



DHS SCIENCE AND TECHNOLOGY

The 2020 Biometric Technology Rally

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**Homeland
Security**

Science and Technology



Biometric and Identity Technology Center

Vision

- **Drive biometric and identity innovation** at DHS through RDT&E capability
- **Facilitate and accelerate understanding of biometrics and identity technologies** into new DHS use cases
- Follow “Build once, use widely” approach

Goals

- **Drive efficiencies** by supporting cross cutting methods, best practices, and solutions across programs
- **Deliver Subject Matter Expertise** across the DHS enterprise
- **Engage Industry** and provide feedback
- **Encourage Innovation** with Industry/Academia



Goals of the Biometric Technology Rallies

- Challenge industry to meet specific DHS use-cases
- Foster innovation and create partnerships across government and industry
- Inform DHS procurement activities such as operational tests, pilots, and system acquisitions



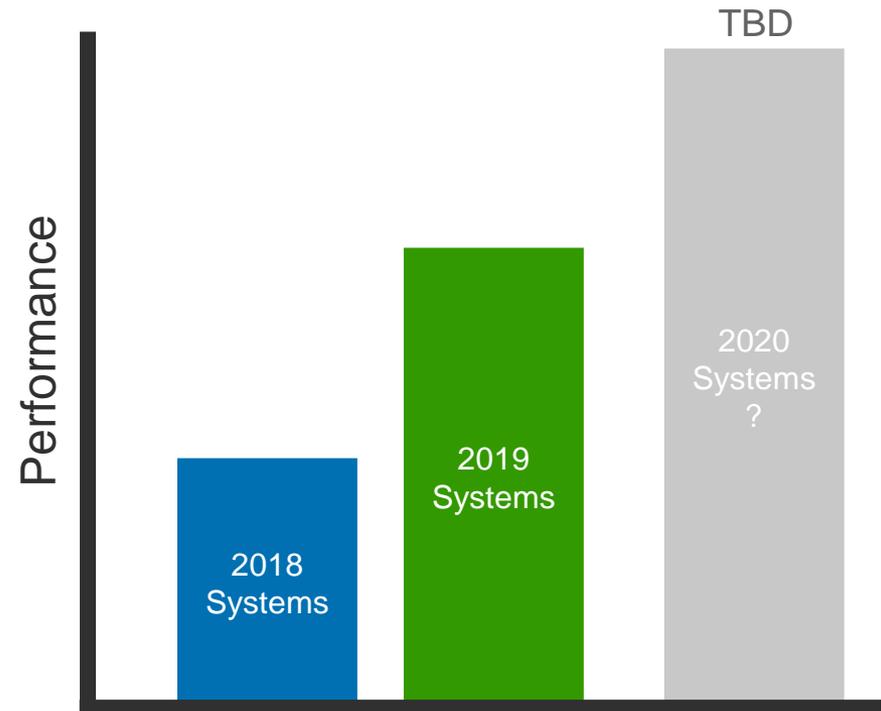
Experiences from the 2018 & 2019 Rallies

- 2018 Rally tested Acquisition Systems
- 2019 Rally tested Acquisition *and* Matching Systems
- Prior Acquisition System Providers have stated that participating in Rallies provided insights into how people interact with their systems



Industry Performance Improvement from Past Rallies

- Industry participants improved from 2018 to 2019 in all measured metrics for the high throughput use case
 - Efficiency
 - Effectiveness
 - Satisfaction
- The 2018 and 2019 Rallies measured performance for processing people one at a time
- Next challenge for industry: processing groups



2020 Biometric Technology Rally

- Acquisition Systems will be evaluated in 2 phases
- Each phase focuses on specific use-cases faced by DHS

Phase1 – Individuals

- Similar to past Rallies
- Face image required, iris/fingerprint optional
- Top systems from Phase 1 will carry over into Phase 2

