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# TRUSTID Multiplier Event in Cyprus

University of Cyprus

29<sup>th</sup> of May 2023

Marios Belk, Cognitive UX GmbH



University  
of Cyprus



**cognitiveux**

# Agenda

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<b>13:00-20:00</b>	<b>TRUSTID Multiplier Event in Cyprus</b>
<b>13:00-13:15</b>	Gathering and Welcome Speech by the Host – Dr. Argyris Constantinides
<b>13:15-13:45</b>	Introduction and Overview of the TRUSTID Project: Analysis, Design and Development of the TRUSTID Open-source Framework and System – <i>Dr. Marios Belk</i>
<b>13:45-14:15</b>	Evaluation Reports regarding Efficiency, Effectiveness and User Acceptance of TRUSTID in Three Case Studies at Higher Education Institutions across Europe – <i>Dr. Argyris Constantinides</i>
<b>14:15-14:45</b>	Knowledge Repository containing Training Webinars, Guides of Best Practices, Integration Guidelines, Training Materials and Forum Discussions on how to Adopt and Deploy Continuous Student Identity Management Solutions in Higher Education Institutions – <i>Dr. Argyris Constantinides</i>
<b>14:45-15:00</b>	Coffee Break and Networking
<b>15:00-17:00</b>	TRUSTID Live System Demonstration and Walk-in Hands-on Interaction with the Open-source TRUSTID Technology – <i>Mr. Michalis Bofos and Dr. Argyris Constantinides</i>
<b>17:00-17:30</b>	Coffee Break and Networking
<b>17:30-19:30</b>	TRUSTID Live System Demonstration and Walk-in Hands-on Interaction with the Open-source TRUSTID Technology – <i>Mr. Michalis Bofos and Dr. Argyris Constantinides</i>
<b>19:30-20:00</b>	Conclusions, Discussions and Networking

# TRUSTID Overview

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- *TRUSTID: “Intelligent and Continuous Online Student Identity Management for Improving Security and Trust in European Higher Education Institutions”*
- Part of the actions of Erasmus+ 2020 and in particular the Call *“Strategic Partnerships in **Response to the COVID-19 Situation**: Partnerships for Digital Education Readiness in the field of Higher Education (KA226)”*
- *Duration*: June 2021 - May 2023 (**24 Months**)
- Currently pursuing **Month 24** of the project

# Project Partners

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- Department of Electrical and Computer Engineering,  
University of Patras, Patras, Greece (*Project Coordinator*)



- Department of Computer Science, University of Cyprus,  
Nicosia, Cyprus (*Project Partner*)



- Institute of Systems and Robotics, University of Coimbra,  
Coimbra, Portugal (*Project Partner*)



- Cognitive UX GmbH, Heidelberg, Germany (*Project Partner*)

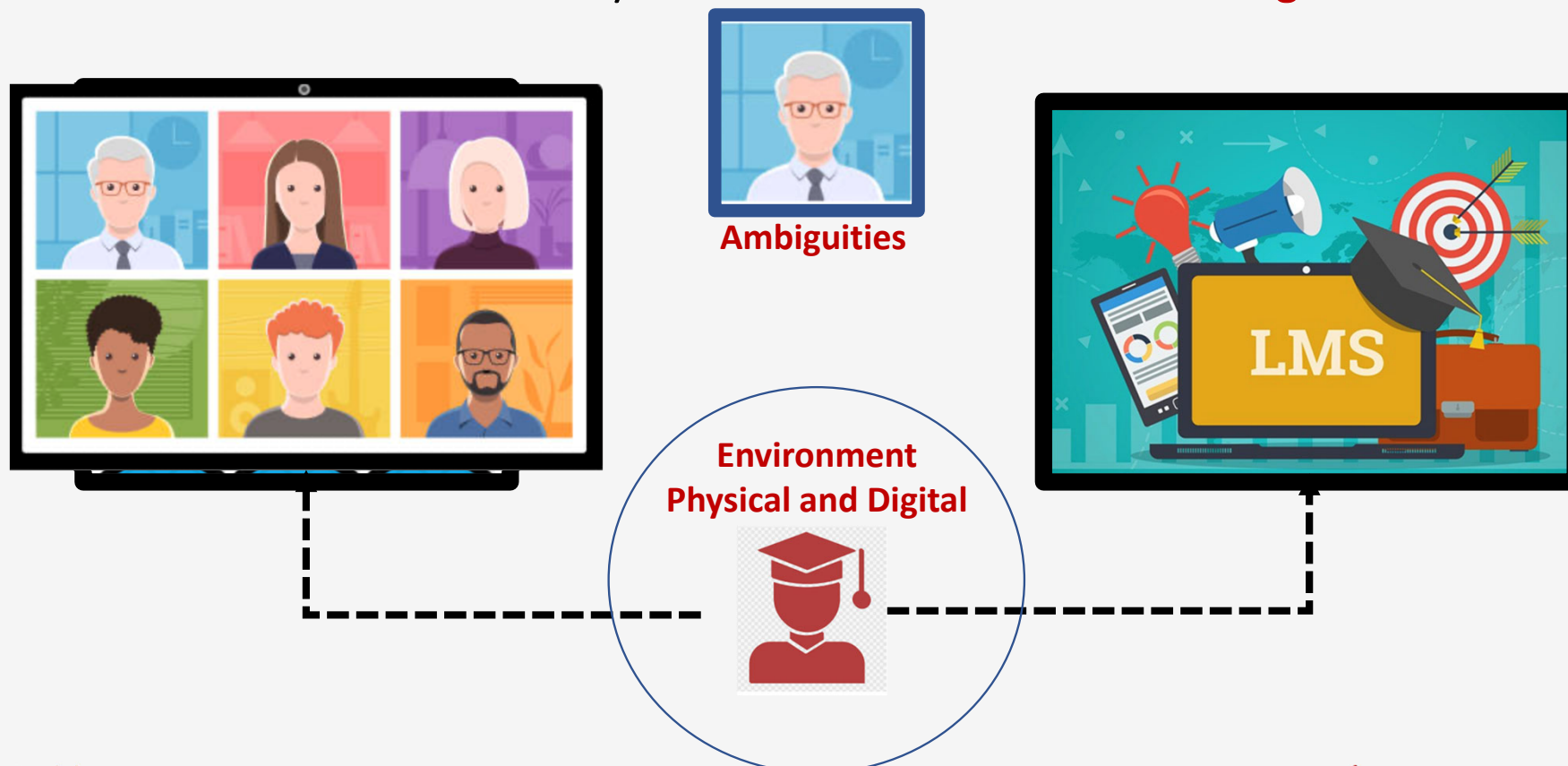


TrustID :: <https://trustid-project.eu>



# Covid-19 outbreak: Problem and Challenges in HEI's

- **Before** the Covid-19 outbreak many HEI's followed a **blended learning** educational model



