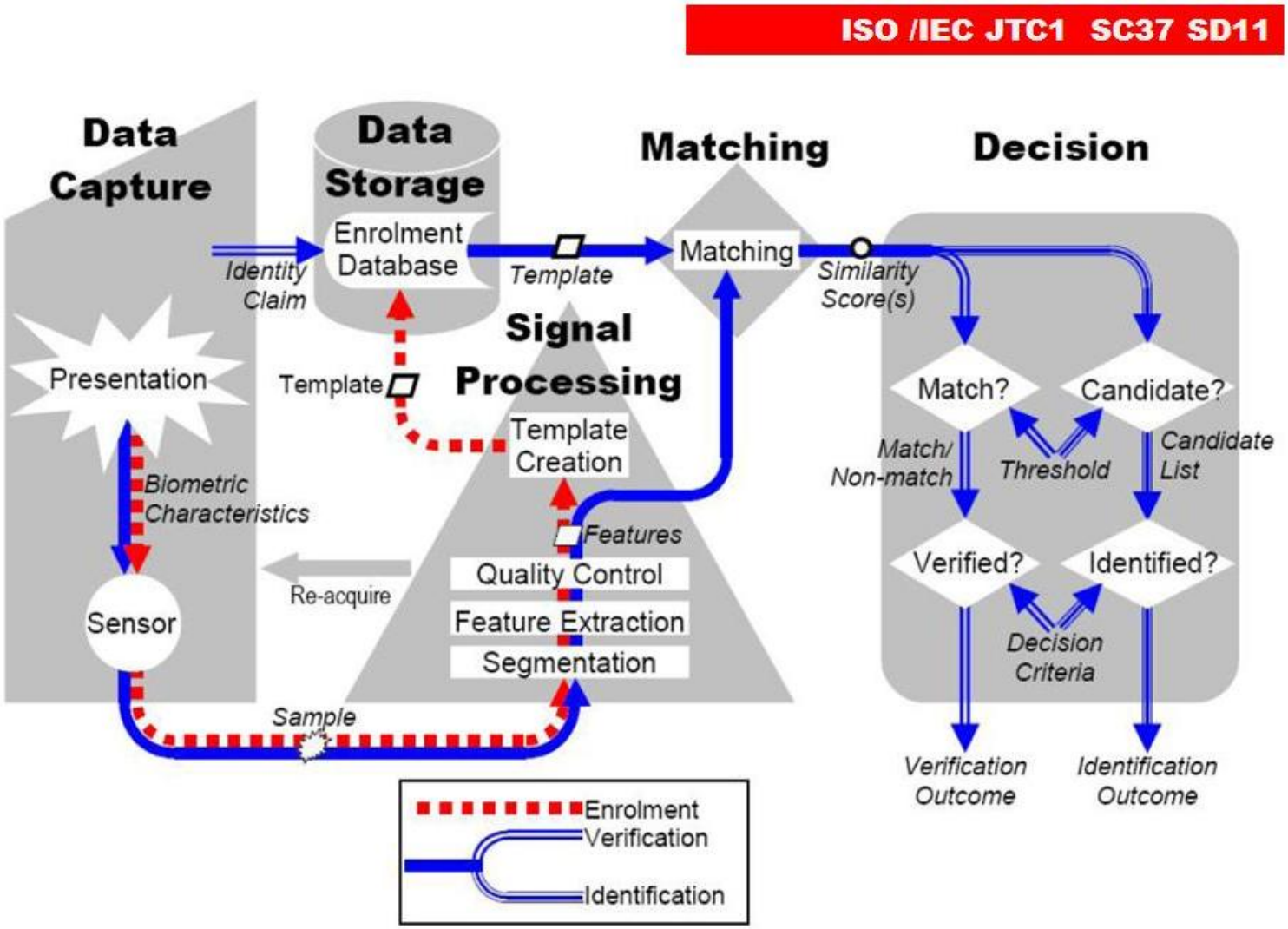
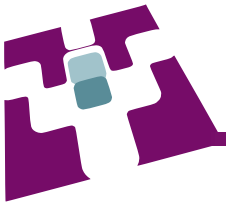
NIST International Biometric Performance Testing Conference 2014



Outline

Introduction (1/2)





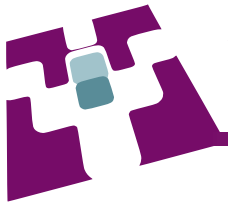
Introduction (2/2)

Open questions

How to choose a sensor or a MOC algorithm ?