Phase 2 – Groups

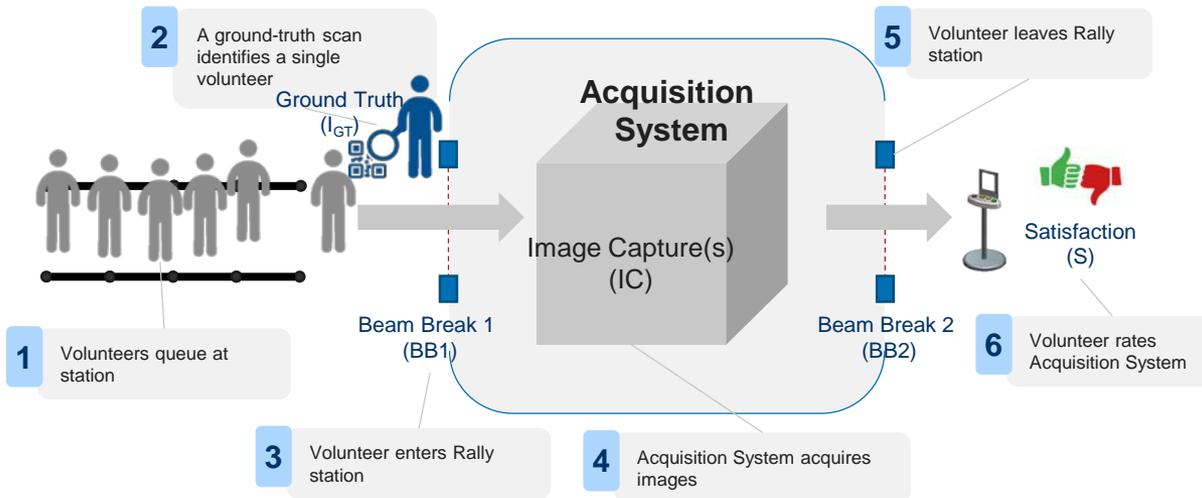
- New challenge
- Acquire one face image per individual in a group
- Opt in and opt out individuals
- Must utilize the same system as in Phase 1
- VIP Day will be held during this phase

2020 Biometric Technology Rally

- Matching System Evaluation
 - Match performance will be evaluated using data gathered at the MdTF
 - Accepting face, fingerprint, and iris biometric matching algorithms



Phase 1 – Individual Processing



- Acquisition Systems will process test volunteers using a one-at-a-time process, similar to prior Rally test procedures
- Facial biometric modality is required, other modalities paired with facial biometrics are optional

Phase 1 – Individual Processing

- Up to **16 systems** will be selected to participate in Phase 1
- Vendors will have a single day to install their systems
- Phase 1 will involve three days of data collection
- DHS S&T is looking for Acquisition Systems that demonstrate flexibility to support multiple use-cases
 - E.g., Booth, Kiosk, Podium, Free-standing, E-gates

Phase 1 Metrics

- Same as 2018 and 2019 Biometric Technology Rally
- Efficiency
 - Time required to use a system
- Effectiveness
 - Acquisition of a single, quality image of each person
- Satisfaction
 - Positive user ratings towards a system

More details in April 7, 2020 technical webinar

Transition from Phase 1 to Phase 2

- Down-select
 - A maximum of 8 top performing Acquisition Systems from Phase 1 will participate in Phase 2
- Tear Down
 - All Acquisition System Providers will de-install their systems at the conclusion of Phase 1 testing
 - Acquisition Systems selected for Phase 2 will remain at the MdTF between test phases
- System Re-installation
 - Phase 2 participants will re-install their systems in a new station configuration

