U.S. Department of Homeland Security

SCIENCE AND TECHNOLOGY DIRECTORATE

2022 Biometric Technology Rally Announcement Webinar

Science and Technology

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Outline

- Background
- 2022 Rally and Test Process
- Metrics Overview
- API Overview
- Benefits of Participation
- CRADA Information
- System Requirements
- Timeline
- Q & A

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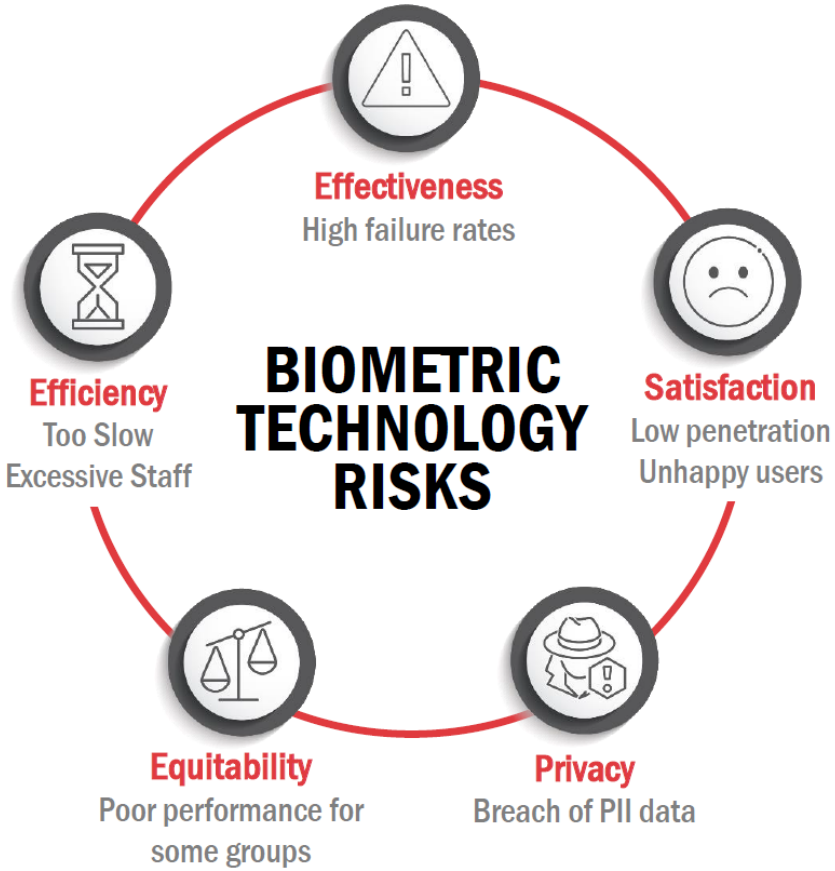
Biometric & Identity Technology Center

S&T conducts foundational research to ensure advancements in science and technology are harnessed for cutting-edge solutions to new and emerging operational challenges.

- Drive biometric and identity innovation at DHS through RDT&E capabilities
- Facilitate and accelerate understanding of biometrics and identity technologies for new DHS use cases
- 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 and Academia

Biometric Technology Rallies



- Rally Goals
  - **Focus industry on a specific use-case challenge** (e.g., high throughput, small groups)
  - **Identify and mitigate risks** associated with new biometric technology
  - **Create an independent assessment** of current industry offerings
  - **Collaborate and guide** promising technologies, using Cooperative Research and Development Agreements
- Annual Rallies
  - High throughput unattended use case
  - Scenario testing with naïve test volunteers
  - Dozens of commercial devices
  - More information: https://mdtf.org

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Past Biometric Technology Rallies

2018 Rally assessed acquisition systems

2019 Rally assessed acquisition systems *and* matching systems

2020 Rally assessed acquisition *and* matching systems *with* face masks

2021 Rally assessed acquisition *and* matching systems *with* face masks *and* system equitability

- Since 2018, the Rallies have demonstrated progress in the performance and maturity of biometric acquisition and matching systems
  - Rally results provide insights into how people interact with biometric systems to improve usability
  - Rally results have been used to inform participating vendors, leading to improved performance of both acquisition and matching systems
  - **There are continuing challenges with respect to reliable image acquisition in this use-case**

2022 Biometric Technology Rally

- This year's scenario will be an unattended "high throughput" use-case with new challenges for acquisition systems
  - **NEW:** Focus on group processing, requiring systems to rapidly capture biometrics from multiple users
  - **NEW:** Face modality only