Many criteria need to be considered :

- Performance ;
- Security ;
- Usability ;
- Cost.



State of the art

Evaluation Platform

NIST Platform (**NBIS ...**) ;

FVC-OnGoing (**FVC-OnGoing**) ;

BEAT European Project(**www.beat-eu.org**) ;

Standards

ISO/IEC 24745 (Security techniques, Biometric information protection) ;

ISO/IEC 19794-1 (Conformance testing methodology) ;

ISO/IEC TR 29794-4 (Biometric sample quality : Finger image data) ;

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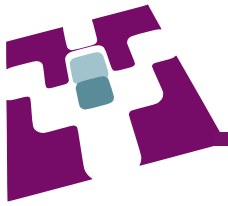


Contributions

Objectives

Define an evalution platform for different purposes.

Industrial

Help them to choose a MOC or a Sensor ;

Acquire specific biometric databases.

Research

Propose new attacks on MOC (**Fuzzing** ; **HillClimbing**) ;

Impact on quality metrics to the enrolment ;

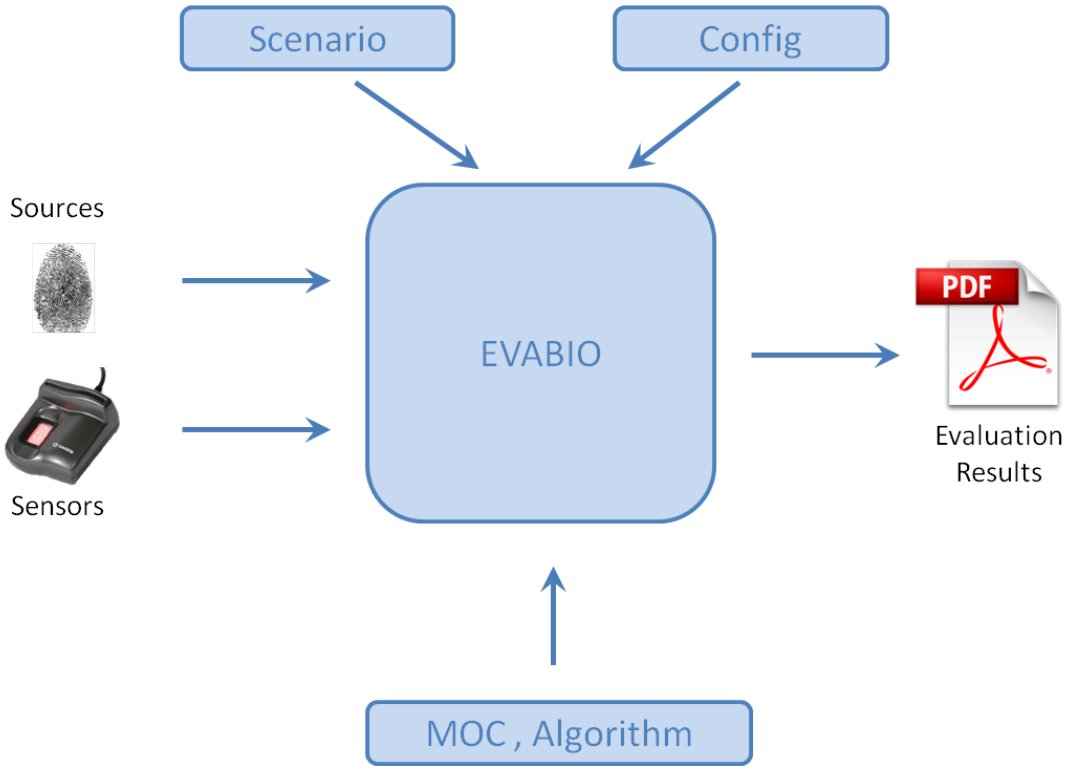
Qualifying own MOC algorithm ;

