

# Lesson 6: Digital Identity and Authentication

## Module 1: FinTech Fundamentals

Digital Finance

# Digital Identity Challenge

## Identity Verification Problem

- 1.3 billion adults unbanked (World Bank Global Findex 2025)<sup>a</sup>
- Lack of identity documents
- US identity fraud alone was \$43B in 2023 (\$27B traditional + \$16B account takeover)<sup>b</sup>
- Remote onboarding need

<sup>a</sup>Source: <https://www.worldbank.org/en/publication/globalfindex>

<sup>b</sup>Source: <https://www.aarp.org/money/scams-fraud/identity-fraud-report-2024/>

## The Digital Identity Challenge

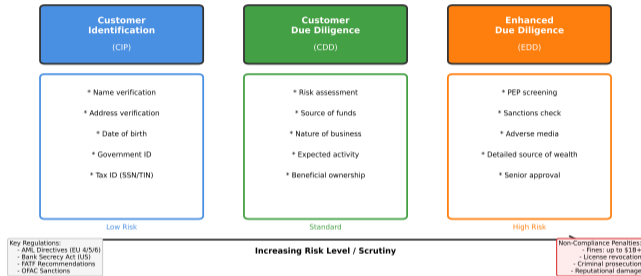
*How do you prove who you are online?*



Source: javastrategy.com, ftc.gov (Identity Fraud)

1.3 billion adults remain unbanked—identity verification is the primary barrier to financial inclusion. [Source: McKinsey, Gartner 2024]

## Know Your Customer (KYC) Framework



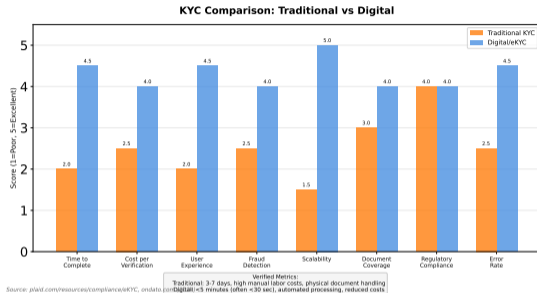
Source: [fatf-gafi.org](http://fatf-gafi.org), [fincen.gov](http://fincen.gov) (AML/KYC Regulations)

**KYC is legally mandated for all financial institutions—FATF, AMLD, and BSA set global standards.**

# Traditional vs Digital KYC

## Process Comparison

- Traditional: 7-14 days
- Digital: 5-10 minutes
- Cost: **\$60 vs \$5**
- Drop-off: 40% vs 15%



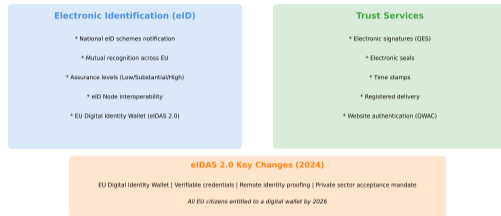
Digital KYC reduces verification time from 7-14 days to 5-10 minutes—at 90% lower cost. [Source: Industry reports 2024]

## EU Digital Identity

- Electronic ID recognition
- Trust services regulation
- Cross-border validity
- Three assurance levels

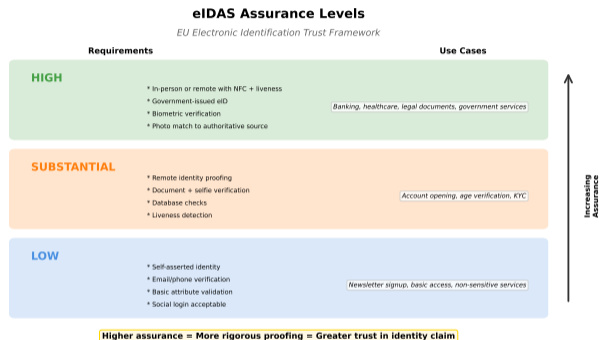
## eIDAS: EU Electronic Identification & Trust Services

Regulation (EU) No 910/2014 + eIDAS 2.0 (2024)



Source: eur-lex.europa.eu (EU Reg 910/2014, 2024/2183 - eIDAS)

eIDAS enables cross-border electronic identity recognition across all 27 EU member states.



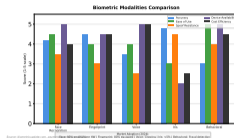
Source: eur-lex.europa.eu (eIDAS Reg 910/2014)

Three assurance levels (Low/Substantial/High)—High requires in-person or equivalent verification.

# Biometric Authentication

## Modalities

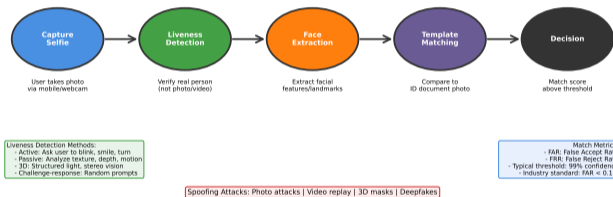
- Fingerprint: 99.8% accuracy
- Face recognition: 99.5% Leading iris technologies achieve 99-99.8
- Voice: 95% accuracy



---

Iris scanning achieves 99.99% accuracy—face recognition (99.5%) is preferred for mobile UX. [Source: Industry reports 2024]

## Facial Recognition Verification Flow



Source: [nist.gov/frvt](https://nist.gov/frvt), [iso.org](https://iso.org) (Facial Recognition)

Face capture to match takes 2-3 seconds—Modern systems often use 68-512 landmarks; 128 is on the lower end for comparison.