## - Challenges

- **Continuously and seamlessly identify students while preserving their privacy and** without interrupting or interfering with the current learning activities of each HEI
- **Provide insights to instructors** in order to take informed decisions for their classes and attendees
- **Provide alternative integration capabilities and modes** of TRUSTID in order to better adapt to specific requirements of each HEI

# TRUSTID Vision

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Design, develop and evaluate a **multi-tier continuous student identification framework**, bootstrapped to HEIs' needs, that will consist of state-of-the-art **intelligent image, voice and interaction data** processing **while preserving their privacy**

# Core Objectives

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- **Literature review** on current practices and procedures related to student identity management of EU HEIs and **triangulate findings** with stakeholders' studies at the participating HEIs
- **Design and develop an integrated framework** for student identity management
- Validate the solution through a **User-Centered Design (UCD) methodology**; two formative studies are planned, during the software development process; and one summative study is planned, after the final release of the software
- Create a **repository** that will support **knowledge building**
- **Dissemination and exploitation** activities – *research papers, workshops, seminars, LTTAs, etc.*



# Intellectual Outputs

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- **Intellectual Output 1: Analysis & validation** of the TRUSTID framework for HEIs' continuous student identity management (*Conceptual*)
- **Intellectual Output 2: Implementation** of an open-source software toolkit (*Operational*)
- **Intellectual Output 3: Evaluation** and validation reports in the context of three case-studies at different HEIs (*Lessons Learned and Guidelines*)
- **Intellectual Output 4: Knowledge building online community and repository** (*Sustainability*)

Key Achievements and Milestones reached

# Intellectual Output 1 – Tasks and Achievements

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## IO1 - Needs Analysis and Design of the Theoretical Framework for Continuous Student Identity Management

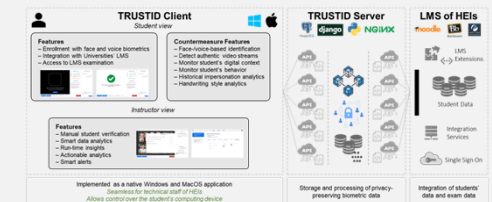
**Output:** Publications, Other, Dataset

- Task 1.1: Needs Analysis on Identity Management in HEIs
- Task 1.2: Needs Verification at HEIs
- Task 1.3: Specification of the Framework

## Achievements and Outputs

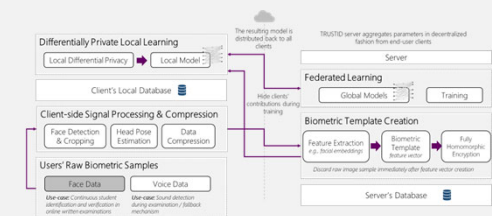
### Specifications of the TRUSTID framework

- Refined the framework
- Specifications for the face, voice and interaction identification mechanism
- Specifications for LMS integrations of TRUSTID at UPAT, UCY, UC sites



### Privacy-preserving architecture for continuous student identity management

- Designed the privacy-preserving architecture
- Defined the privacy-preserving smartphone wallet
- Defined the flow between client and server applications of TRUSTID towards achieving privacy-preservation of users' biometric data



# Intellectual Output 2 - Tasks and Achievements

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## IO2 - Design and Implementation of Open-source Privacy-preserving Toolkit and Application Programming Interfaces

**Output:** Software, Services, Publications

- Task 2.1: Architecture Design
- Task 2.2: Privacy-preserving Biometrics
- Task 2.3: Development of Voice-, Image- and Interaction-based Algorithms
- Task 2.4: Integration and Verification Testing

## Achievements and Outputs

Major **improvement** of the **face-based identification** mechanism enrollment and continuous identification

Development of the **voice-based and interaction-based identification** mechanisms

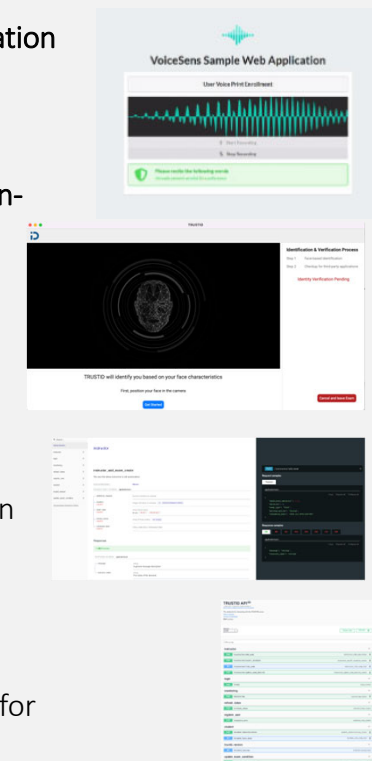
Implemented a new **architecture for privacy-preservation**

**Prototype** designs and implementations

Development and integration of new features in the **native Windows and MacOS applications**

Mechanisms for **LMS integration**

**Application Programming Interface**, end-points for service integration



# Intellectual Output 3 - Tasks and Achievements

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IO3 - **Evaluation Reports** regarding Efficiency, Effectiveness and User Acceptance of TRUSTID in Three Case Studies at Higher Education Institutions across Europe

**Output:** Dataset, Publications

- Task 3.1: Design of Experimental Evaluation Methodology
- Task 3.2: Formative Evaluation Report
- Task 3.3: Summative Evaluation Report

## Achievements and Outputs

Successfully completed the PoC2 study with 133 participants, which participated in the user evaluation study in which they interacted with various mechanisms of TRUSTID.

Planned and organized the **final summative evaluation study**

**Running the final summative formative user study** to test the final proof of concept and evaluate its usability and accuracy of implemented identification mechanisms (face, voice, interaction).