EVABIO Platform

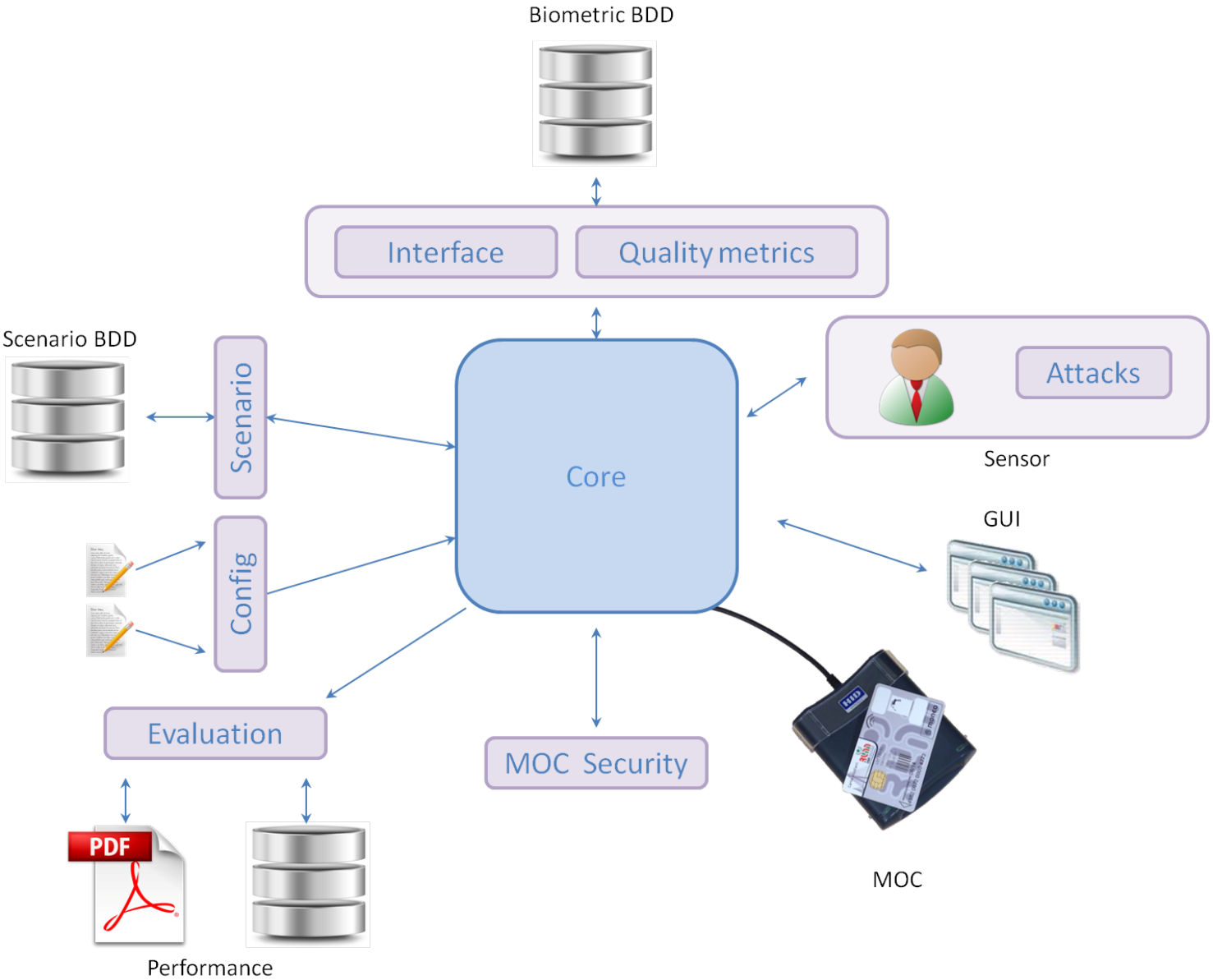
Goals

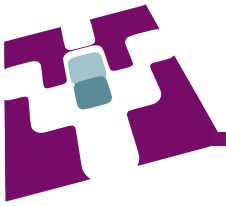
Evaluating Sensors and MOC ;

Reproducible research results.