- Results will demonstrate the efficiency, effectiveness, and user satisfaction with current commercial biometric systems and inform:
  - The ability of acquisition systems to capture images that work across algorithms
  - The ability of matching systems to work across acquisition systems
  - Biometric system performance reported by specific demographic groups based on race, gender, and skin tone
  - **NEW:** Biometric systems protect the privacy of bystanders and non-users to preserve anonymity

- DHS Science and Technology (S&T) will continue to collaborate and guide promising technologies and share information via Cooperative Research and Development Agreements

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Station Configuration Overview

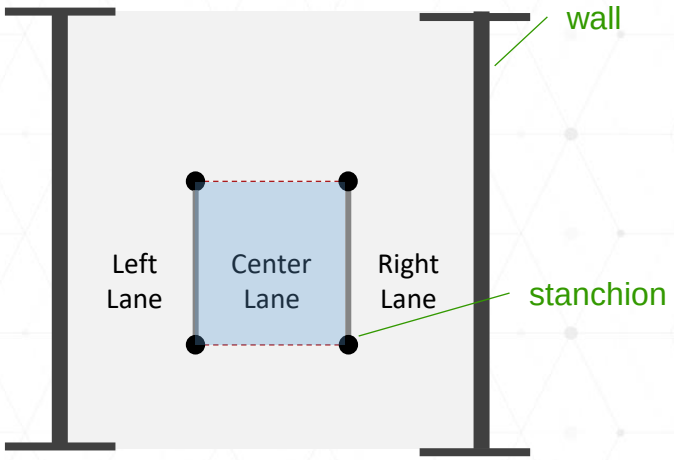
- The 2022 Rally stations will consist of 3 lanes:
- Acquisition systems will be installed within the 6’ W by 8’ L area in the center lane

2022 Rally Station Configuration

Left Lane | Center Lane | Right Lane

(Lanes will not be color coded during the test)

2022 Rally Station Overhead Schematic



*rear stanchions not depicted in schematic

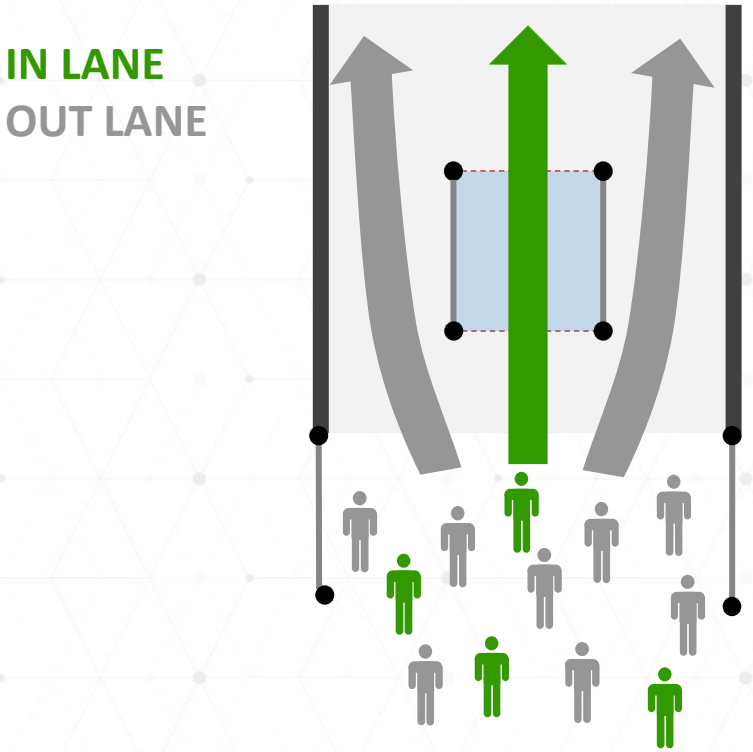
Rally Group Station Process – Lanes Explanation

- Many volunteers will enter and pass through the station together
  - Not one at a time like in prior Rally tests

- On each pass:
  - All assembled volunteers will enter the station at the same time
  - **A group of "IN LANE" volunteers will walk through the center lane:**
    - Instructed to use the acquisition system
  - **Other "OUT LANE" volunteers will walk through the left and right lanes**:
    - Instructed NOT to use the acquisition system

  - Different volunteers may be designated "**IN LANE**" or "**OUT LANE**"
  - Different numbers of volunteers may be designated "**IN LANE**"
  - The same volunteer may be designated "**IN LANE**" on multiple passes