# Intellectual Output 4 - Tasks and Achievements

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IO3 - **Knowledge Repository** containing Training Webinars, Guides of Best Practices, Integration Guidelines, Training Materials and Forum Discussions on how to Adopt and Deploy Continuous Student Identity Management Solutions in HEIs

**Output:** Internet, Broadcast, Event, Publications, Video

- Task 4.1: Training Webinars
- Task 4.2: Best Practice Guides
- Task 4.3: System Integration Guidelines (through an Application Programming Interface)

## Achievements and Outputs

### Deployment of Final Knowledge Repository

<https://trustid-project.eu/kr.php>

### Deployment of Final TRUSTID Community Forum

<https://trustid-project.eu/community.php>

### TRUSTID GitHub Open-source Code Repository

Available at: <https://github.com/cognitiveux/trustid>

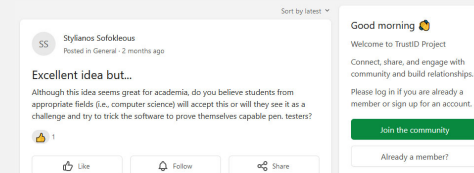
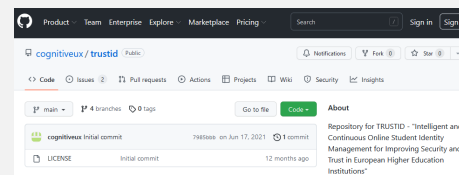
#### Knowledge Repository

##### Educational, Training and Course Material

- Ethical Guidelines and Data Privacy
- TRUSTID Solution Design
- User Needs & User Feedback
- Threat Models and Countermeasures
- Image-based Recognition
- INFOGRAPHIC - Covid19 Impact on Higher Education
- INFOGRAPHIC - Interviews with Stakeholders and Identified Threat Scenarios

##### Open-source TRUSTID System Code :: hosted on GitHub

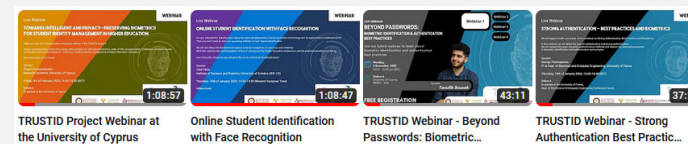
- Main GitHub branch
- TRUSTID Windows Application
- TRUSTID MacOS Application
- Face-based User Identification Algorithms



### Webinar

#### TRUSTID Webinar Events

- UPAT Event
- CUX Event
- ISR-UC Event
- UCY Event



# Analysis, Design and Development of the TRUSTID Open-source Framework and System

**Intellectual Output 1:** Needs Analysis and Design of the Theoretical Framework for Continuous Student Identity Management

**Intellectual Output 2:** Design and Implementation of Open-source Privacy-preserving Toolkit and Application Programming Interfaces

# Analysis, Design and Development of the TRUSTID Open-source Framework and System

**Intellectual Output 1:** Needs Analysis and Design of the Theoretical Framework for Continuous Student Identity Management

**Intellectual Output 2:** Design and Implementation of Open-source Privacy-preserving Toolkit and Application Programming Interfaces



# Intellectual Output 1 (IO1)

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- **Needs Analysis and Design of the Theoretical Framework for Continuous Student Identity Management**
- *Lead:* University of Patras
- *Participating Partners:*
  - University of Cyprus
  - Cognitive UX GmbH
  - University of Coimbra ISR
- *Output type:* Methodologies / guidelines – Methodological framework for implementation
- *Media:* Publications, Other, Dataset

# IO1 - Tasks and Task Leaders

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- Task 1.1: Needs Analysis on Identity Management in HEIs
  - **Lead: University of Coimbra**
  - *Participating:* University of Patras, University of Cyprus, Cognitive UX GmbH
- Task 1.2: Needs Verification at HEIs
  - **Lead: University of Patras**
  - *Participating:* University of Cyprus, Cognitive UX GmbH, University of Coimbra
- Task 1.3: Specification of the Framework
  - **Lead: Cognitive UX GmbH**
  - *Participating:* University of Patras, University of Cyprus, University of Coimbra

# Needs Analysis

## - Aims

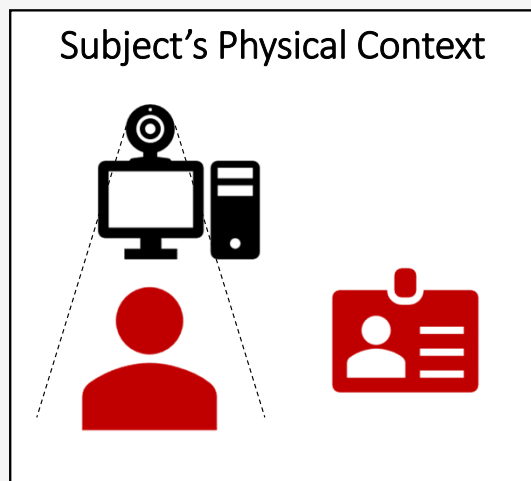
- Verify the needs analysis with the active involvement of the participating HEIs
  - Identify the current authentication and identity management practices and their drawbacks within the online/distance learning domain
- **Conduct a series of semi-structured interviews** with stakeholders with the university partners
- *Sample:* 31 stakeholders participated from all partner HEIs

## Three-phase methodology

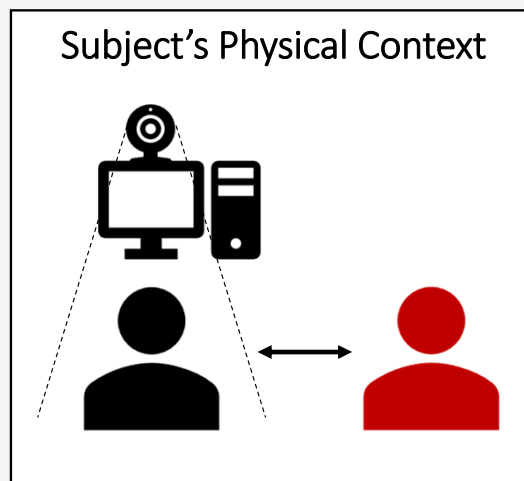
- Phase A: Needs Analysis
- Phase B: Needs Verification Analysis
- Phase C: Countermeasures and Features

