POLICE SCIENTIFIQUE

isorg

Proof of Concept – Mobile fingerprint scanner and palm scanner

16/06/2022

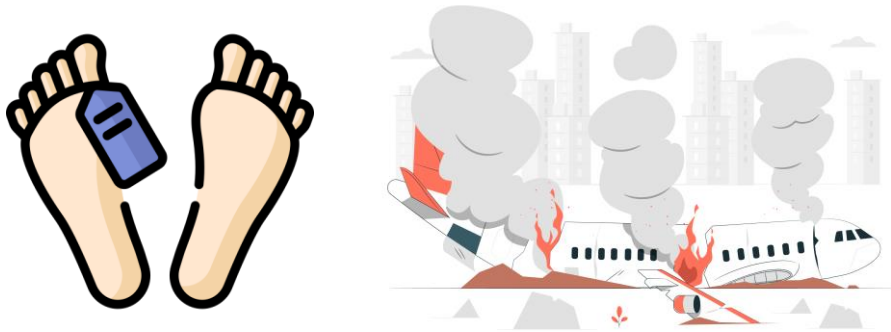
Christophe Abraham | Technicien en chef de PTS
Jennifer Aflalo | Program Manager

Background and scope of the proof of concept

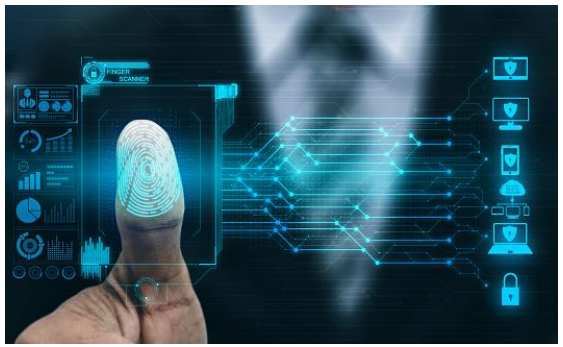
Need from French forensic and French authorities of having a mobile fingerprint scanner

Discrimination of victims

Identification of cadavers



Verification of identity
And right of residence



Enrolment in informations systems

Key functionalities

- Enrolment → rolling fingerprint
- 1 to 4x finger acquisition
- Palm scanner
- Autonomous

Background and scope of the proof of concept

Isorg expertise

- Core technology : Organic photodiode (OPD)
- Manufactures large area image sensors (OPD + TFT backplane)
- Isorg can integrate its image sensor behind phone screen (FoD), or behind a light source (Security & ID)
- Isorg has its FAP10 module FBI certified in 2021

Quality criteria for fingerprint scanner

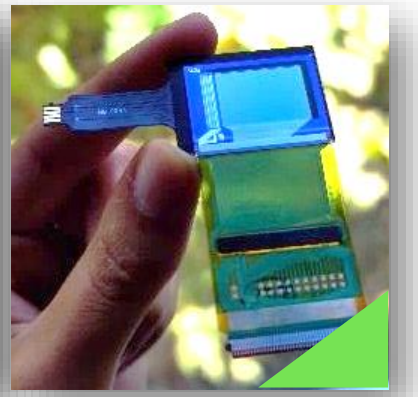
- False Acceptance Rate (FAR) / False Rejection rate
- FBI certification (standardized format)
  - Standard resolution → 500dpi
  - Spatial resolution
  - Uniformity
  - Fingerprint dynamic

Decision to start Proof-of-Concept project to design mobile large area fingerprint scanner

- **Format**: Smartphone size ~120x60mm²
- **Qualification criteria** → defined by French Forensic (SNPS – Service National de la Police Scientifique)

POLICE SCIENTIFIQUE

Prototypes design during the POC project



V1 – FAP10 module

→**For initial image quality assessment**

- Integrates touch function for image acquisition
- Image processing integrated to the software

V2 – Smartphone size

→ **For image quality assessment on large area**

→ **Initial comparison with existing technologies**

- Minimal functionalities at first
- Image processing delivered afterwards to take into account the first feedbacks
- Prototype for the touch function
- Prototype version of the background cut-off
- Battery integrated