- Acquisition systems should:
  - Always submit a single image for each "**IN LANE**" volunteer on each pass
  - Never submit images for any "**OUT LANE**" volunteers



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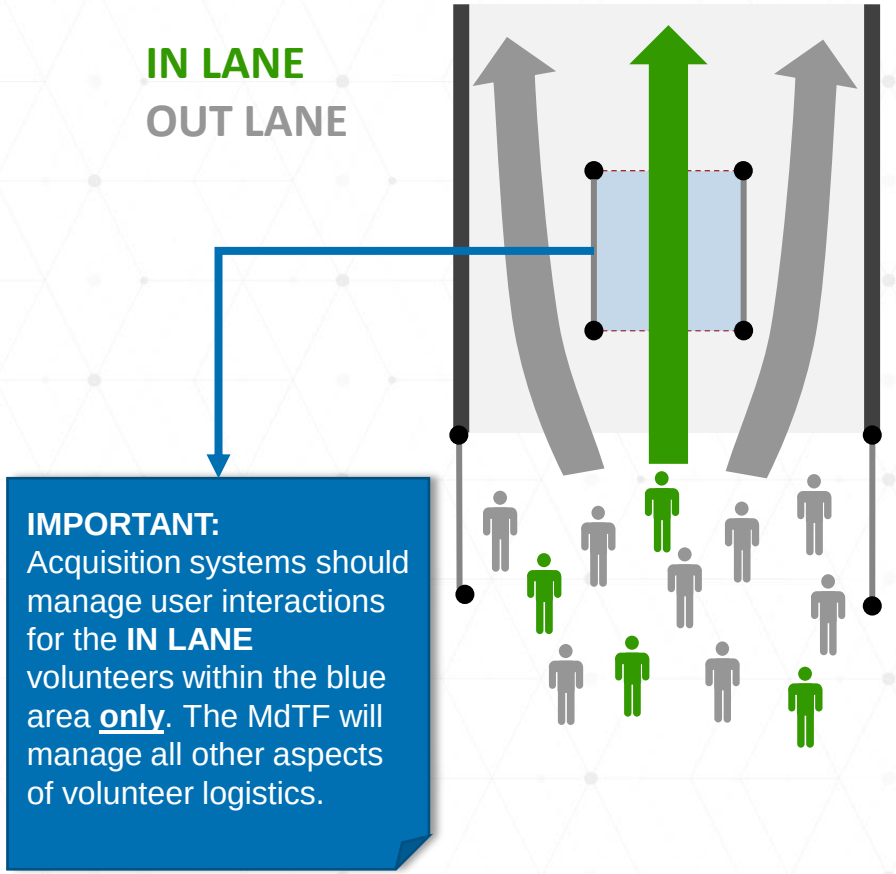

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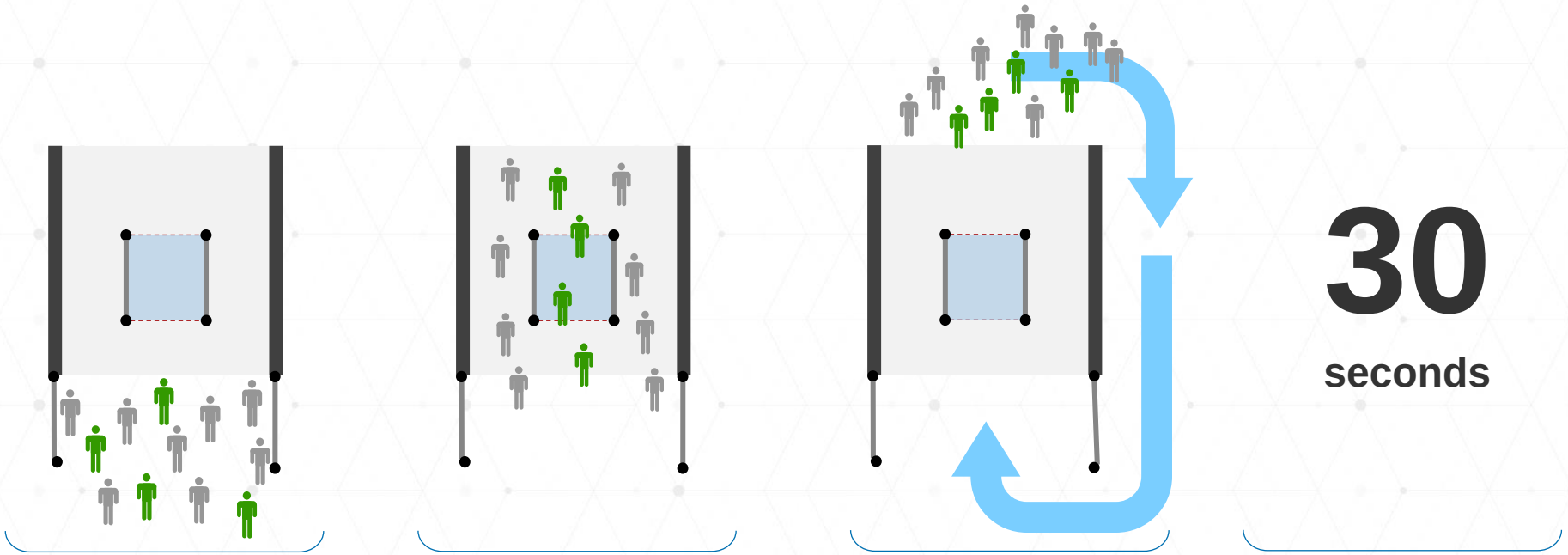
Rally Group Station Process