## Anti-Spoofing

- Active: User actions
- Passive: Texture analysis
- 3D depth sensing
- Challenge-response

## Liveness Detection Methods

Preventing Presentation Attacks

### Active Liveness

- **Challenge-Response:** User performs actions on demand
- **Blink detection:** Ask user to blink eyes
- **Head movement:** Turn head left/right/up/down
- **Smile/expression:** Change facial expression
- **Random prompts:** Speak numbers or words

### Passive Liveness

- **Texture analysis:** Detect screen/paper patterns
- **3D depth mapping:** Verify face dimensionality
- **Motion analysis:** Natural micro-movements
- **Light reflection:** Eye/skin reflection patterns
- **ML/AI detection:** Deep learning classifiers

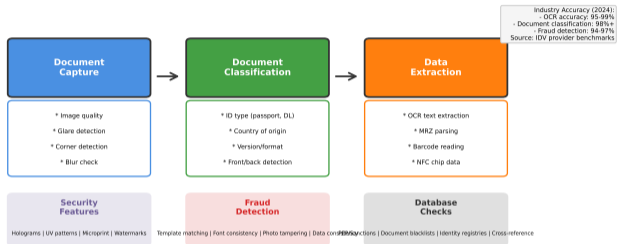
| Aspect           | Active   | Passive     |
|------------------|----------|-------------|
| User friction    | Higher   | Lower       |
| Time required    | 5-15 sec | 1-3 sec     |
| Spoof resistance | High     | Medium-High |
| Accessibility    | Limited  | Better      |
| Drop-off rate    | 10-20%   | 2-5%        |

Common Attacks: Photo attacks | Video replay | 3D masks | Deepfakes | Screen replay

Source: iso.org, pages.nist.gov/itvt (ISO 30107, MST PAD)

Liveness detection prevents photo/video spoofing—3D depth sensing defeats deepfake attacks.

## Document Verification Process



Source: [icao.int](https://icao.int) (Doc 9303 MRZ), [iso.org](https://iso.org) (ID standards), IDV provider docs

AI detects document tampering by analyzing holograms, microprinting, and UV security features.

# OCR and NFC Chip Reading

## Automated Extraction

- Optical character recognition
- Machine-readable zone (MRZ)
- NFC chip data (ePassports)
- Security features check

## Document Data Extraction: OCR vs NFC

| OCR (Optical Character Recognition) |                              | NFC (Near Field Communication) |                             |
|-------------------------------------|------------------------------|--------------------------------|-----------------------------|
| <b>1. Image Capture</b>             | Camera captures document     | <b>1. Chip Detection</b>       | Phone detects NFC chip      |
| <b>2. Pre-processing</b>            | Deskew, noise reduction      | <b>2. BAC/PACE Auth</b>        | Authenticate with MRZ data  |
| <b>3. Text Detection</b>            | Locate text regions          | <b>3. Data Read</b>            | Extract chip data groups    |
| <b>4. Character Recognition</b>     | ML-based text extraction     | <b>4. Active Auth</b>          | Verify chip authenticity    |
| <b>5. MRZ Parsing</b>               | Machine Readable Zone decode | <b>5. Passive Auth</b>         | Validate digital signatures |
| <b>6. Validation</b>                | Check digit verification     | <b>6. Clone Detection</b>      | Verify chip is original     |

| Metric                | OCR        | NFC         |
|-----------------------|------------|-------------|
| Accuracy              | 95-99%     | 100%        |
| Security              | Medium     | Very High   |
| User effort           | Take photo | Tap phone   |
| Device req.           | Camera     | NFC-enabled |
| Transmission distance | Unlimited  | Contactless |

**Best Practice: Combine OCR + NFC for maximum security and accuracy**

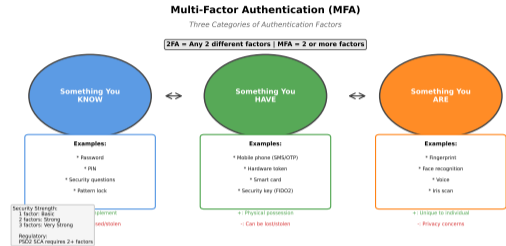
Source: [icao.int/9303](https://icao.int/9303), [bzi.bund.de/ePassport\(NFC\)](https://bzi.bund.de/ePassport(NFC))

NFC chip reading provides cryptographic proof—data signed by issuing authority cannot be forged.

