ICAO

2025 ICAO TRIP SYMPOSIUM

MONTRÉAL , CANADA | NOVEMBER 4 - 6

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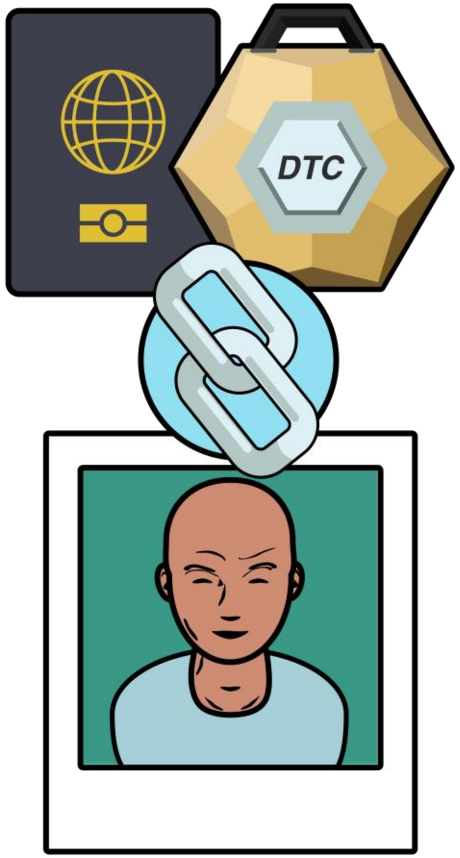
Biometrics and Border Management:
Understanding and Calibrating for your Use Case

Purpose of Using Biometrics



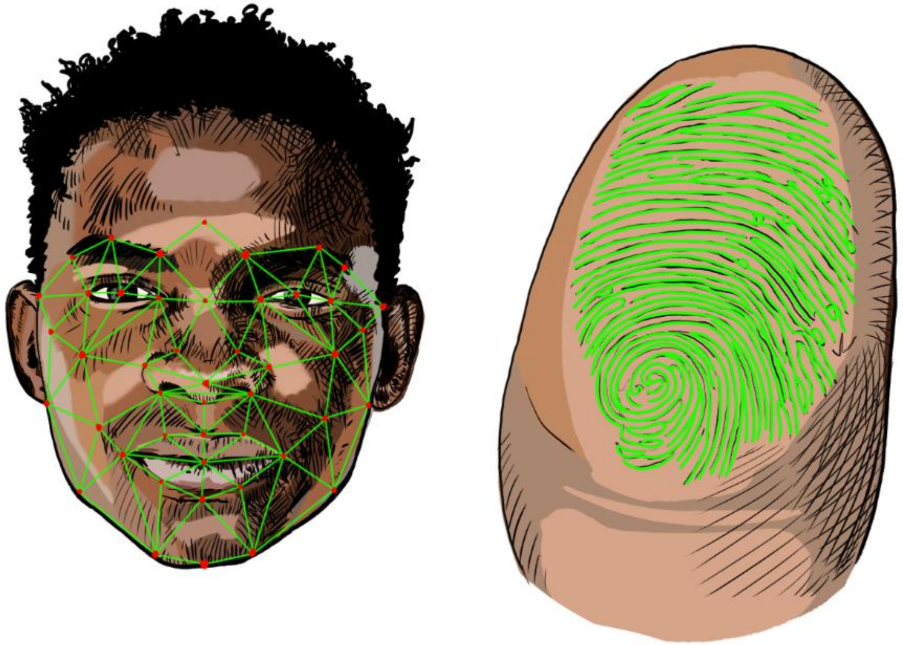
- Biometrics add a layer of security to any transaction.
- Biometrics can be paired with infrastructure (e.g., smartphone, eGate, etc.) to automate identity verification.
- Biometrics open new ways to interact with clients; can build and link client identities, can interact online or remotely and can remove friction for low-risk or pre-vetted clients.
- Biometrics are flexible and can be tailored to a scenario by adjusting threshold (e.g., accessing a sporting venue vs applying for a new bank account online).
- If used to anchor or claim an identity, Biometrics can streamline downstream processes by building identity verification upfront.