- Group arrives at station
- **IN LANE** / **OUT LANE** assigned

- Volunteers walk through station
- **System returns ONE image per IN LANE volunteer**

- Volunteers exit station
- **IN LANE** volunteers have wrist band scanned and rate satisfaction
- Group returns for next pass

- **Plan for 30-seconds wait between each pass**

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Metrics Overview

- Measure ability to capture face images from small groups of volunteer users (acquisition systems) and identify them (matching systems):
  - The ideal system will reliably capture a single quality face image for each individual in groups of varying size
  - **Efficiency –** Measure the amount of time required to use the acquisition system, per volunteer
  - **Satisfaction –** Measure positive satisfaction ratings by volunteers after using the acquisition system
  - **Effectiveness –** Measure performance of biometric systems, encompassing failures to acquire and/or match
- Measure privacy in crowded environments:
  - The ideal system will not capture images of bystanders and other non-users
  - **Privacy** – Measure the ability of the system to acquire only the required biometric images
- Measure whether biometric performance is equitable:
  - The ideal system will maintain similar levels of performance for volunteers of different race, gender, and skin tone
  - **Equitability** – Measure the ability of the system to meet performance benchmarks for each demographic group
- Effectiveness and equitability will be measured for unique combinations of acquisition and matching systems

Efficiency and Satisfaction Metrics

- **Efficiency**
  - Average Transaction Time
    - Amount of time needed, per **IN LANE** volunteer, to use the acquisition system
- **Satisfaction**
  - Positive Satisfaction Rate
    - Percent of **IN LANE** volunteers who give a positive satisfaction rating after using an acquisition system
- Efficiency and satisfaction will be measured for acquisition systems only

Effectiveness Metrics and Equitability

- **Effectiveness**
  - Failure to Acquire Rate (FtAR)
    - Percent of **IN LANE** volunteers for whom a matching system - acquisition system combination does not have an image of sufficient quality
  - True Identification Rate (TIR)
    - Percent of **IN LANE** volunteers for whom a matching system - acquisition system combination returns the correct identity
  - Matching Focused True Identification Rate (matching-TIR)
    - Percent of **IN LANE** volunteers for whom a matching system- acquisition system combination has an acquired image, and returns the correct identity
  - Effectiveness metrics will be calculated for each combination of acquisition and matching systems
- **Equitability**
  - Effectiveness metrics will be calculated separately for different demographic categories: Gender, Race, and Skin Tone

Privacy Metrics

Privacy

- Non-User – Identification Rate (NU-IR)
  - Percent of images submitted which have identifications as anyone other than an **IN LANE** volunteer, using acquired images
- Extra Acquisition Metric (EAM)
  - Percent of images submitted by an acquisition system in excess of one image per volunteer

- Privacy metrics are new for the 2022 Rally!

MdTF API Overview

- Acquisition systems and matching systems will integrate with the MdTF APIs for testing

- MdTF Acquisition System API:
  - Acquisition system is the client and MdTF is the server
  - Allows the images to be sent directly to the MdTF from acquisition systems
  - Acquisition system needs to demonstrate successful API integration prior to arrival at MdTF

- MdTF Matching System API:
  - Matching system is the server and MdTF is the client
  - MdTF submits images for template extraction and matching
  - Matching system implemented within a Docker image **`.tar`** file created via **`docker save`**

- Test and packaging scripts will be available on https://github.mdtf.org

- Details of the APIs and associated Docker image requirements will be communicated on http://mdtf.org after the Rally participant selection process is complete