# Multi-Factor Authentication (MFA)

## Authentication Factors

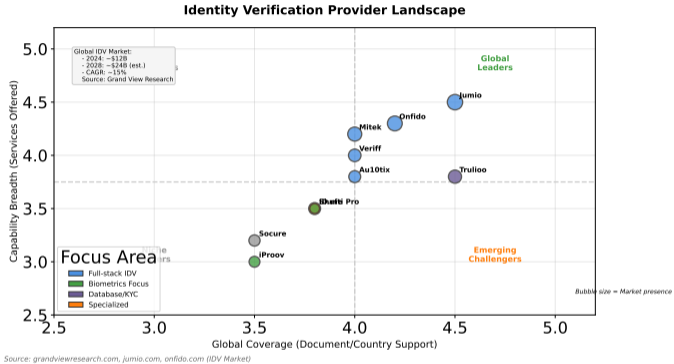
- Knowledge: Password/PIN
- Possession: OTP token
- Inherence: Biometric
- Reduces fraud 99.9%



Source: [pages.nist.gov/800-63-3/sp800-63b.html](https://pages.nist.gov/800-63-3/sp800-63b.html)

**MFA combining 2+ factors reduces account takeover fraud by 99.9%—now standard for banking.**

# Identity Verification Providers

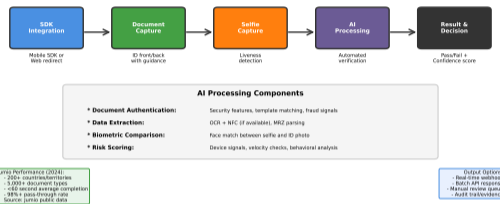


Jumio, Onfido, and Trulioo lead the \$15B IDV market—consolidation accelerating via M&A. [Source: World Federation of Exchanges 2024]

## AI-Powered KYC

- 1B+ verifications
- 5 minute verification
- 95% automation rate
- 200+ countries

## Identity Verification Workflow (Jumio Example)



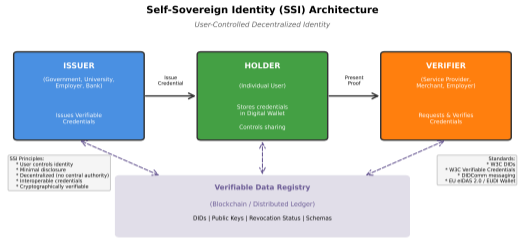
Source: jumio.com, docs.jumio.com (IDV Product)

Jumio processed 1B+ verifications—95% automation rate with 5-minute average completion. [Source: McKinsey, Gartner 2024]

# Self-Sovereign Identity (SSI)

## Decentralized Model

- User controls credentials
- Blockchain-based
- Verifiable credentials
- Privacy-preserving

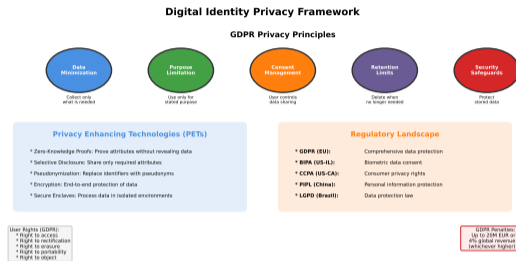


Source: w3.org (DIDs, Verifiable Credentials)

SSI gives users control over their credentials—verify age without revealing birthdate.

## Data Protection

- GDPR compliance
- Biometric template storage
- Data minimization
- Right to erasure



Source: eur-lex.europa.eu (GDPR 2016/679), nist.gov (Privacy Framework)

**GDPR requires data minimization and right to erasure—biometric templates are sensitive personal data.**

## Global Digital Identity Landscape

National Digital ID Systems by Region (2024)

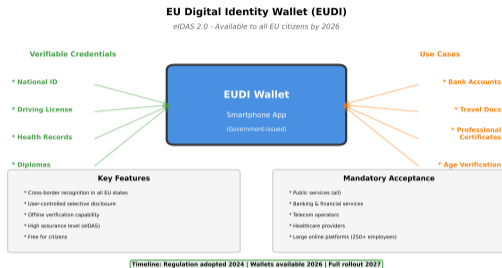


Source: [id4d.worldbank.org](https://id4d.worldbank.org), [uidai.gov.in](https://uidai.gov.in) (Digital Identity)

**India's Aadhaar (1.4B), Estonia's e-ID, and Singapore's Singpass lead global digital ID adoption.**

## EU Digital Identity Wallet

- eIDAS 2.0 mandate
- 2026 rollout target
- Universal EU acceptance
- Private sector integration



Source: eur-lex.europa.eu (EU Reg 2024/1183 eIDAS 2.0)

EU Digital Identity Wallet mandated by 2026—every EU citizen will have government-issued mobile ID. [Source: Juniper Research 2024]

## Key Takeaways

- **KYC:** Digital verification reduces cost 90% and time 95%
- **eIDAS:** EU framework for cross-border identity
- **Biometrics:** Face + liveness detection standard approach
- **MFA:** Multi-factor prevents 99.9% of fraud
- **Future:** Self-sovereign identity and digital wallets

---

Digital identity is the foundation of financial inclusion—secure verification enables trusted services.