



Biometrics

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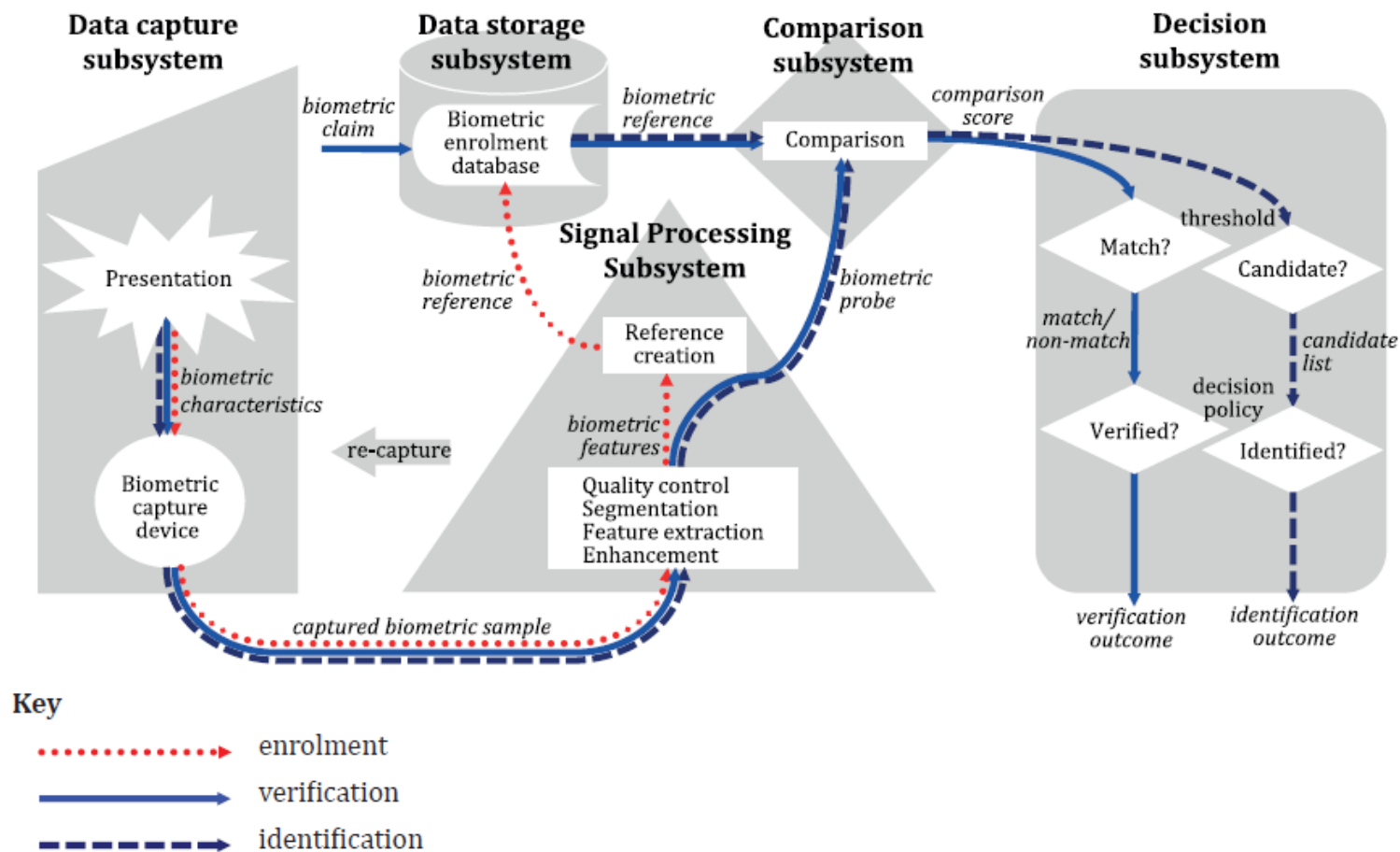
Very brief intro on some Biometrics topics Paul expressed an interest in:

- Biometric Capture
- Biometrics Samples
- Biometric Template Protection
- Biometric Interchange

We can discuss additional topics as/when needed

Generic Biometric System

ISO/IEC FDIS 19795-1:



Biometric Sample

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Biometric Sample - data that is obtained by the biometric system's capture device. It could be an image of the shape of an individual's hand to his finger, iris, or retina, or a recording of his voice. This data then becomes a master profile from which the unique features of the individual's hand, finger, iris, or voice are extracted, analyzed, and then converted into a mathematical file. This mathematical file comes to be known as the biometric template.

ISO/IEC 2382-37

Biometric Sample - analog or digital representation of *biometric characteristics* (3.1.2) prior to *biometric feature extraction* (3.5.4)

EXAMPLE A record containing the image of a finger is a **biometric sample**.