Stakeholder Group	Higher Education Institution 1	Higher Education Institution 2	Higher Education Institution 3
Students	2	3	3
Instructors	3	4	3
System Administrators	2	2	2
Decision Makers	2	1	1
Data Protection Experts	1	1	1
<b>Total</b>	<b>10</b>	<b>11</b>	<b>10</b>

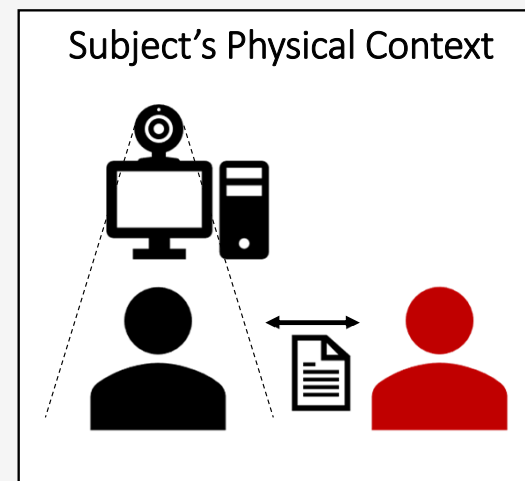
# Identification of Impersonation Threat Scenarios



*Subject fakes his/her identity proofs during enrolment*



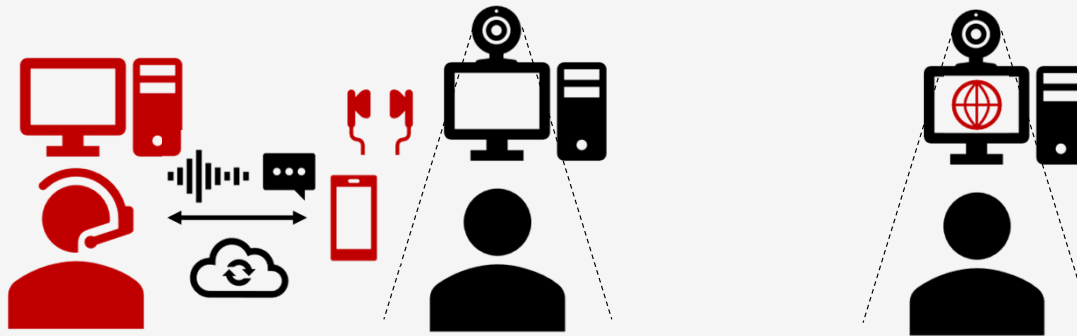
*Subject switches seats with another person after enrolment*



*Exchange of hardcopy written messages*

# Identification of Communication, Collaboration and Resource Access Threat Scenarios

## - Computer Mediated Scenarios



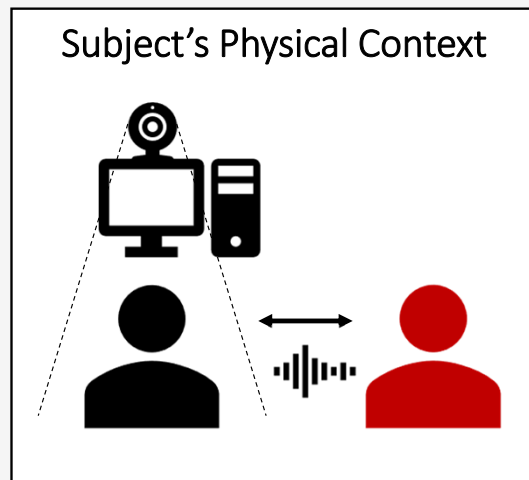
*Remote communication/collaboration between a smartphone or another computer of the subject and another remote computer*

**B<sub>1</sub>**: Communication through voice or chat  
**B<sub>2</sub>**: Collaboration through mobile application (e.g., remote desktop connection)

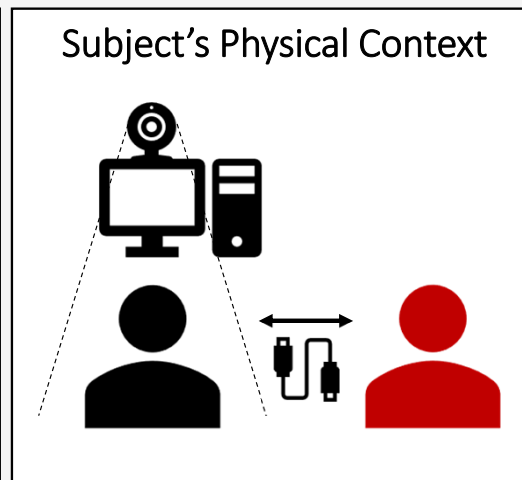
*Subject seeks for help from online resources, search engines, which are not allowed based on the examination policy*