Technical architecture





Focus on Evaluation

Evaluation module

Automated generated report ;

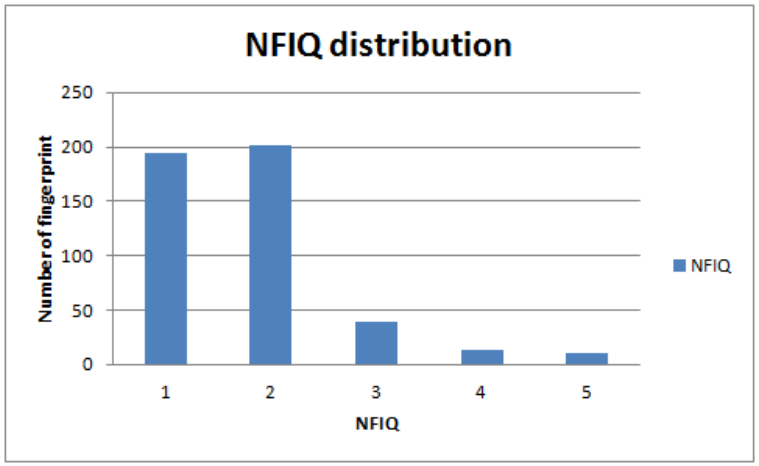
Generation of Metrics graphics (ISO 19795) :

- FTA : Failure To Acquire ;
- FTE : Failure To Enrol ;
- FNMR : False Non Match Rate ;
- FMR : False Match Rate ;
- Time ;
- ROC Curve ;

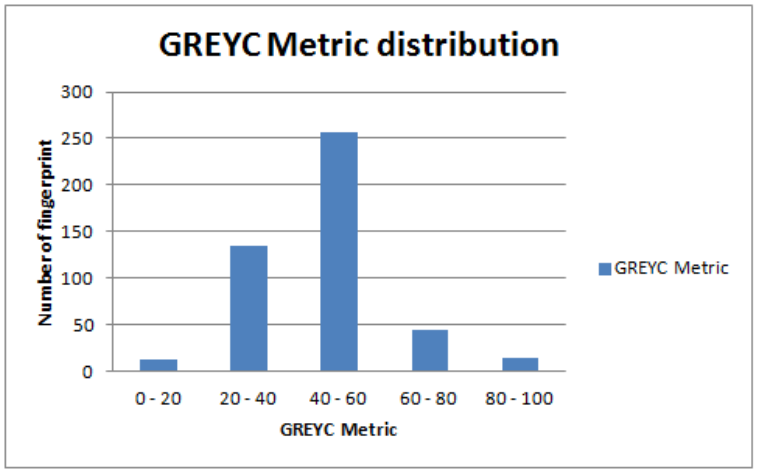
Quality metrics

NFIQ (Most Used by Industrial) ;

Q by GREYC (Yao & al. 2014) ;