Biometric Sample Quality

Biometric Sample Quality is a key factor in biometric matching performance:

- **Accuracy:** all biometric systems have Type I (False Non-Match) and Type II (False Match) errors
- **Speed:** typically measured in comparisons per second per core; overall matching speed can be impacted by poor quality samples as different strategies may be invoked for identification searches
- **Cost:** additional CPU utilization may be a result of poor quality

The ISO/IEC 29794-X series deals with Quality:

- **Biometric sample quality — Part 1: Framework**
- **Biometric sample quality — Part 4: Fingerprint image data***
- **Biometric sample quality — Part 5: Face image data**
- **Biometric sample quality — Part 6: Iris image data**

*NIST: NFIQ, NFIQ2

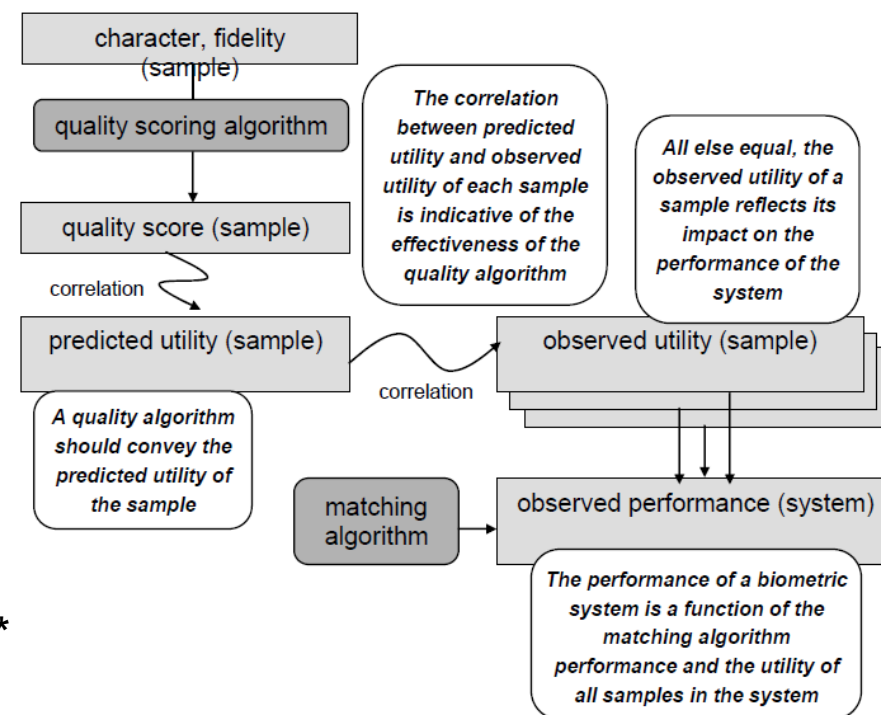


Figure 2 – Relationship between quality and system performance

from: ISO/IEC 29794-1

Biometric Template

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A **biometric template** is a digital representation of the unique features that have been extracted from a biometric sample and is stored in a biometric database. These templates are then used in the biometric authentication and identification process..

ISO/IEC 2382-37

Biometric feature extraction - process applied to a *biometric sample* (3.3.21) with the intent of isolating and outputting repeatable and distinctive numbers or labels which can be compared to those extracted from other *biometric samples* (3.3.21)

- Note 1 to entry: The creation of filters to be applied to *biometric samples* (3.3.21) is not **biometric feature extraction**, however, the application of filters to *biometric samples* (3.3.21) may be. Therefore, for example, the creation of eigenfaces is not **biometric feature extraction**.
- Note 2 to entry: Repeatable implies low variation between outputs generated from *biometric samples* (3.3.21) of the same *biometric data subject* (3.7.5).
- Note 3 to entry: Distinctive implies high variation between outputs generated from *biometric samples* (3.3.21) of different *biometric data subjects* (3.7.5).
- Note 4 to entry: **Biometric feature extraction** may fail.
- Note 5 to entry: **Biometric feature extraction** may be applied to an *intermediate biometric sample* (3.3.30).

Biometric Interchange

What biometric information is shared?