Benefits of Participation

For acquisition system providers

- Receive biometric images collected on your system from a diverse sample of people
- Measure performance of your system in a high throughput use-case
- Measure performance with specific demographic groups
- View videos of volunteers using your system to identify use errors and improve your system

For matching system providers

- Measure performance across a variety of commercial acquisition systems
- Measure performance with specific demographic groups
- Receive demographic and biometric data to help tune system performance
- Opportunities to partner with acquisition systems

All Rally participants will…

- Inform government regarding your system's performance in an operationally relevant scenario test
- Receive industry recognition via aliased reporting of results and known their standing against peers
- Attend VIP Day, a networking opportunity with government and industry representatives
- Form an ongoing Cooperative Research and Development Agreement (CRADA) with DHS S&T

What Is a CRADA?

- An agreement between a federal laboratory and a non-federal entity to conduct collaborative research and development (R&D) activities
- A legally binding and enforceable agreement that allows federal researchers and their CRADA partners (collaborators) to exchange data and ideas while protecting intellectual property and proprietary information
- Collaborative activities performed under a CRADA can span the entire R&D lifecycle, from basic research and concept ideation to test and evaluation, pilot technology deployments, and product enhancement

No funding will be provided by DHS S&T under Rally CRADAs

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When Is a CRADA Appropriate?

- CRADAs are an ideal mechanism for collaboration when DHS:
  - Has resources and/or expertise not otherwise available to industry or outside parties that can be used to further the development of mission-critical technology
  - Needs the help of a private sector partner to develop an idea or technology to further its R&D mission
  - Needs a private sector partner to advance development of a technology or product to make it useful for consumers or the commercial market

2022 Biometric Technology Rally System Requirements

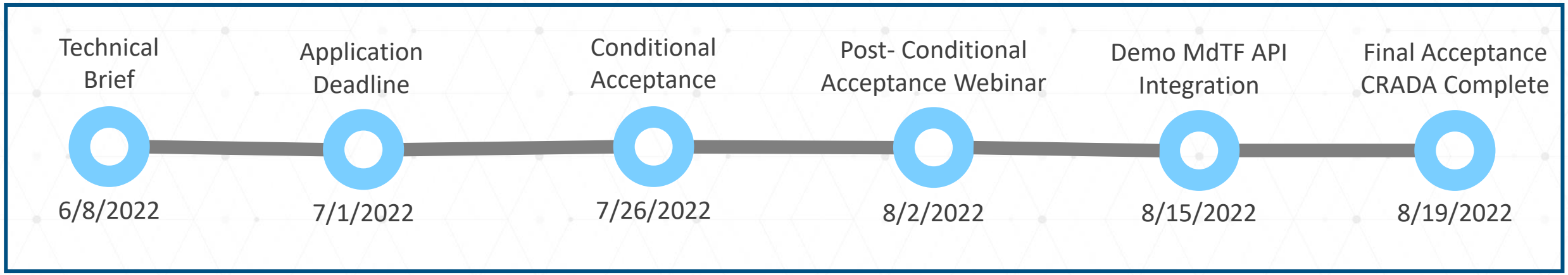
- Who can participate?
  - Vendors of face biometric acquisition systems
  - Vendors of face biometric matching systems
  - Vendors may provide a face matching system, a face acquisition system, or both

- Minimum requirements for acquisition systems:
  - Integrates with the MdTF Acquisition System API
    - mdtf-public/rally2-acquisition-system/api at master · TheMdTF/mdtf-public · GitHub
  - Operate in an unmanned mode (i.e., no operator / instructor present)
  - Operate within a 6’ W x 8’ L physical footprint (capture volume)
  - Submit a single face biometric image per in lane volunteer on each pass while within the 6’W x 8’L capture volume
  - Process and submit biometric data within defined time constraints

- Minimum requirements for matching systems:
  - Provide a Docker image conforming to the MdTF Matching System API
    - mdtf-public/rally2-matching-system/api at master · TheMdTF/mdtf-public · GitHub
  - Operate within defined computational resource limits (memory, CPU)

Timeline

Before Testing



Testing

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Questions & Answers

- Thank you for attending the announcement webinar!

- Contact information
  - Questions about the CRADA: peoplescreening@hq.dhs.gov
  - Technical and logistics questions: rally@mdtf.org

- Visit our websites for additional information
  - To see additional work DHS S&T supports visit www.dhs.gov/science-and-technology
  - To view additional information about this year and prior Rallies, visit https://mdtf.org
    - Material from all webinars and briefings will be posted here

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