

IEEE Standard for Biometric Open Protocol

IEEE Communications Society

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Developed by the

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Abstract: Identity assertion, role gathering, multilevel access control, assurance, and auditing are provided by the Biometric Open Protocol Standard (BOPS). An implementation of the BOPS III spec is described, which includes both the software running on the client device as well as the server. Pluggable components are allowed to replace existing components' functionality, accepting integration into current operating environments in a short period of time. A "point-and-cut" mechanism to add the appropriate security to both development and production systems is offered through the BOPS implementation functionality. Homomorphic encryption and a tremendous simplification of the API are also described.

Keywords: admin console, application, BOPS admin, BOPS cluster, BOPS IDS, BOPS server, client device IDS, IDS cluster, IEEE 2410™, Jena Rules, liveness, original site admin, site admin, trusted adjudicated data, user, user device

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Introduction

This introduction is not part of IEEE Std 2410™-2019, IEEE Standard for Biometric Open Protocol.

Homomorphic encryption, the inclusion of identification and authentication, and a greatly simplified Application Programming Interface (API) distinguish the architecture design of IEEE Std 2410™-2019 from its predecessor IEEE Std 2410™-2017. The reinforced architecture of the Biometric Open Protocol Standard (BOPS) is well suited for implementation into enterprise systems for secure authentication via biometric modalities.

The biometric enrollment information, that is, representation of a fingerprint, voice, and/or facial features, is represented by Euclidean Measurable Feature Vectors. These feature vectors are one-way encrypted and provide privacy and simplicity. No longer does the specification bother with key management or decryption, and the result is a complete solution fully based on three API endpoints. Privacy is ensured by never processing, handling, or receiving the biometric in plain text. Homomorphic encryption allows all processing in the encrypted space. The solution is a simple, biometric agnostic solution.

With the increasing need to secure user access to their footprints of personally identifiable information (PII) in the Internet (financial and health records) and enterprise assets, the BOPS server is designed to control communication with its clients via a two-way SSL/TLS homomorphic interface.

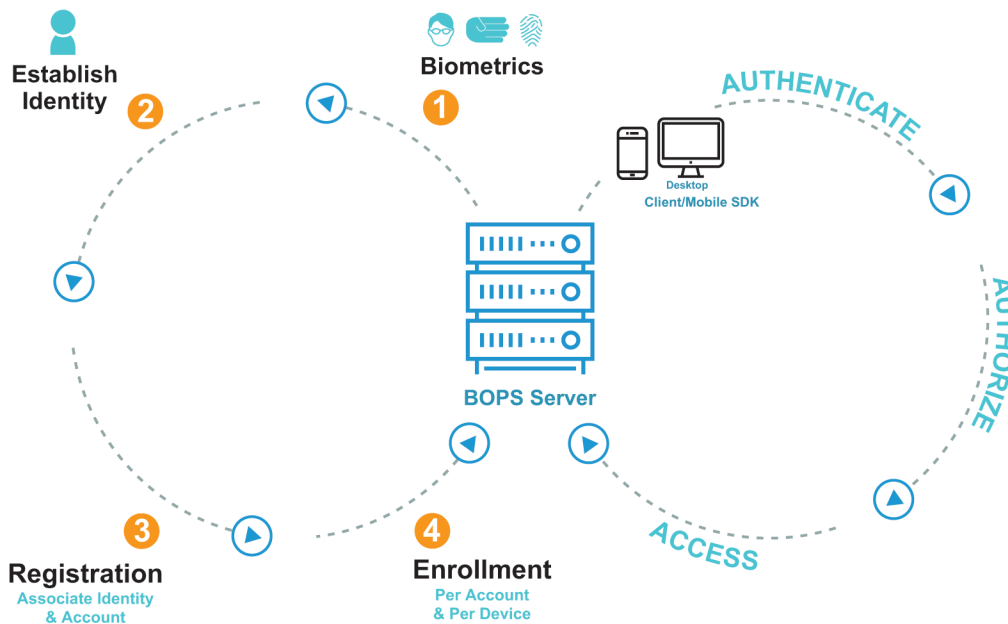


Figure 1—BOPS authentication cycle

Before users are granted access via the BOPS platform, they shall authenticate their identity with an enterprise system that controls access to the resources and assets. If authentication is successful, the user is authorized to access the resource or asset (i.e., they are “granted access”). Otherwise, they are denied access. Identity is often established at some prior phase via registration of a username that identifies the user with an account in the system.

Biometrics have a long-held hope of replacing passwords by establishing non-repudiable identity and providing authentication with convenience. Biometrics include a wide range of information taken from a person, for

example, fingerprints, face, voice, and iris pattern; and his/her behavioral properties, for example, gait, date, time, and location. Recent increases in the processing power and sensor technologies allow digital signal processing (DSP) algorithms to run in the time needed for a real-time authentication (1–5 seconds, similar to username and password login processing). Unlike passwords, biometrics cannot be script-injected; however, biometric data is considered highly sensitive due to its personal nature and unique association with users. Secure storage, transport, and processing of biometric data is paramount in the design and implementation of the BOPS system.

While the old standard considered matching in the plain text space, IEEE Std 2410-2019 brings a new level of consumer privacy assurance by keeping biometric data encrypted at rest and in transit.

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IEEE Standard for Biometric Open Protocol

1. Overview

1.1 Scope

The Biometric Open Protocol Standard (BOPS) provides three application-programming interface (API) calls to support biometric identification and authentication including liveness. The BOPS implementation allows the systems to meet security needs by using the API. The BOPS implementation need not know whether the underlying system is a machine learning model, a relational database management system (RDBMS), or a search engine. The BOPS implementation functionality offers a “point-and-cut” mechanism to add the appropriate security to the production systems as well as to the systems in development.

Additionally, BOPS includes the biometric identification that the industry frequently calls the “one-to-many” (1:M) case. In the past, biometric identification was not considered because it requires a lookup against previously stored biometrics and this lookup required indexing and storing the biometric in plain text biometric identification. This specification includes biometric identification by using biometric features vectors as input to the enroll endpoint, biometric feature vectors as input to the predict endpoint, and either video or audio as input to the liveness endpoint.

1.2 Purpose

This standard provides a biometric-agnostic security protocol for authentication, identification, and liveness.

1.3 Intended audience

The intended audience of this document includes security evaluators, system underwriters, developers, and systems engineers. The BOPS is subject to changes and updates.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

The Trusted Computer System Evaluation Criteria (Mitre 1984).¹

¹Available at: <http://seclab.cs.ucdavis.edu/projects/history/papers/dod85.pdf>.