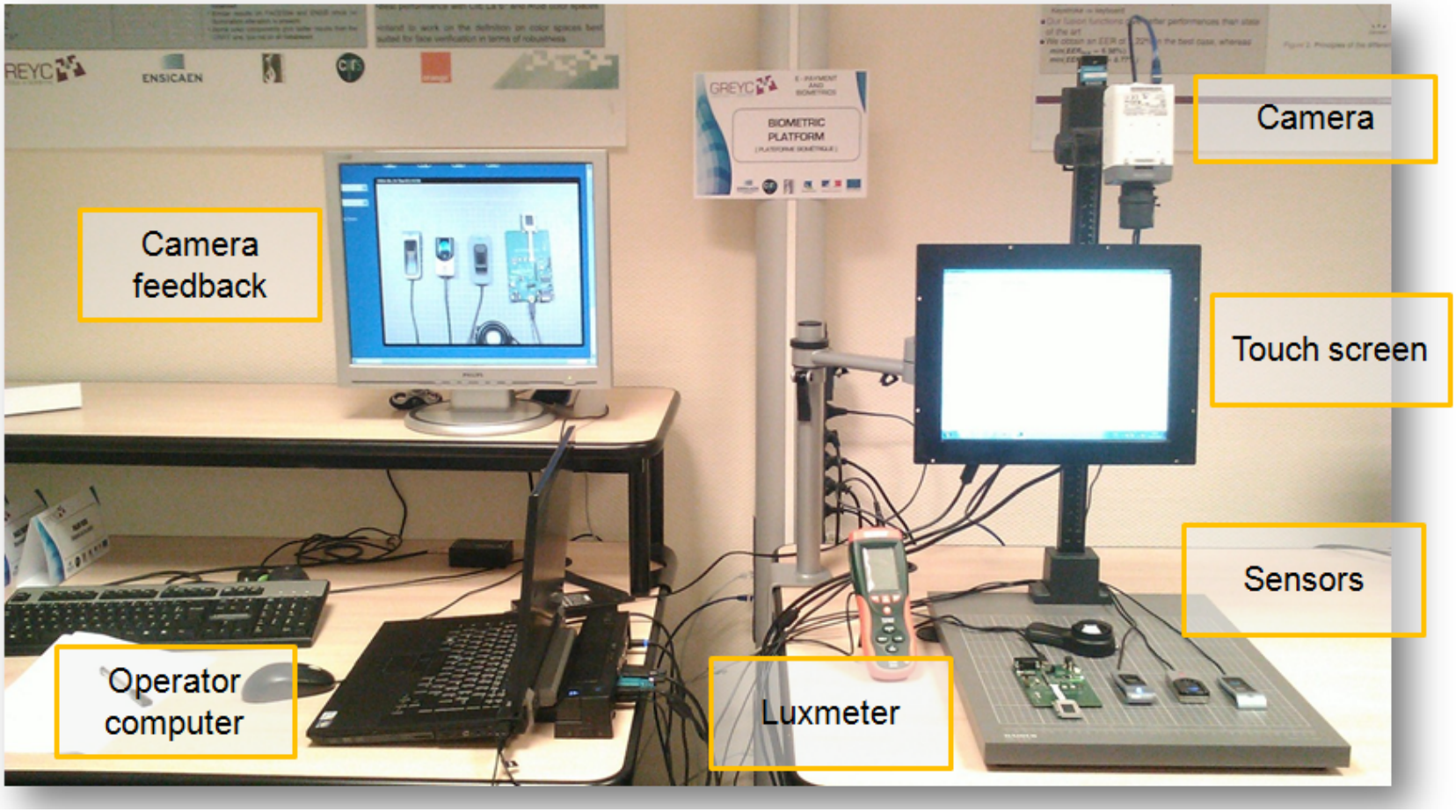
(a) NFIQ distribution



(b) Q distribution

FIGURE 1: metrics distribution

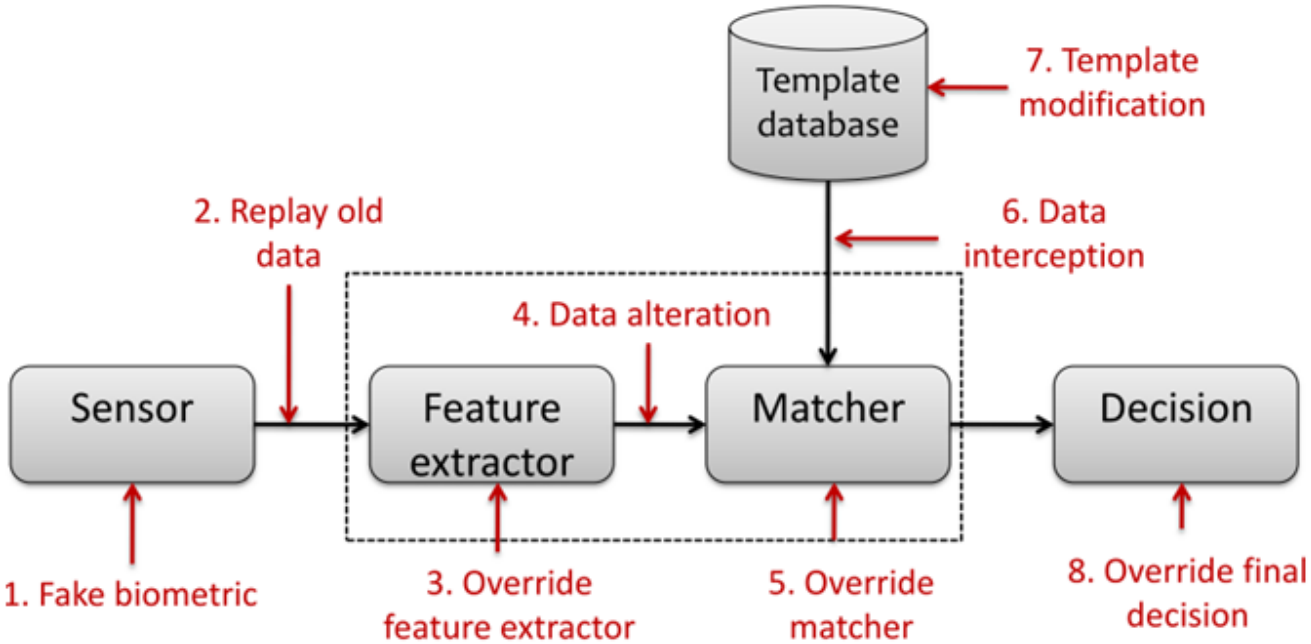
Focus on Sensor



Attacks on Biometric system (**Ratha**)

Fake biometric (Point 1)

Replay old data (Point 2)



Fake Fingerprint Illustration

Illustration

Create fake fingerprint database with real fingers and fingerprints

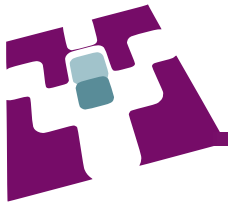
Used Wax & Gelatin (materials not thick)

Results

Sensor 1,3 and 4 : FTAR = 0%

- 96 tests have been performed :
  - 65% led to a negative verification
  - 35% to a positive

Sensor 2 : FTAR = 100%



Dead Fingerprint Illustration

Illustration

Create dead fingerprint database with dead fingers on 4 people

- 3 sensors
- 4 fingers (except thumb)
- 2 hands (left & right)
- 6 captures / individual / finger/ sensor ($\bar{1}$44 images and ISO Compact Card II template)

576 samples in total

FTAR = 36.11% (1-(368/576))

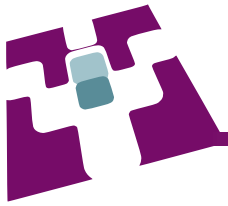
Results

(a) Acquisition

Metric Q results				
	Sensor 1	Sensor 2	Sensor 3	Sensor 4
Mortuary	38.3	81.9	72.3	68.3
Senior database	32.1	84	78.6	73.7

(b) Average Q metric value for fingerprint coming from a senior database and the dead fingers one

FIGURE 2: Acquisition and Results



Conclusion & perspectives

Conclusion

Proposed a platform for the evaluation of biometric sensors and Match-On-Card algorithm.

Illustrate two attacks on sensors with the platform

- Fake Fingerprint : spoofing, FTAR
- Dead Fingerprint : Lower quality for the data

Perspectives

Improve the Q metric for fingerprint quality assessment

Make a new database, more dead and alive fingers

Thanks for Your Attention

http://www.epaymentbiometrics.ensicaen.fr/