Uses for Group Processing Capabilities



Podiums



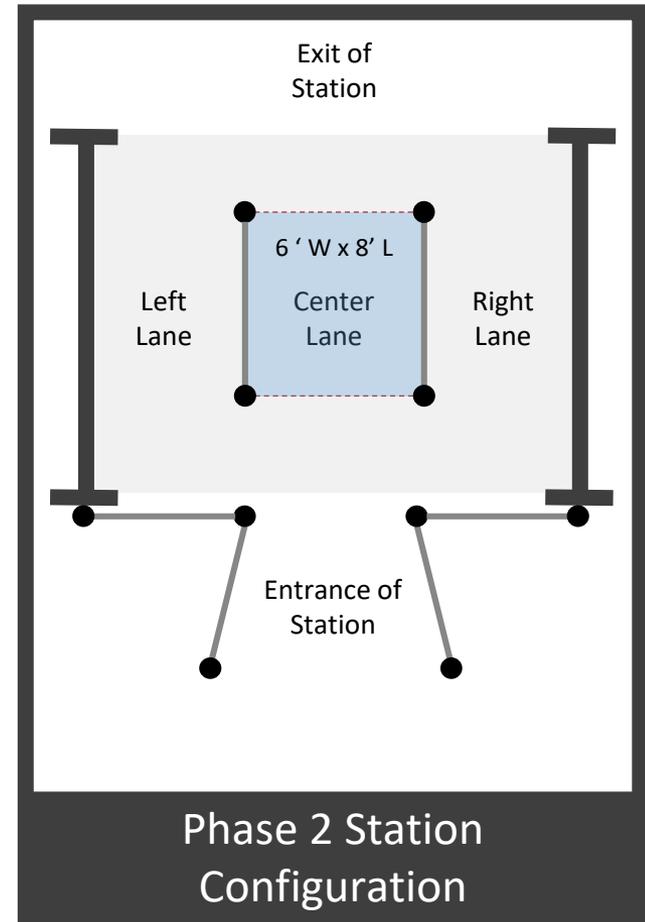
Booths



E-Gates

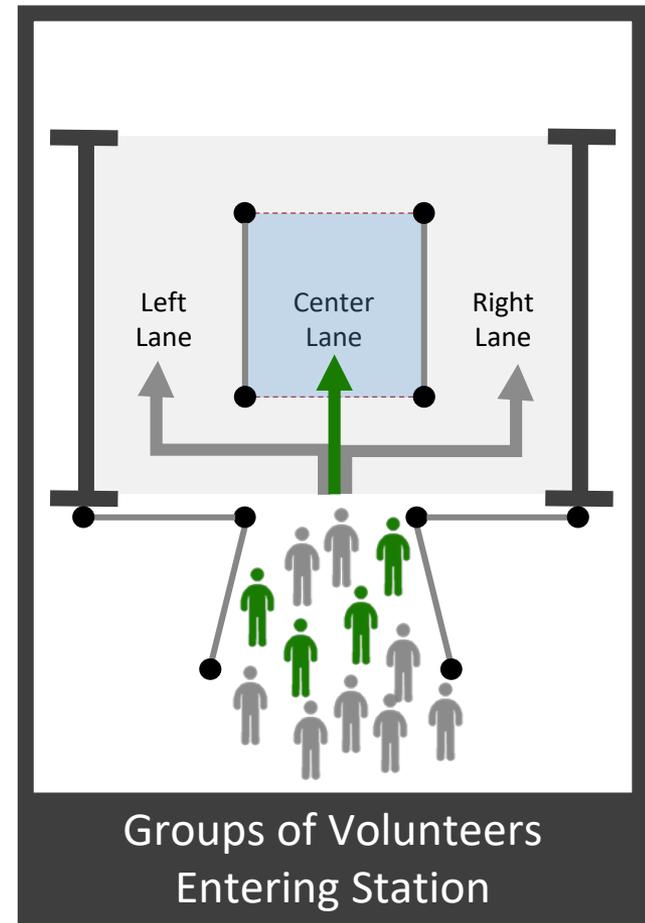
Phase 2 – Group Processing

- In this Phase, Acquisition Systems will be installed in stations consisting of three lanes
 - Acquisition Systems and signage will be installed in the center lane – 6' W x 8' L