V3 Smartphone size (upgraded)

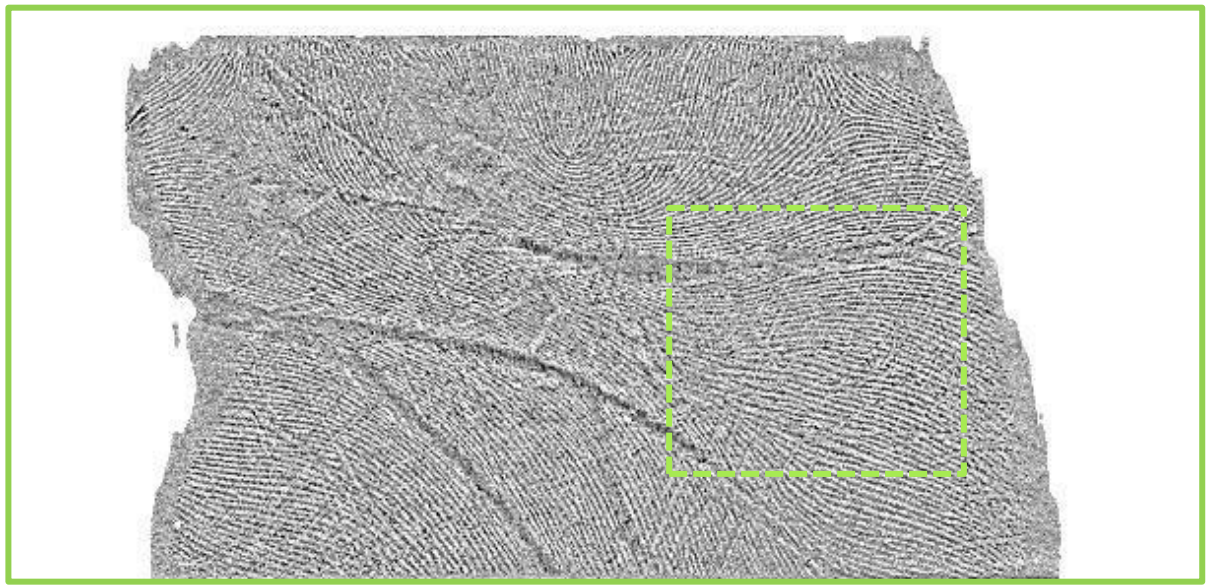
→ **For final image quality assessment**

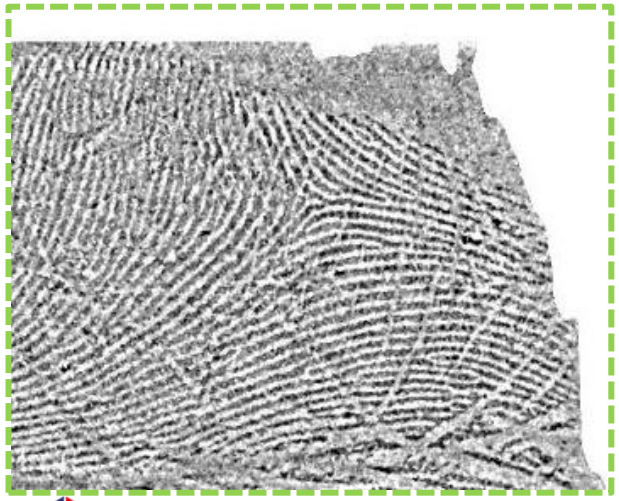
→ **Comparison with existing technologies**

- Version upgraded to take into account the feedback from the previous version
- Integrated touch function
- Improved image processing
- Battery integrated

POLICE SCIENTIFIQUE

Large area images example –(V3)





- Palm print (after image processing, with background cutoff)

- 4-fingerprint image, after image processing (with background cut off)