Why Do Borders Use Biometrics?

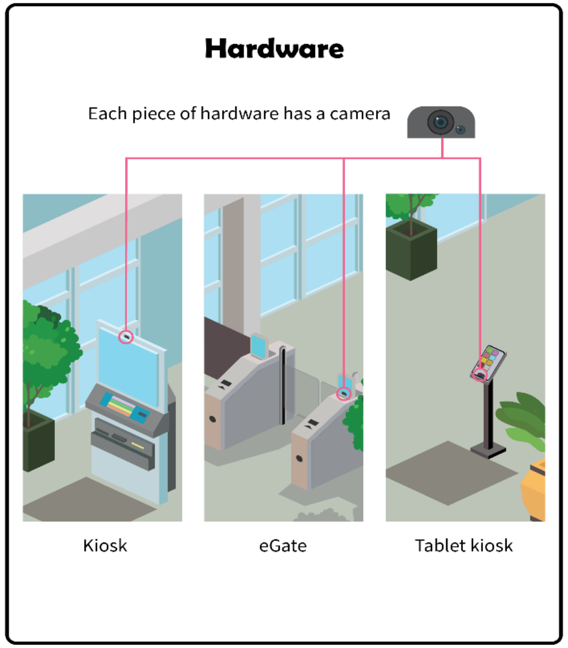
- Biometrics provide a secure means to verify the identity of a traveller attempting to cross a border

- The ePassport is a reliable source of data, and has drastically changed the practices of border management organizations

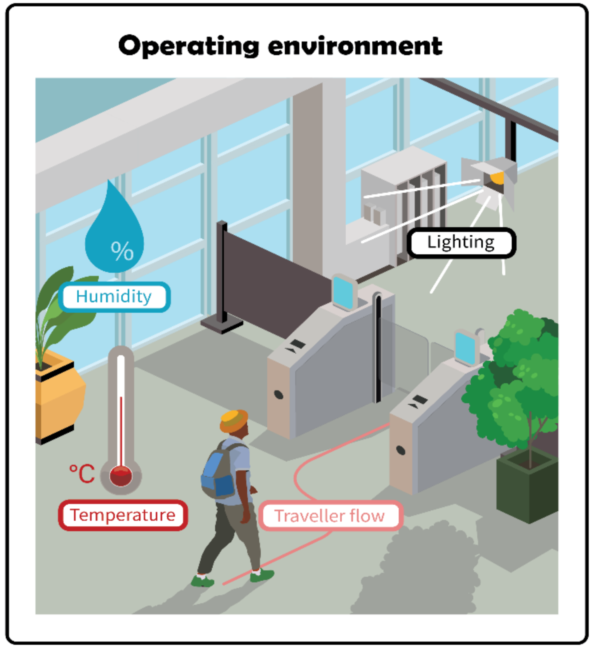
- Global movement adoption is high and has been very successful, but the world of travel is evolving.