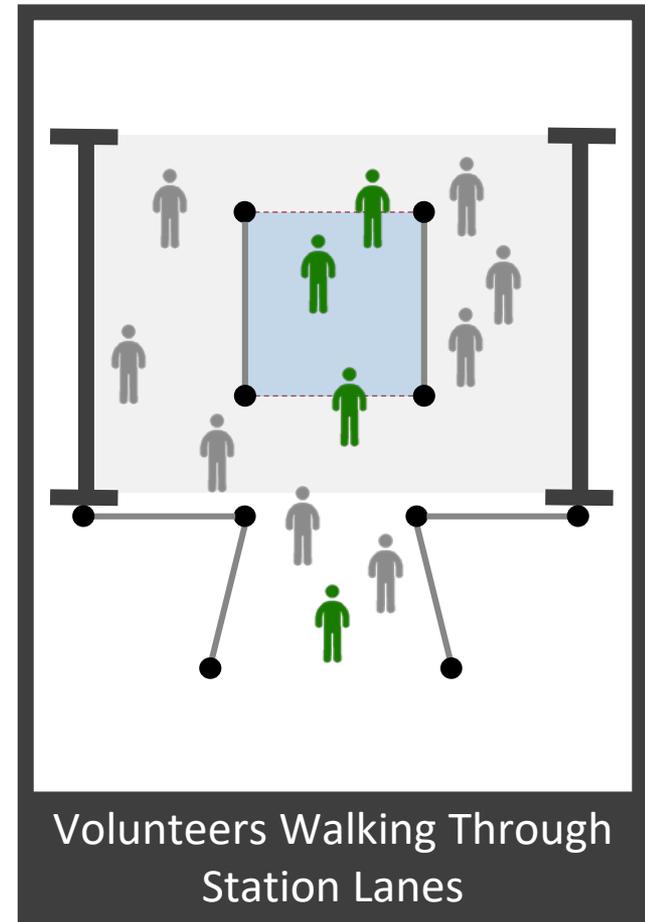
Phase 2 – Group Processing

- A group of volunteers will be prompted to enter a station where Acquisition Systems are installed
- Volunteers will be directed to enter the station all at once and walk through different lanes



Phase 2 – Group Processing

- Acquisition Systems are challenged to **ONLY** capture a single image for each volunteer walking through the **center lane**
- Volunteers walking through the **center lane** are opting-in to use your system
- Volunteers walking through the left and right lanes are opting-out of use of your system
 - Acquisition Systems should **NOT** capture images of these volunteers



Phase 2 Metrics

- Efficiency
 - Time required to use a system
- Effectiveness
 - Acquisition of a single, quality image of each person in the **opt in** group
- Satisfaction
 - Positive user ratings towards a system
- Privacy
 - Acquire no other images, i.e. people that opt out

More details during April 7, 2020 technical webinar

Matching System Evaluation

- Similar to 2019 Rally
- Face, fingerprint, iris matching systems are welcome to apply
- Matching systems will be evaluated using data collected at the MdTF
- Will be required to conform to the MdTF API

- Vendors may provide one or both of a Matching System or Acquisition System

Matching System Metrics

- Effectiveness
 - Identify individuals using probe images from Rally Acquisition Systems
- Robustness
 - Maintaining high effectiveness across Acquisition Systems

More details during April 7, 2020 technical webinar

Why participate in the Rally?

- For Acquisition System Providers
 - Receive biometric images collected on your system with a diverse group of test volunteers
 - Measure performance of your system
 - View videos of use errors to improve your system
 - Gain additional insight that may inform technology improvements
- For Matching System Providers
 - Receive data on performance across a variety of commercial Acquisition Systems and diverse volunteers
 - Opportunities to partner with Acquisition Systems
 - Inform government on your system's performance in an operationally relevant scenario test

Why participate in the Rally?

- Industry Recognition
 - Results are posted onto mdtf.org which has had thousands of visitors
 - Linked to dozens of press releases, news articles, and shares on social media
 - All results reported publicly are aliased
- VIP Day
 - For Phase 2 Acquisition System Providers
 - Past VIP days have had more than 100 visitors from government and industry
- On-going Cooperative Research and Development Agreement (CRADA) with DHS S&T