# Identification of Communication, Collaboration and Resource Access Threat Scenarios

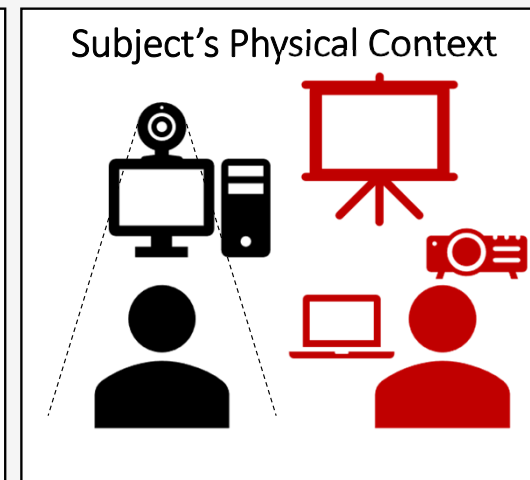
## - In-situ Scenarios



*Interaction with another person in the same room through voice*



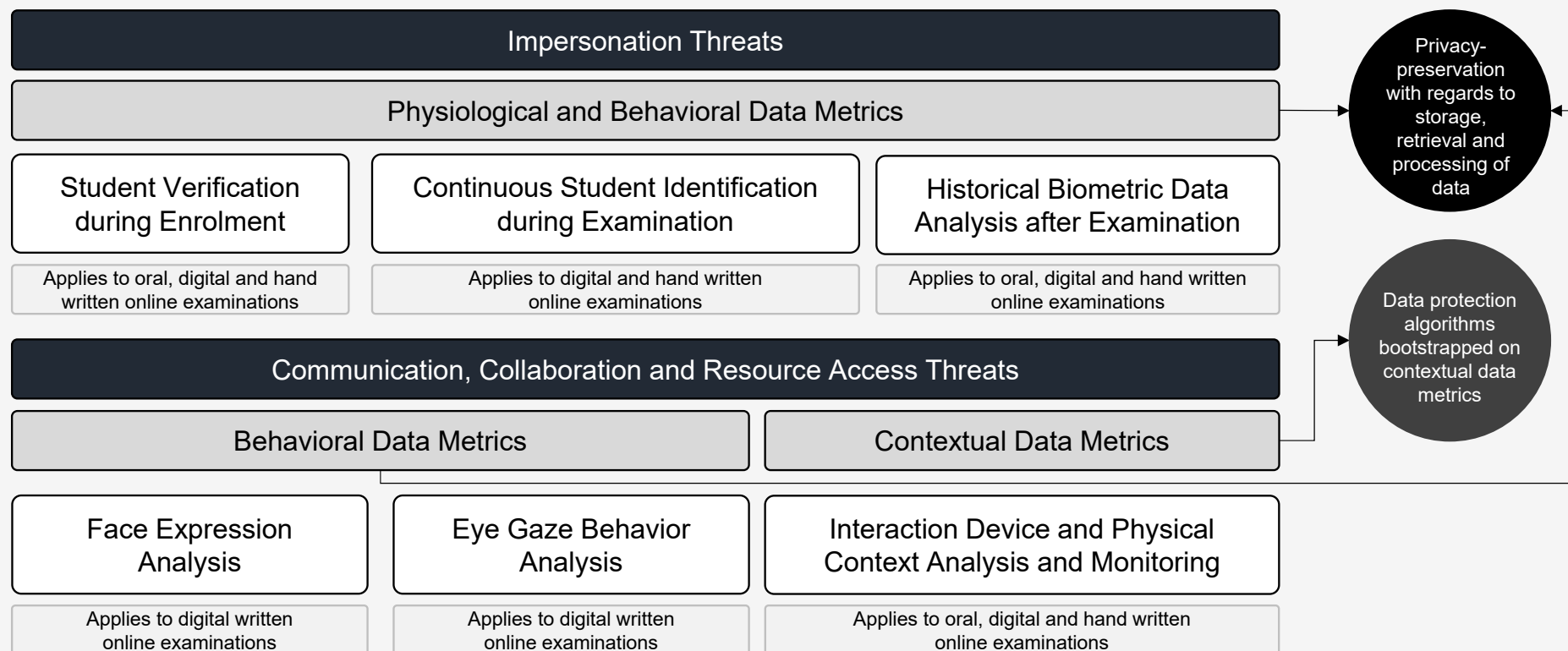
*Another person that is in the same room as the subject is interacting with the examination using other devices of the subject's computer*



*Projection of answers on a whiteboard*

# Threat Model, Data Metrics and Countermeasures

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Threat model composed in terms of impersonation, communication, collaboration, resource access threats

Data metrics for analyzing and monitoring physiological, behavioral and contextual data

Suggested countermeasures and features for addressing the identified threats

# Analysis, Design and Development of the TRUSTID Open-source Framework and System

**Intellectual Output 1:** Needs Analysis and Design of the Theoretical Framework for Continuous Student Identity Management

**Intellectual Output 2:** Design and Implementation of Open-source Privacy-preserving Toolkit and Application Programming Interfaces



# Intellectual Output 2 (IO2)

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- Design and Implementation of Open-source Privacy-preserving Toolkit and Application Programming Interfaces
- *Lead:* Cognitive UX GmbH
- *Participating Partners:*
  - University of Patras
  - University of Cyprus
  - University of Coimbra ISR
- *Output type:* Services / structures – E-learning platform
- *Media:* Software, Service, Publications

# IO2 - Tasks and Task Leaders

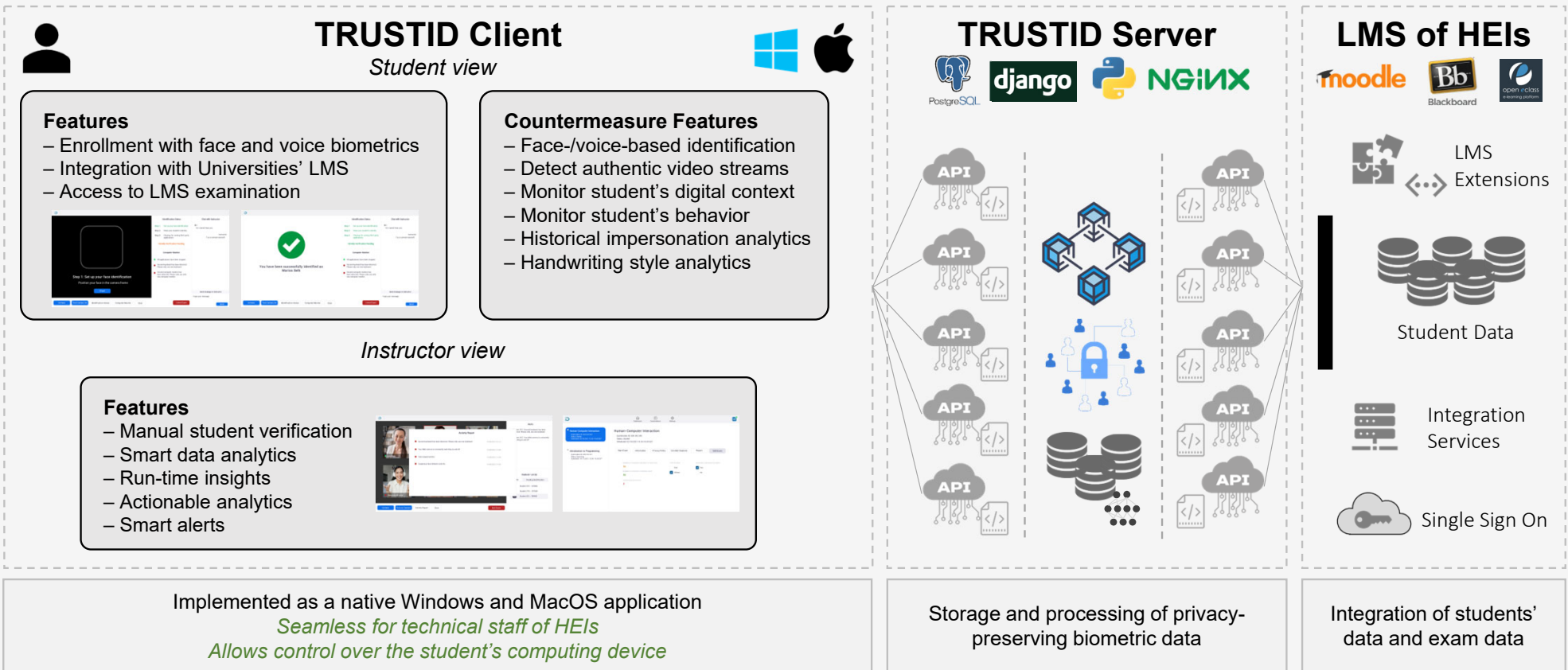
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- Task 2.1: Architecture Design
  - **Lead: Cognitive UX GmbH**
  - *Participating:* University of Patras, University of Cyprus, University of Coimbra
- Task 2.2: Privacy-preserving Biometrics
  - **Lead: University of Cyprus**
  - *Participating:* University of Patras, University of Coimbra, Cognitive UX GmbH
- Task 2.3: Development of Voice-, Image- and Interaction-based Algorithms
  - **Lead: Cognitive UX GmbH**
  - *Participating:* University of Patras, University of Cyprus, University of Coimbra
- Task 2.4: Integration and Verification Testing
  - **Lead: Cognitive UX GmbH**
  - *Participating:* University of Patras, University of Cyprus, University of Coimbra