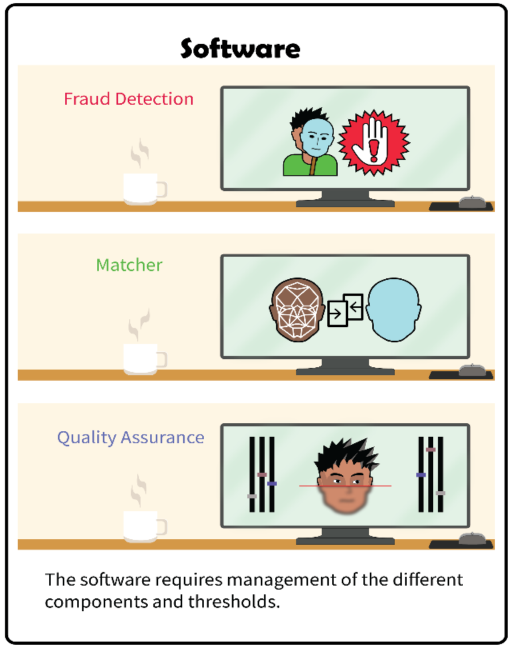
Hardware



Operating environment

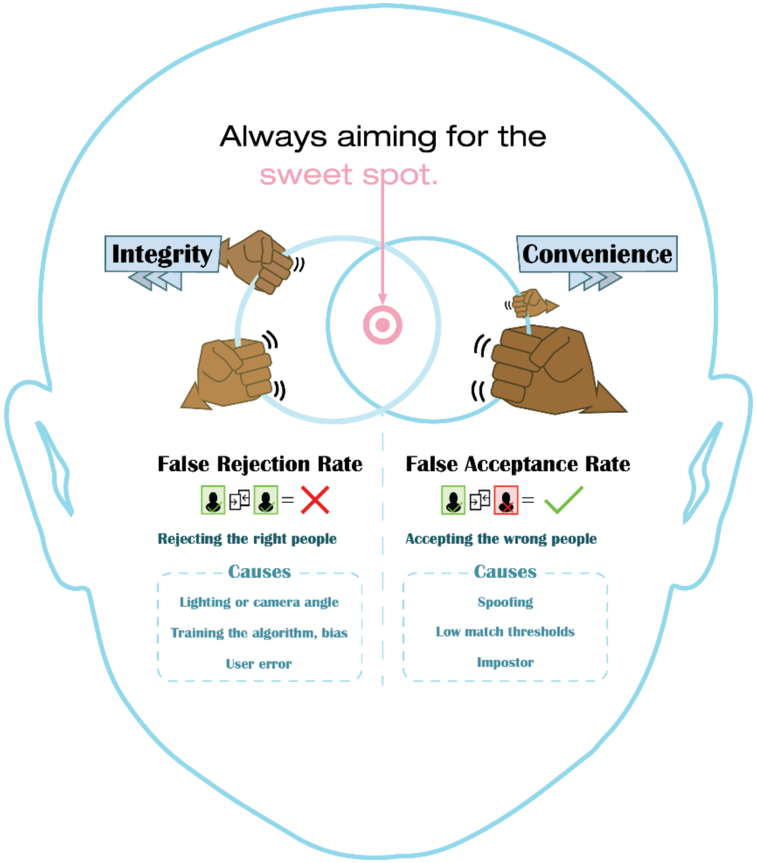


Software



The software requires management of the different components and thresholds.

- Biometric technology continues to mature, and it has become extremely accurate in confirming the identity of people of varying demographics (i.e., gender, age and nationality).
- The technology's performance is not isolated; there are many factors that affect its performance: hardware; operating environment; software; and traveller flow/familiarity with the technology.
    - All of these factors combine to impact the quality of the biometric data that is collected and used to verify the identity of a user of the system.
- Accounting for these factors is very important to ensure that all travellers have a fair and convenient experience, while preserving the integrity of systems in the airport and/or at border control.



Adjusting to the Use Case

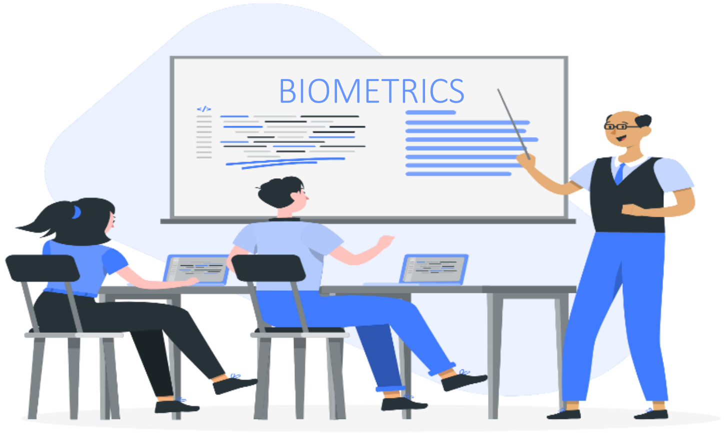
- Biometrics can be highly effective in preventing identity fraud, while facilitating the verification of genuine individuals.