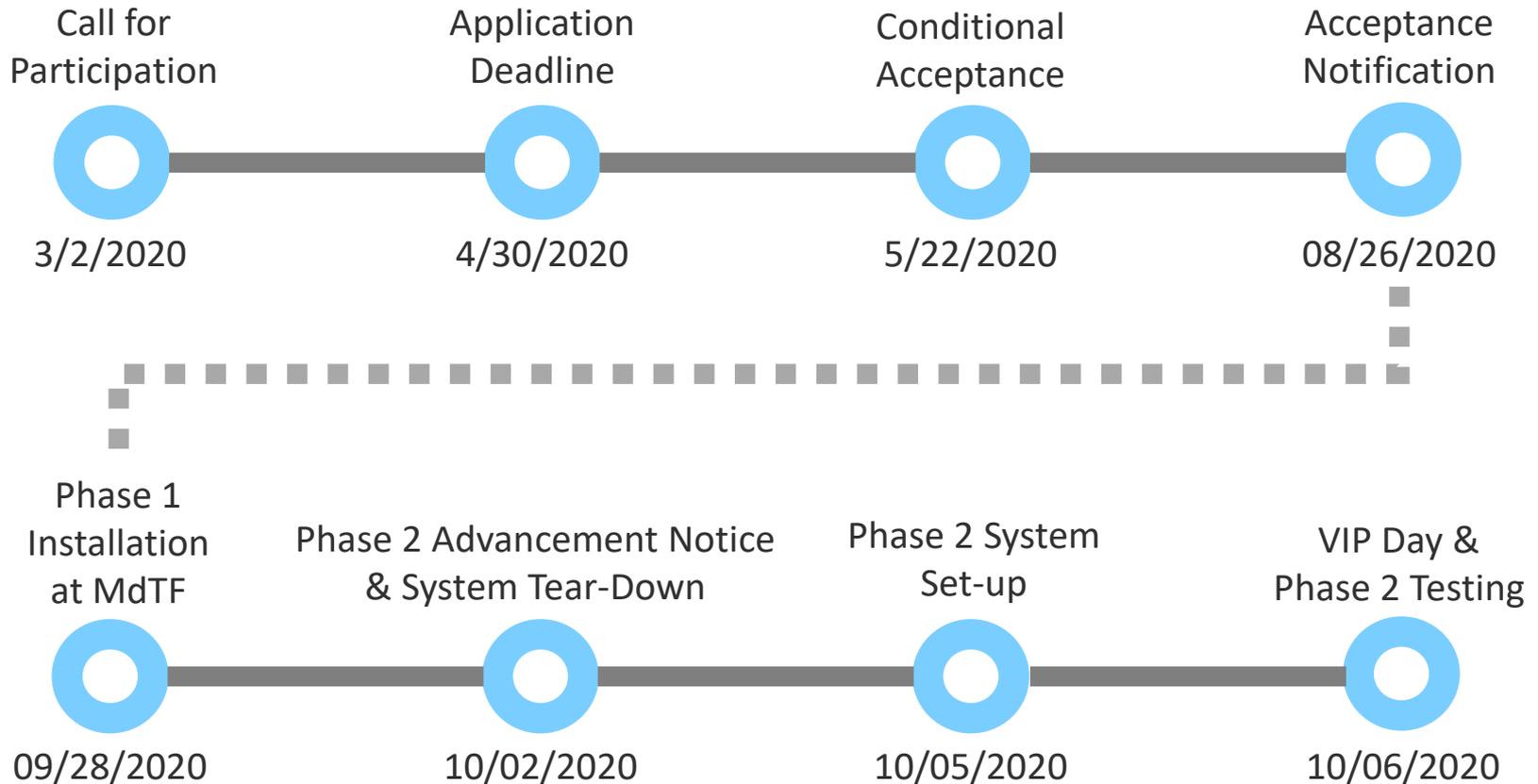
Acquisition System Application Package

- Submission deadline: **April 30, 2020**
- Provide a white paper (5-page limit) that addresses all of the following:
 1. Brief overview of provider
 2. Overview of the Acquisition System
 3. A description of the complexity and maturity of the Acquisition System
 4. Description of the imagery acquired by the system
 5. Description of user interaction with the system
 6. Estimates of performance
 7. System safety information, including eye safety
- Demonstration video of system functionality

Matching System Application Package

- Submission deadline: **April 30, 2020**
- Provide an application package (limit 5 pages), in the form of a white paper, that addresses all of the following:
 1. Brief overview of provider
 2. Overview of the Matching System
 3. Descriptions of the complexity and maturity of the Matching System
 4. Estimates of performance
 5. Algorithm training

Timeline – All Systems



What to Expect

- A technical webinar detailing more about the metrics and test process will be hosted **April 7, 2020**
- After submitting your application package, you will be notified if your system has been selected to participate in the 2020 Biometric Technology Rally by **May 22, 2020**
- Acceptance for participation in the 2020 Biometric Technology Rally will be considered conditional until you complete training and various administrative tasks
 - Those selected for participation will be required to attend a Conditional Acceptance webinar that reviews this information