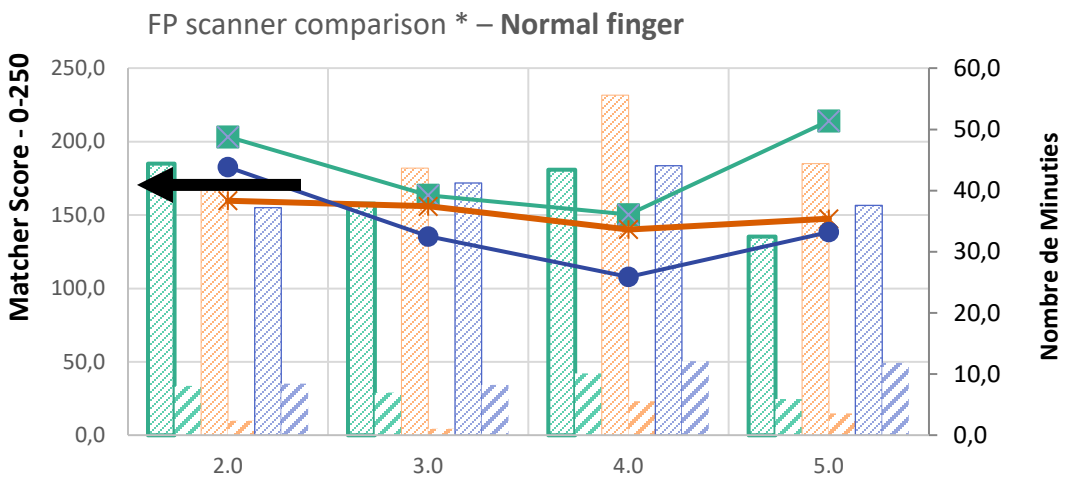
POLICE SCIENTIFIQUE

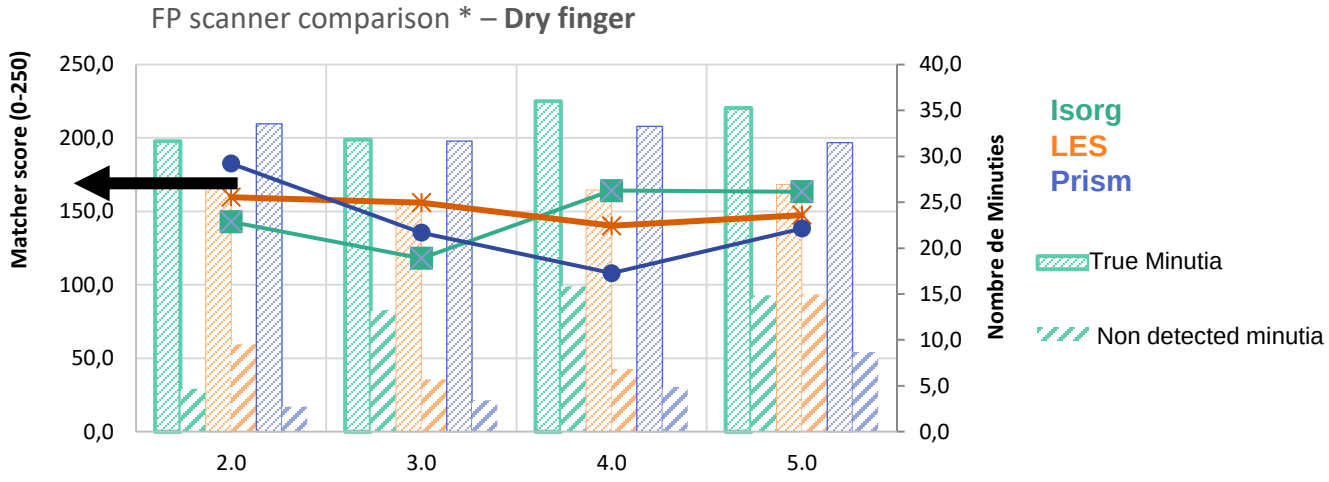
4 print images– after image processing (no background cut off)

4 print images– after image processing (no background cut off)