- Calibrating the technology to account for the risk, operational deployment, clients and environment is essential to meeting the objectives of your programming.

- Testing the technology allows the operator to understand its limits and set thresholds in a way that securely facilitates passenger management.

(An) Approach to Testing

How do I ensure that my biometric system is working the way it should be?



Step 1: Foundations

- Identify and define use cases
- Determine acceptable performance for individual or combined capabilities
- Source data and define test methodology

Step 2: Targeted Evaluations

- Depending on the use case, data availability/source, and capacity, undertake scenario and/or technology evaluations (ISO/IEC 19795).
- Assess accuracy, fraud-resistance and demographic fairness

Step 3: Derive Insights

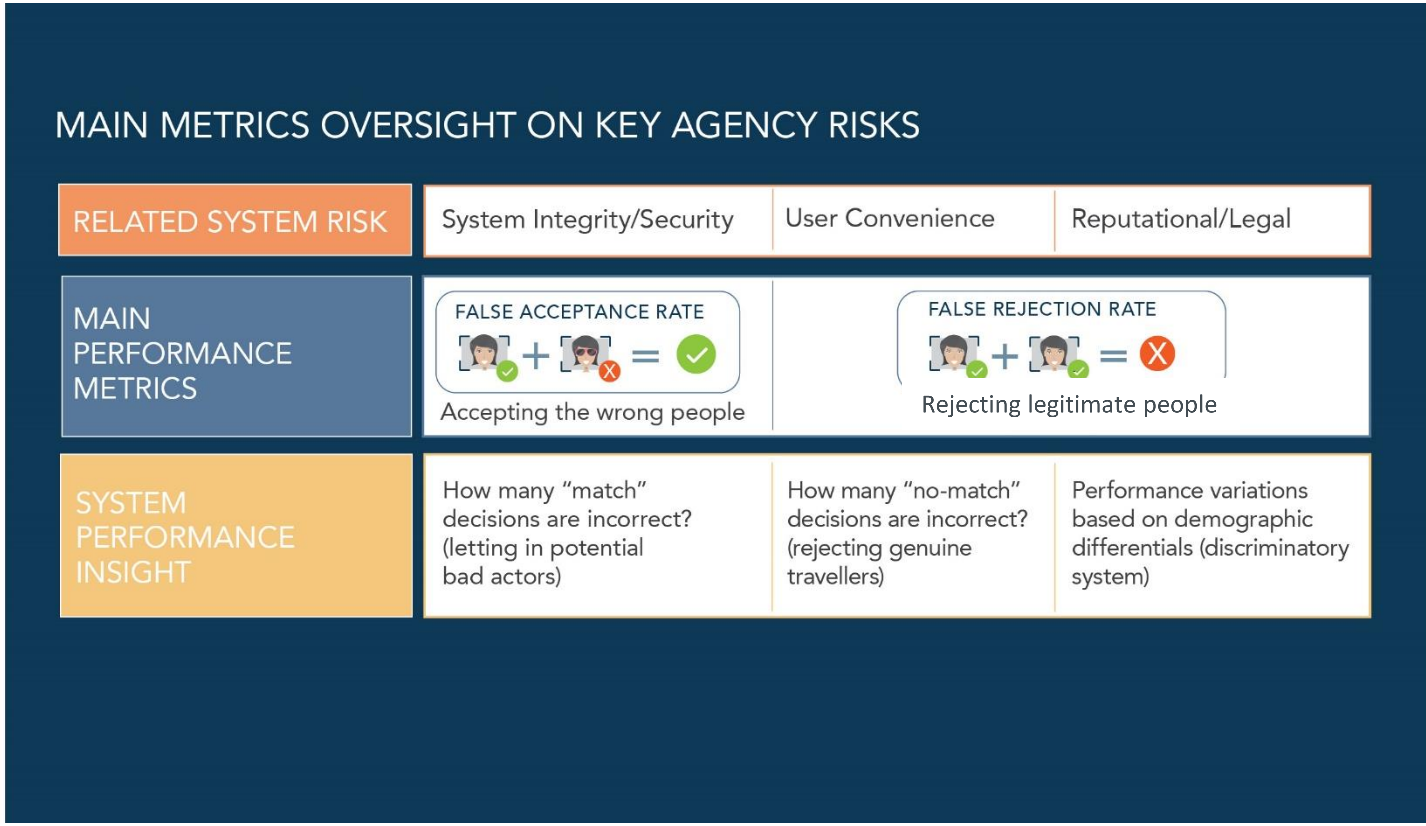
- Analyze system performance using key metrics and standard methods (e.g., ISO/IEC 19795) for structured results.
- Assess whether your technology stack meets your operational and security objectives using these insights.