# TRUSTID High-level Framework

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# Client Application

Windows and MacOS

# Integrated Login

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TRUSTID :: Intelligent Student Identity Management

**TRUSTID**

Email

Password

Organization

- University of Cyprus 
- University of Patras 
- University of Coimbra 

Login

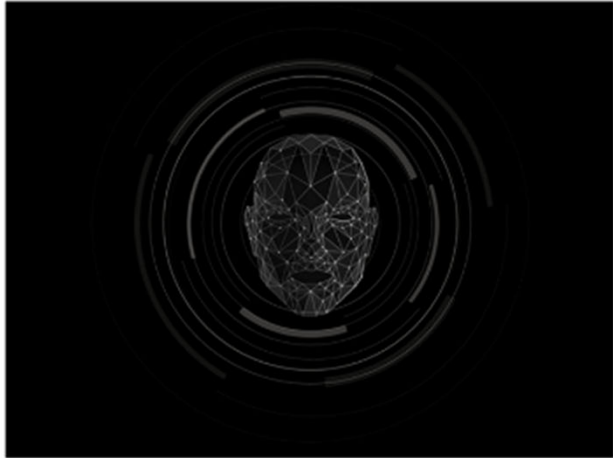
# Register Face Biometrics

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Face Enrollment

## Register Face Biometrics



TRUSTID needs your consent to collect your face data  
Please select I consent to continue

**I consent**

**Cancel Enrollment**

### Biometrics Process

- Step 1 - Consent
- Step 2 - Face Biometrics

**Biometrics Ready**


# Register Voice Biometrics

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Voice Enrollment

## Register Voice Biometrics



TRUSTID needs your consent to collect your voice data  
Please select I consent to continue

**I consent**

**Cancel Enrollment**

**Biometrics Process**  
Step 1 - Consent  
Step 2 - Voice Biometrics

**Biometrics Ready**

# Control and Manage Biometrics

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TRUSTID :: Intelligent Student Identity Management

Dashboard Examinations Biometric Models AC

### Edit Biometrics

Actions

 Voice Created on: 06/12/2022 12:47:50	<a href="#">Update</a> <a href="#">Delete</a>
 Face Created on: 06/12/2022 12:48:50	<a href="#">Update</a> <a href="#">Delete</a>



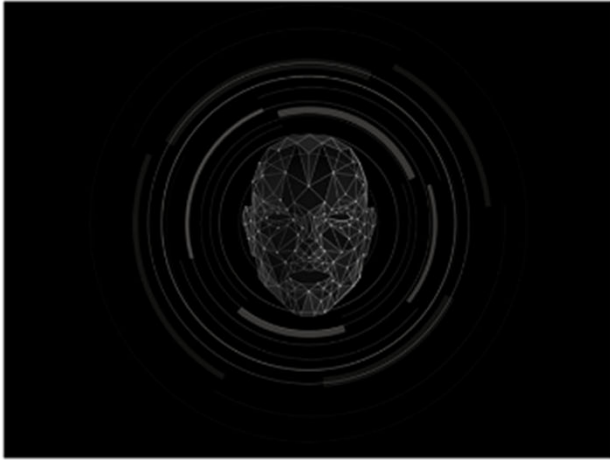
# Continuous Face Identification

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Face Identification

## Face-based Identification



TRUSTID will identify you based on your face characteristics  
First, position your face in the camera frame

[Get Started](#)

### Identification and Verification Process

- Step 1 - Face-based identification
- Step 2 - Voice-based identification
- Step 3 - Checkup for third-party applications

**Identity Verification**

[Cancel](#)


# Continuous Voice Identification

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Voice Identification

## Voice-based Identification



Your voice is now being recorded - Please speak loudly and clearly

Capture

Cancel

### Identification and Verification Process

- Step 1 - Face-based identification
- Step 2 - Voice-based identification
- Step 3 - Checkup for third-party applications

**Identity Verification**

# Digital Written Examination Scenario

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Written Examination

Multiple Choice Questions

**What does the ERASMUS acronym stand for?**

- European Committee Agency Scheme for the Mobility of University Students
- European Community Action Scheme for the Mobility of University Students
- European Continental Agility Scheme for the Mobility of University Students
- European Congress Ambassador Scheme for the Mobility of University Students

**Monitoring**

- Camera capture is enabled
- Voice capture is enabled
- Checkup running applications is enabled

TRUSTID will periodically capture your photo and voice for continuous identification purposes and will checkup the running applications and processes on your computer

**User Feedback Mechanism**

- I will impersonate with another person
- I will open a forbidden application

**Send Feedback**

**Close Exam**


# Oral Examination Scenario

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Oral Examination

## Oral Examination in Progress



**Start Voice Capture**

**Stop Voice Capture**

### Monitoring

Camera capture is enabled

Checkup running applications is enabled

TRUSTID will periodically capture your photo and voice for continuous identification purposes and will checkup the running applications and processes on your computer