POLICE SCIENTIFIQUE

Technology comparison : matching scores and minutia number





**fingerpint data for 100 000 pixels (to compare data with respec to the surface*

- **Technologies compared : Prism, Light Emitting Sensor, Isorg**
- **Results**
  - Isorg scanner equivalent to other technologies
  - True minutiae detected equivalent to other technologies assessed
  - Good performance on dry finger (with previous version, scores were close to 0)

POLICE SCIENTIFIQUE

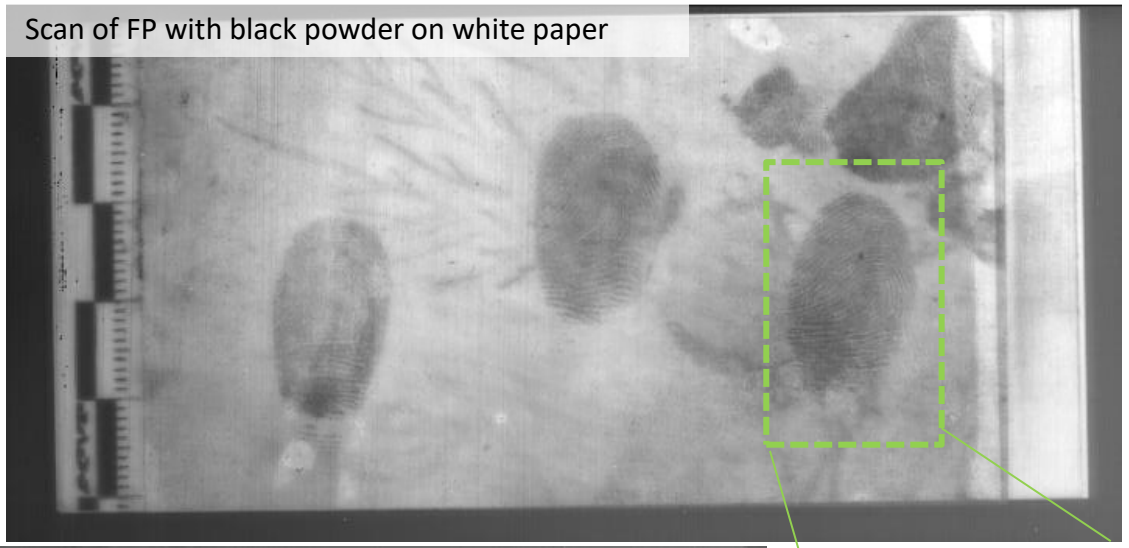
isorg

Scanner function assessment

- Scanner trials on V3 module
  - contact scanning
  - Secured document: Driver ID, ID, badge
  - Fingerprint:
    - Black powder on white paper
    - White powder on black paper
    - Fluorescent powder

- **Results**
  - Good quality of scanned document
  - Scanned MRZ stripe usable on ID paper
  - Ridges and valley visible on scanned powder print → OK for identification