- Performance management allows for:
  - Calibration of system performance to achieve the right balance between security and facilitation
  - Monitoring system performance in operations to ensure system is working as intended

- Allows for the measurement of the effectiveness of a given biometric system based on 3 key risks :
  - Border Security
  - Traveller Facilitation
  - Reputational/Legal risk

- Applicable to all biometric use-cases :
  - Various modalities (fingerprints, voice recognition, Facial recognition, etc.)
  - Various applications (1:1 verification and 1:N identification)

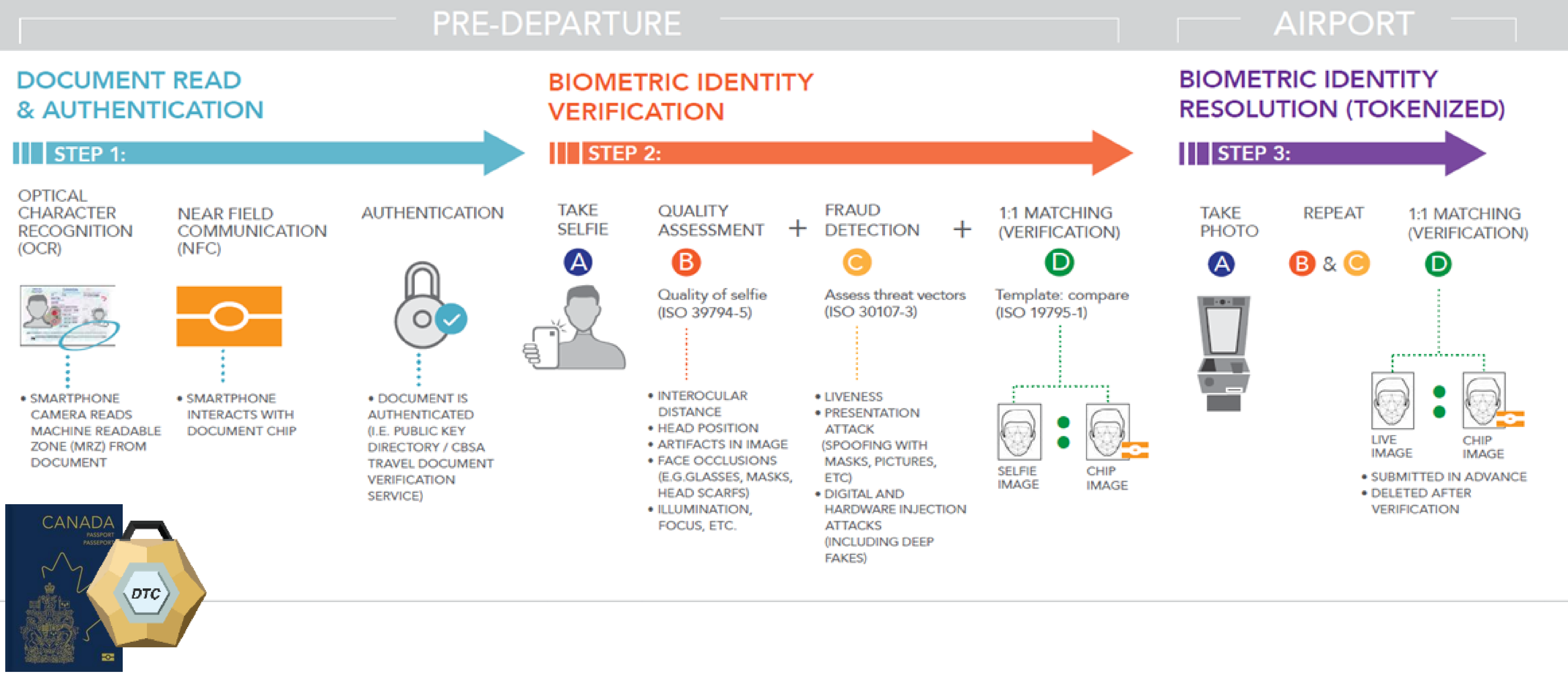
CBSA's Performance Framework



MAIN METRICS OVERSIGHT ON KEY AGENCY RISKS

RELATED SYSTEM RISK	System Integrity/Security	User Convenience	Reputational/Legal
MAIN PERFORMANCE METRICS	FALSE ACCEPTANCE RATE ✓ + ✗ = ✓ Accepting the wrong people	FALSE REJECTION RATE ✓ + ✓ = ✗ Rejecting legitimate people	
SYSTEM PERFORMANCE INSIGHT	How many "match" decisions are incorrect? (letting in potential bad actors)	How many "no-match" decisions are incorrect? (rejecting genuine travellers)	Performance variations based on demographic differentials (discriminatory system)