Details on Acquisition System Application Packages

2020 Biometric Technology Rally System Requirements

- Who can participate?
 - Vendors of face, face/iris and face/fingerprint biometric Acquisition Systems
 - Vendors of face, iris, or fingerprint biometric Matching Systems
- Minimum requirements for Acquisition Systems:
 - Operate in an unmanned mode (i.e., no operator / instructor present)
 - Operate within a 6' W x 8' L physical footprint
 - Collect a single face biometric image per test volunteer
 - Process and submit biometric data within defined time constraints*
 - **Optional:** Provide other biometric modality images*
- Minimum requirements for Matching Systems:
 - Provide a software package that conforms to the MdTF Matching API
 - Operate within some computational limits (RAM/CPU usage, speed, etc.)*

* Denotes that details will be discussed in a follow-up webinar

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Detailed Acquisition System Application Package

1. Brief overview of provider

- a) A brief history of the provider's experience in the biometric community
- b) Location, including country, of provider's headquarters
- c) Contact information (name, email, telephone number, citizenship) of a business representative
- d) Contact information (name, email, telephone number, citizenship) of a technology representative

2. Overview of the Acquisition System

- a) Description of cameras and/or sensors utilized, and other equipment necessary
- b) Expected layout of all equipment within the specified footprint (6' W x 8' L)
- c) Network and power requirements
- d) Example use case and workflow

3. A description of the complexity and maturity of the Acquisition System

- a) When was the system first conceived and developed? Is it still under development?
- b) Known acquisition issues (height, weight, disability restrictions, etc.)
- c) Has a third party integrated your system into a larger system? If so, how much effort was needed?
- d) A description of any past or present operational deployments

Detailed Acquisition System Application Package (continued)

4. Descriptions of the imagery acquired by the system
 - a) Formats (jpg, png, wsq, etc.)
 - b) Quantity and Quality
5. Description of user interaction with the system
 - a) Actions the users perform to complete a transaction
 - b) Instructions / feedback provided to users
 - c) Are there any exception processes?
 - d) Any known usability issues or concerns and expected workarounds so that all users can complete a transaction with the system
6. Estimates of performance
 - a) Estimated failure to acquire rate
 - b) Estimated true positive identification rate using a top 3 recognition algorithm
 - c) Estimated transaction time

Detailed Acquisition System Application Package (continued)

7. System safety information, including eye safety

- a) Demonstrate why system is safe for human users
- b) Does your system use specific wavelengths for illumination?
- c) Are there any sources of exposed current?
- d) Are there any exposed sharp edges or moving parts that could cause physical harm?

▪ Demonstration video of system functionality

- a) Provide up to 2 minutes of video demonstrating your system in use
- b) Video should reflect information included in white paper
- c) Should video file be too large to be included in an email, provide a URL and instructions to reviewers for access

Details on Matching System Application Packages

Matching System Application Package

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Detailed Matching System Application Package

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2. Overview of the Matching System

- a) Modalities and acceptable biometric sample types (slap vs. individual finger for example)
- b) High level overview of the underlying technology (CNN, Gabor wavelets, Haar cascades, etc.)
- c) Recommended CPU, RAM, disk, operating system and runtime dependencies
- d) What programming languages does the Matching System SDK support?

Detailed Matching System Application Package (continued)

3. Descriptions of the complexity and maturity of the matching algorithm
 - a) When was the algorithm first conceived and developed? Is it still under development?
 - b) Known processing issues (image size, pixels between the eyes, occlusion, pose, or gaze angle restrictions, etc.)
4. Estimates of performance
 - a) Failure to process rate (unable to create a template)
 - b) True match rates and matching thresholds for the following false match rates:
 - i. @ 1:10,000 FMR. What is the match threshold and the expected TMR?
 - ii. @ 1:100,000 FMR. What is the match threshold and the expected TMR?
 - iii. @ 1:1,000,000 FMR. What is the match threshold and the expected TMR?
 - c) Estimates of algorithm stability to pose, motion blur, low contrast and images from a diverse range of acquisition systems
5. Algorithm Training
 - a) Describe methods used to develop algorithm or measure algorithm's performance over time
 - b) Describe data used to train it – open sourced, private data set, etc.

Thank you for your participation!

For more information, contact: peoplescreening@hq.dhs.gov or <http://mdtf.org>



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