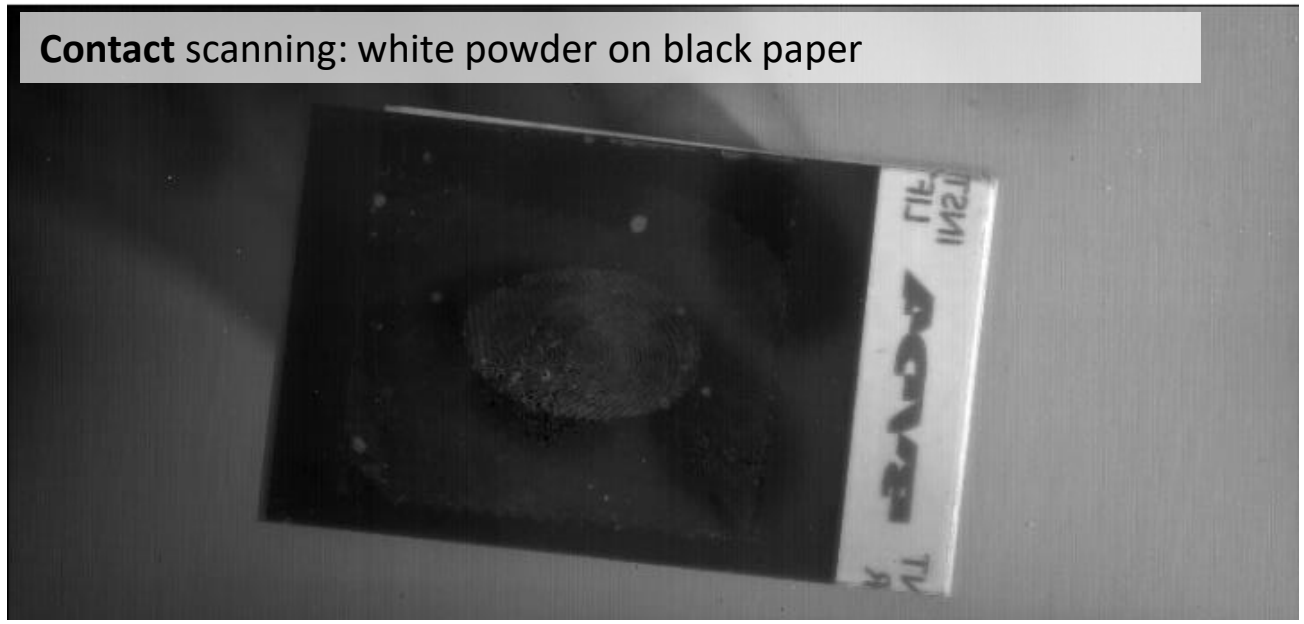
Scan of FP with black powder on white paper