THE 1-2-3 OF BIOMETRICS-ENABLED IDENTIFICATION IN TRAVEL



PRE-DEPARTURE

AIRPORT

DOCUMENT READ & AUTHENTICATION

STEP 1:

OPTICAL CHARACTER RECOGNITION (OCR)

- SMARTPHONE CAMERA READS MACHINE READABLE ZONE (MRZ) FROM DOCUMENT

NEAR FIELD COMMUNICATION (NFC)

- SMARTPHONE INTERACTS WITH DOCUMENT CHIP

AUTHENTICATION

- DOCUMENT IS AUTHENTICATED (I.E. PUBLIC KEY DIRECTORY / CBSA TRAVEL DOCUMENT VERIFICATION SERVICE)

BIOMETRIC IDENTITY VERIFICATION

STEP 2:

TAKE SELFIE

A

QUALITY ASSESSMENT +

B

Quality of selfie (ISO 39794-5)

- INTEROCULAR DISTANCE
- HEAD POSITION
- ARTIFACTS IN IMAGE
- FACE OCCLUSIONS (E.G.GLASSES, MASKS, HEAD SCARFS)
- ILLUMINATION, FOCUS, ETC.

FRAUD DETECTION +

C

Assess threat vectors (ISO 30107-3)

- LIVENESS
- PRESENTATION ATTACK (SPOOFING WITH MASKS, PICTURES, ETC)
- DIGITAL AND HARDWARE INJECTION ATTACKS (INCLUDING DEEP FAKES)

1:1 MATCHING (VERIFICATION)

D

Template: compare (ISO 19795-1)

SELFIE IMAGE

CHIP IMAGE

BIOMETRIC IDENTITY RESOLUTION (TOKENIZED)

STEP 3:

TAKE PHOTO

A

REPEAT

B & C

1:1 MATCHING (VERIFICATION)