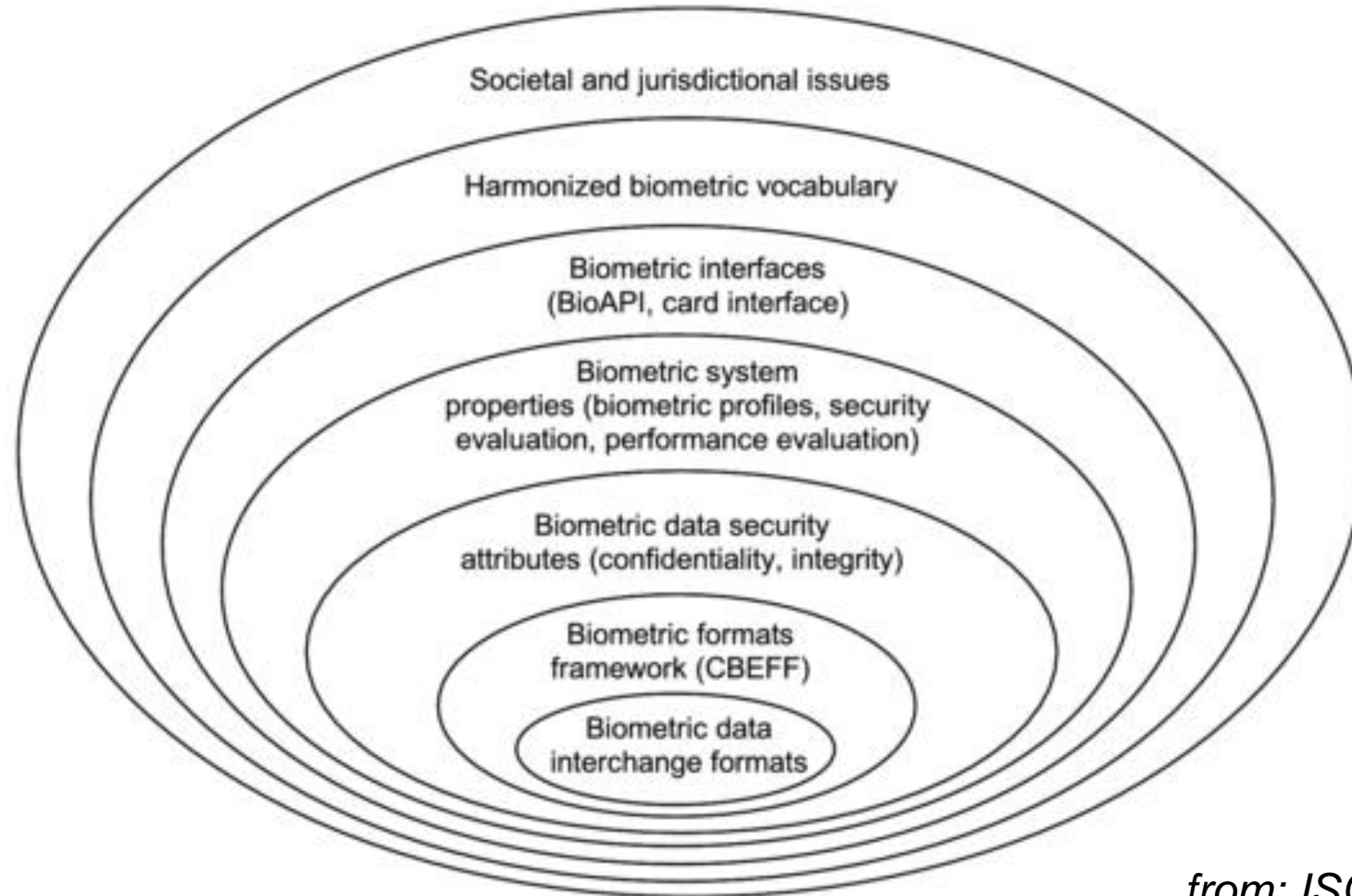
- **Images (predominant option; ICAO, DHS, FBI, Interpol, EU, RCMP, ...)**
- *Templates, Proprietary (e.g., IDEMIA, NEC, Thales, Veridium)*
- *Templates, Interoperable (e.g., ISO/IEC 19794-2 for finger)*
- *Templates. Transformed (e.g., Trust Stamp IT², GenKey BioHASH)*
- *NONE (e.g., FIDO, BSOC)*

How is biometric information shared?

The ISO/IEC 19794-X series deals with Interchange Formats

- **Biometric data interchange formats - Part 1: Framework**
- **Biometric data interchange formats - Part 4: Fingerprint image data**
- **Biometric data interchange formats - Part 5: Face image data**
- **Biometric data interchange formats - Part 6: Iris image data**

Biometric Interchange



from: ISO/IEC 19794-1

Related Standards, non-exhaustive

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| ISO/IEC 7816-11, Identification cards — Integrated circuit cards — Part 11: Personal verification through biometric methods |
| ISO/IEC 9834-1, Information technology — Procedures for the operation of object identifier registration authorities: General procedures and top arcs of the international object identifier tree — Part 1: |
| ISO/IEC 19784 (all parts), Information technology — Biometric Application Programming Interface |
| ISO/IEC 19785 (all parts), Information technology — Common Biometric Exchange Formats Framework |
| ISO/IEC 19785-1, Information technology — Common Biometric Exchange Formats Framework — Part 1: Data element specification |
| ISO/IEC 19785-3, Information technology — Common Biometric Exchange Formats Framework — Part 3: Patron format specifications |
| ISO/IEC 24713 (all parts), Information technology — Biometric profiles for interoperability and data interchange |
| ISO/IEC TR 24722, Information technology — Biometrics — Multimodal and other multibiometric fusion |
| ISO/IEC 24779 (all parts), Information technology — Cross-jurisdictional and societal aspects of implementation of biometric technologies — Pictograms, icons and symbols for use with biometric systems |
| ISO/IEC 24787, Information technology — Identification cards — On-card biometric comparison |
| Overview of tools for ASN.1. Available at https://www.itu.int/en/ITU-T/asn1/Pages/Tools.aspx |
| Overview of tools for XML. Available at https://www.w3.org/XML/Schema.html#Tools |