### User Feedback Mechanism

I will impersonate with another person

I will open a forbidden application

**Send Feedback**

**Close Exam**

# Examination Management Dashboard

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TRUSTID :: Intelligent Student Identity Management

Dashboard Examinations Management

## Management

Add a new exam Add Exam

Edit existing exams Edit Exams

Enroll students to exam Enroll

# Examination Management

Add Exam

Add Exam


Additional Material  Yes  No

Exam Duration:

Exam Type:

Name:

Privacy Policy

Scheduled date  

Edit Exam

Name	ID	Date	Enrolled Students
Introduction	61667302972	07/12/2022 00:00:00	59

# LMS Integration and Synchronization Tools

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Upload and Enroll to Exam

**Upload and Enroll Students:**

Upload students:

C:\Users\laryr\Downloads\test\_users (1).csv

First name	Last name	Email
Adamos	Adamou	aadamou@live.com

Exam id	Exam name
61667302972	Introduction to F

Select Exam:

61667302972

Select all students:  Yes

All students selected

View Enroll Students

Students Enrolled in Exam: Introduction

First name	Last name	Email
Christou	Panikos	panikoschristou@yahc
Georgiou	Mariaeleni	mgeorg04@ucy.ac.cy
Panagi	Paraskevi	ppanag03@ucy.ac.cy
Tsakilioti	Evangelia	euatsakilioti@gmail.co
Tzamou	Maria	mtzamo01@ucy.ac.cy
Sofocleous	Elena	sofokleous.elena@ucy
Sofocleous	Elena	elenadepp1524@gma
Aristodemou	George	george.arist@gmail.co

# TRUSTID Backend – Application Programming Interface

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### TRUSTID API

[ Base URL: localhost:11000/backend ]  
[ http://localhost:11000/backend/swagger/ ]

The endpoints for interacting with the TRUSTID server

Terms of service  
Contact the developer  
BSD License

Scheme: HTTP

Django Login Authorize

Filter by tag

- instructor**
  - POST /instructor/add\_exam instructor\_add\_exam\_create
  - POST /instructor/enroll\_students instructor\_enroll\_students\_create
  - GET /instructor/list\_exam instructor\_list\_exam\_list
  - POST /instructor/update\_exam\_details instructor\_update\_exam\_details\_create
- login**
  - POST /login login\_create
- monitoring**
  - POST /monitoring monitoring\_create
- refresh\_token**
  - POST /refresh\_token refresh\_token\_create
- register\_user**
  - POST /register\_user register\_user\_create
- student**
  - POST /student/identification student\_identification\_create
  - GET /student/list\_exam student\_list\_exam\_list
- trustid\_version**
  - GET /trustid\_version trustid\_version\_list
- update\_exam\_condition**
  - POST /update\_exam\_condition update\_exam\_condition\_create

### login

POST /login login\_create

Creates a JSON Web Token if the provided credentials are correct

Parameters

Name	Description
<b>data</b> <small>required</small> (body)	<p>Edit Value   Model</p> <pre>{   "email": "string",   "password": "string" }</pre> <p>Cancel</p> <p>Parameter content type: application/json</p> <p>Execute</p>

Responses

Response content type: application/json

Code	Description
201	<p>JSON Web Token has been created successfully. The value is returned in <code>resource_obj</code>.</p> <p>Example Value   Model</p> <pre>{   "message": "string",   "resource_name": "string",   "resource_obj": {} }</pre>



# Web API – Documentation

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Search...

- Authentication
- instructor >
- login >
- monitoring >
- refresh\_token >
- register\_user >
- student >
- trustid\_version >
- update\_exam\_condition >

Documentation Powered by ReDoc

## instructor

### instructor\_add\_exam\_create

The view that allows instructors to add examinations

AUTHORIZATIONS: **Bearer**

REQUEST BODY SCHEMA: application/json

additional_material	boolean (Additional material)
duration <i>required</i>	integer (Duration in minutes) [0..9223372036854776000]
exam_type <i>required</i>	string (Exam type) Enum: "Oral" "Written"
privacy_policy <i>required</i>	string (Privacy policy) non-empty
scheduled_date <i>required</i>	string <date-time> (Scheduled date)

### Responses

^ 200 Success

RESPONSE SCHEMA: application/json

message	string A general message description
resource_name	string The name of the resource

POST /instructor/add\_exam

### Request samples

Payload

application/json

```
{
  "additional_material": true,
  "duration": 0,
  "exam_type": "Oral",
  "privacy_policy": "string",
  "scheduled_date": "2021-12-13T13:28:55Z"
}
```

### Response samples

200 400 401 403 404 405 415 500

application/json

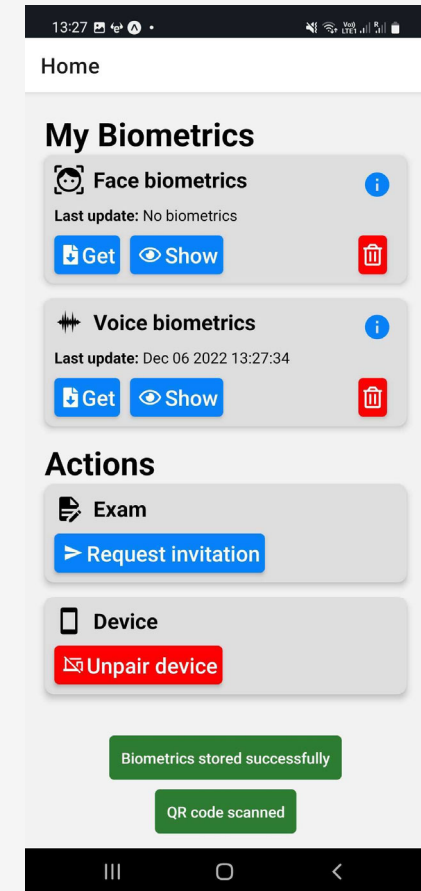
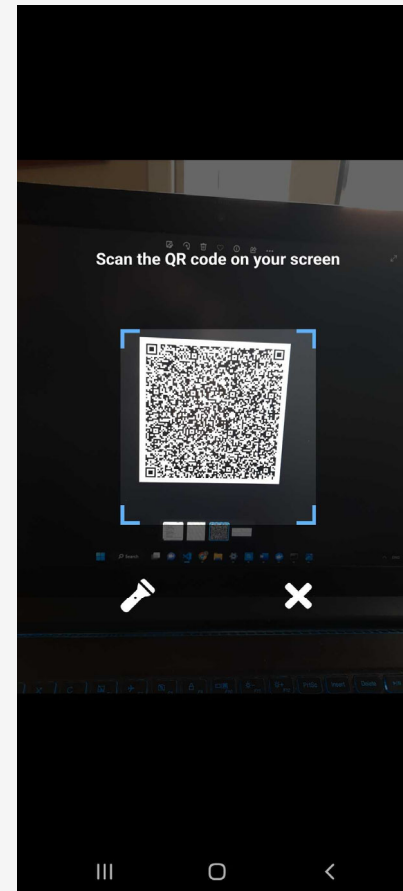
```
{
  "message": "string",
  "resource_name": "string"
}
```