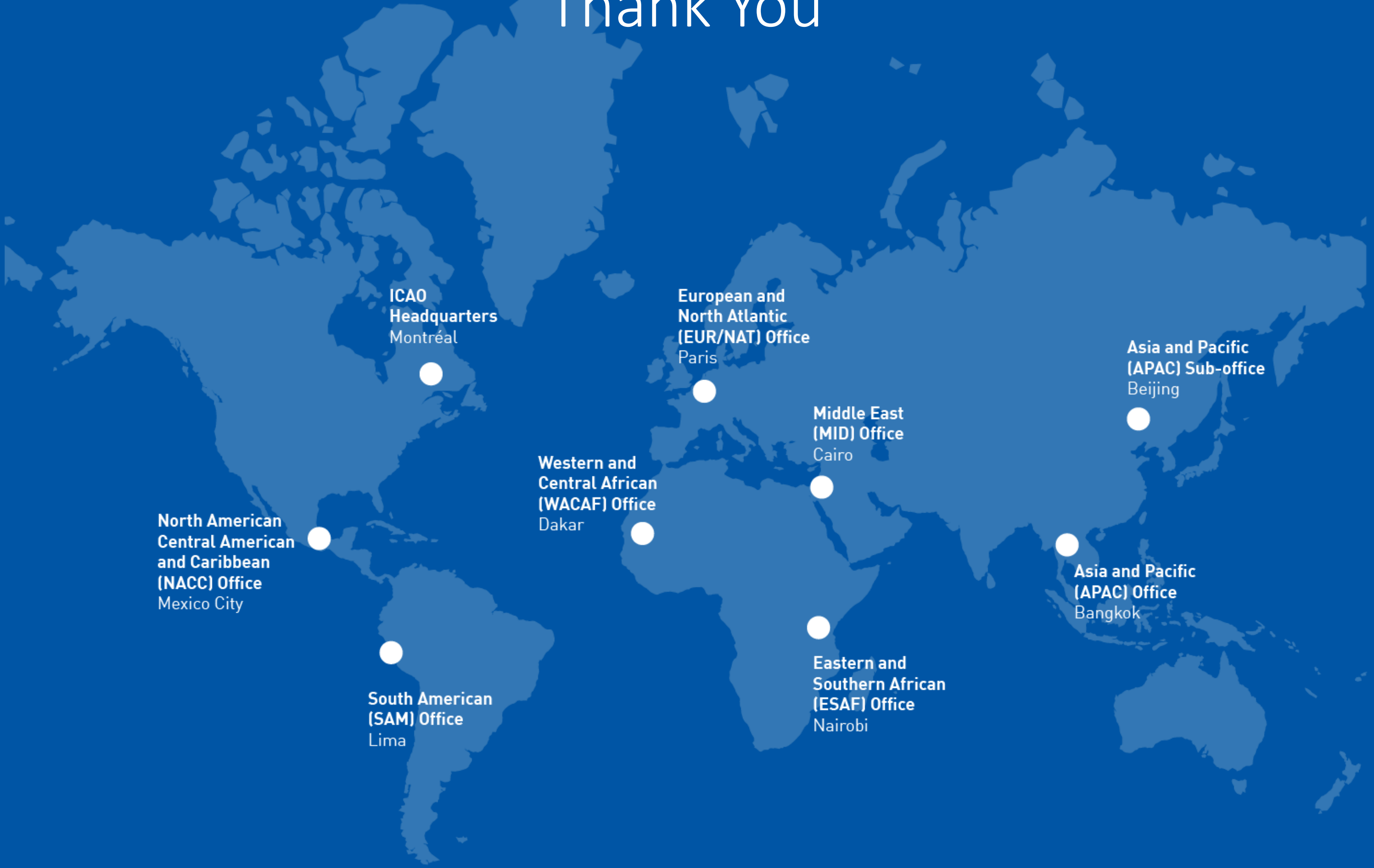
D

LIVE IMAGE

CHIP IMAGE

- SUBMITTED IN ADVANCE
- DELETED AFTER VERIFICATION

Thank You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