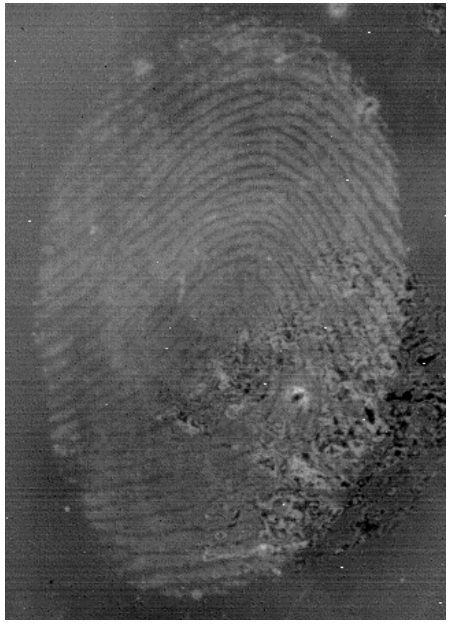


POLICE SCIENTIFIQUE

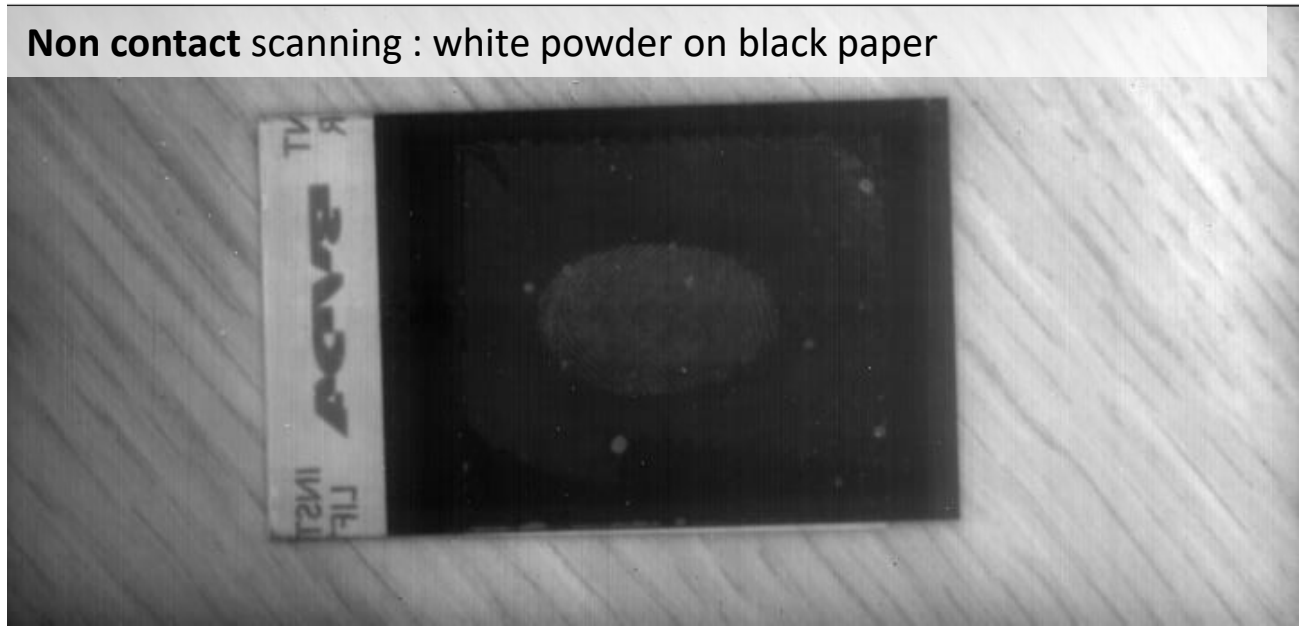
isorg

Contact scanning: white powder on black paper





Non contact scanning : white powder on black paper



POLICE SCIENTIFIQUE

Learnings and progresses through the project

	V1 – FAP10 format (13x17mm²)	V2- Smartphone format (60x120mm²)	V3-Smartphone format
Image quality (authorities matcher score)	High level of line noise (50-70 /250)	Good image quality (70-100)	High score (>100)
Use case : different lighting condition, repeatability	N/A	Lack of image repeatability Prototype background cut-off image processing integrated which improved image repeatability	Fingerprint image repeatable
Touch function	Integrated and operational	Prototype version	Integrated
Comparison with other technologies (Prism, LES)	N/A	Similar scores on normal finger Worse on dry finger Rather background noise	Similar or **higher** scores on dry and normal finger
Scanning function	N/A (too small active area)	N/A	Contact scanning + scanning with air gap tested
Other tests	Repeated acquisition without cleaning → up to 100 image taken → **no variation of the matcher score**		

- **No need to clean module between fingerprint acquisition**
- **Image processing is key to achieve good repeatability and good FP image quality**
- **Scanning mode functional to scan fingerprint (from powder) : contact & non contact**

POLICE SCIENTIFIQUE

isorg

Conclusion

- **Very positive and fruitful collaboration for Isorg to move forward on large area fingerprint scanner**
  - Very first fingerprint scanner module of this area manufactured by Isorg for this project
  - Significant work has been necessary on image processing especially to reach interior security authorities requirement
- **Achievements with the last prototype**
  - Mobile fingerprint module with integrated battery
  - Image quality high enough for identification
  - Possibility to act as scanner
- **Next steps**
  - Improvement of module robustness to high sunlight
  - Integration of rolling function
  - Video function to have direct feedback on fingerprint imaging
  - Module integration (more compact)

POLICE SCIENTIFIQUE

isorg

Jennifer Aflalo |Project Manager
Jennifer.aflalo@isorg.fr
+33 6 65 76 13 53

Christophe Abraham|Technicien en chef de PTS
christophe.abraham@interieur.gouv.fr
+33 4 72 86 86 92 - +33 6 25 08 29 44

LIMOGES - HEADQUARTERS AND FACTORY
17 rue Soyouz.
Parc ESTER Technopole
87068 LIMOGES Cedex 3 – France

GRENOBLE - R & D AND APPLICATIONS
60 Rue des Berges.
Parc Polytec
38000 GRENOBLE - FRANCE

BORDEAUX - ADVANCED R & D
Plateforme ELORPrintTec.
Allée Geoffroy Saint Hillaire.
Bat B8 RDC.
33600 PESSAC – France

HONG KONG SALES & MARKETING
29 LUK HOP ST. SAN PO KONG.
RM 1513. 15/F. WANG FAI IND. BLDG.
KOWLOON. HONG KONG

POLICE SCIENTIFIQUE

isorg