# Wallet for biometrics models

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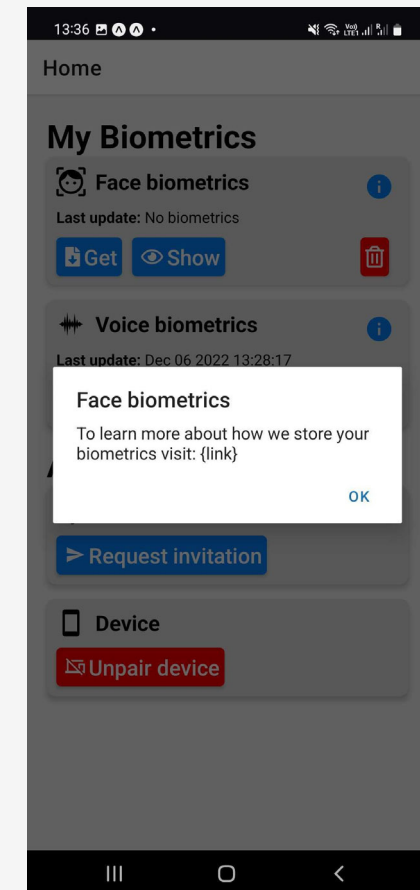
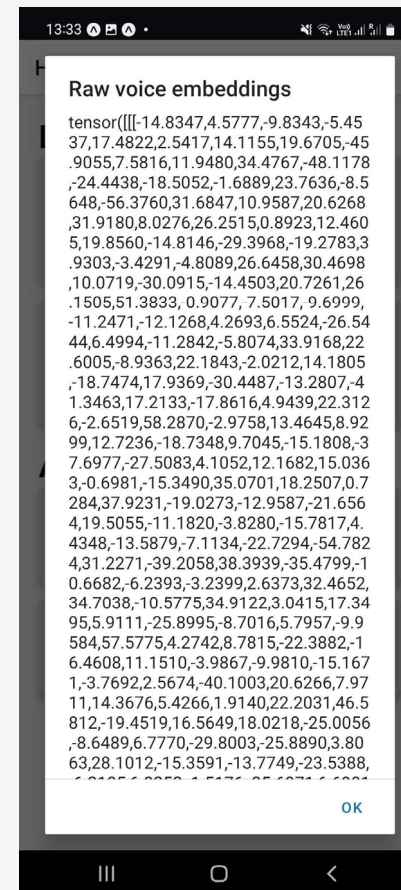


- Pair mobile application with TRUSTID system to fetch and store the biometric models locally



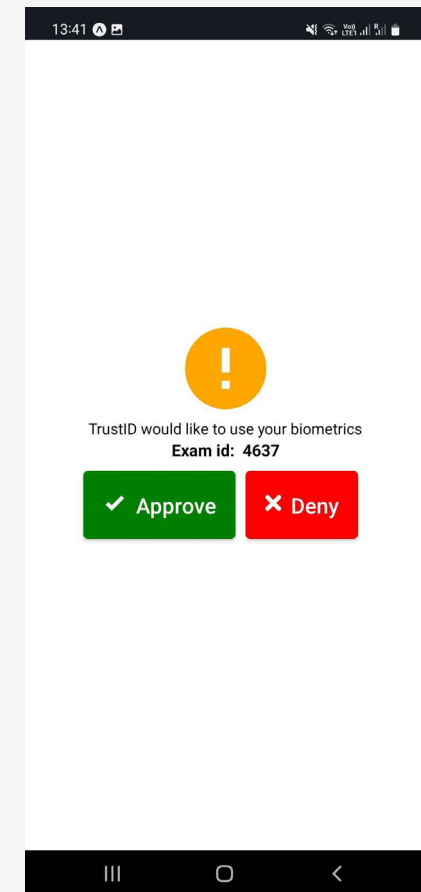
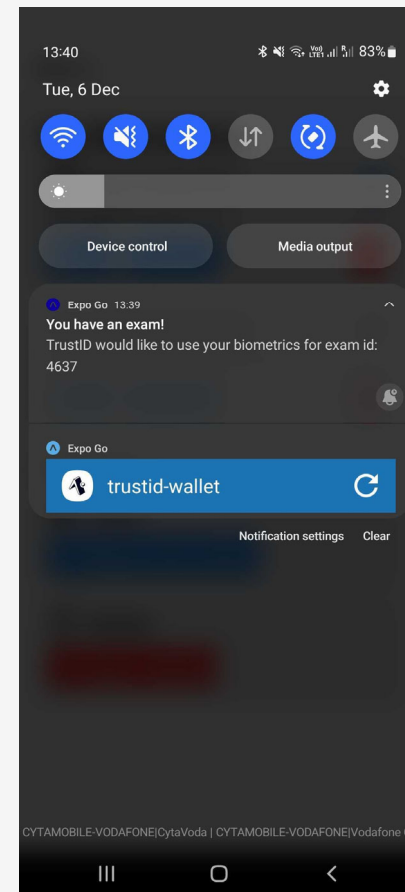
# Wallet for biometrics models

- Management of biometrics models
  - Display
  - Delete
  - Privacy policy



# Wallet for biometrics models

- Push notification for approval of sharing of biometrics models during online examination



Thank you

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Software Technology

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