Biometric Service Provider (BSP)

John “Jack” Callahan
Veridium

Knowledge

Possession

Biometric

Source: Google

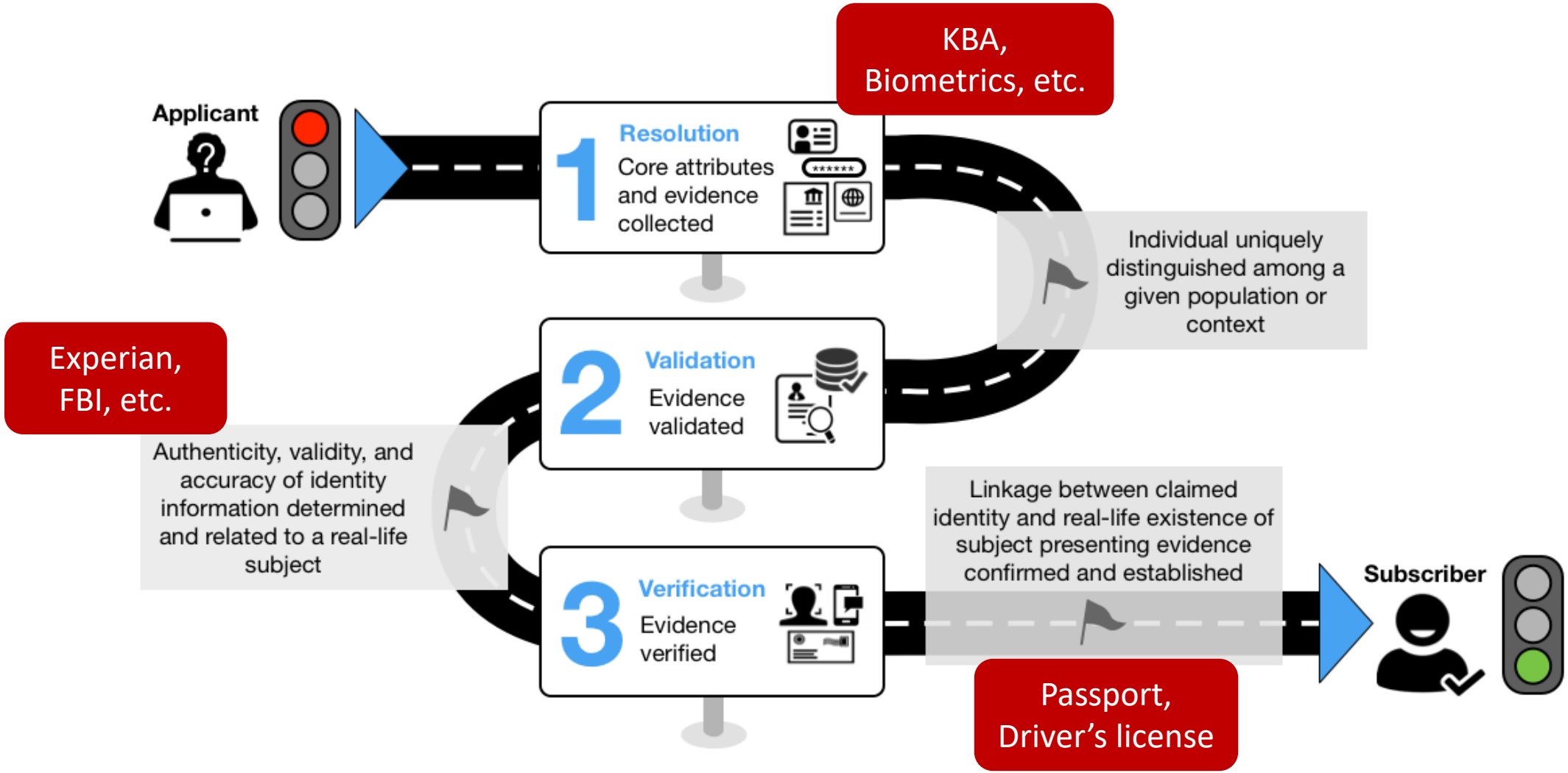
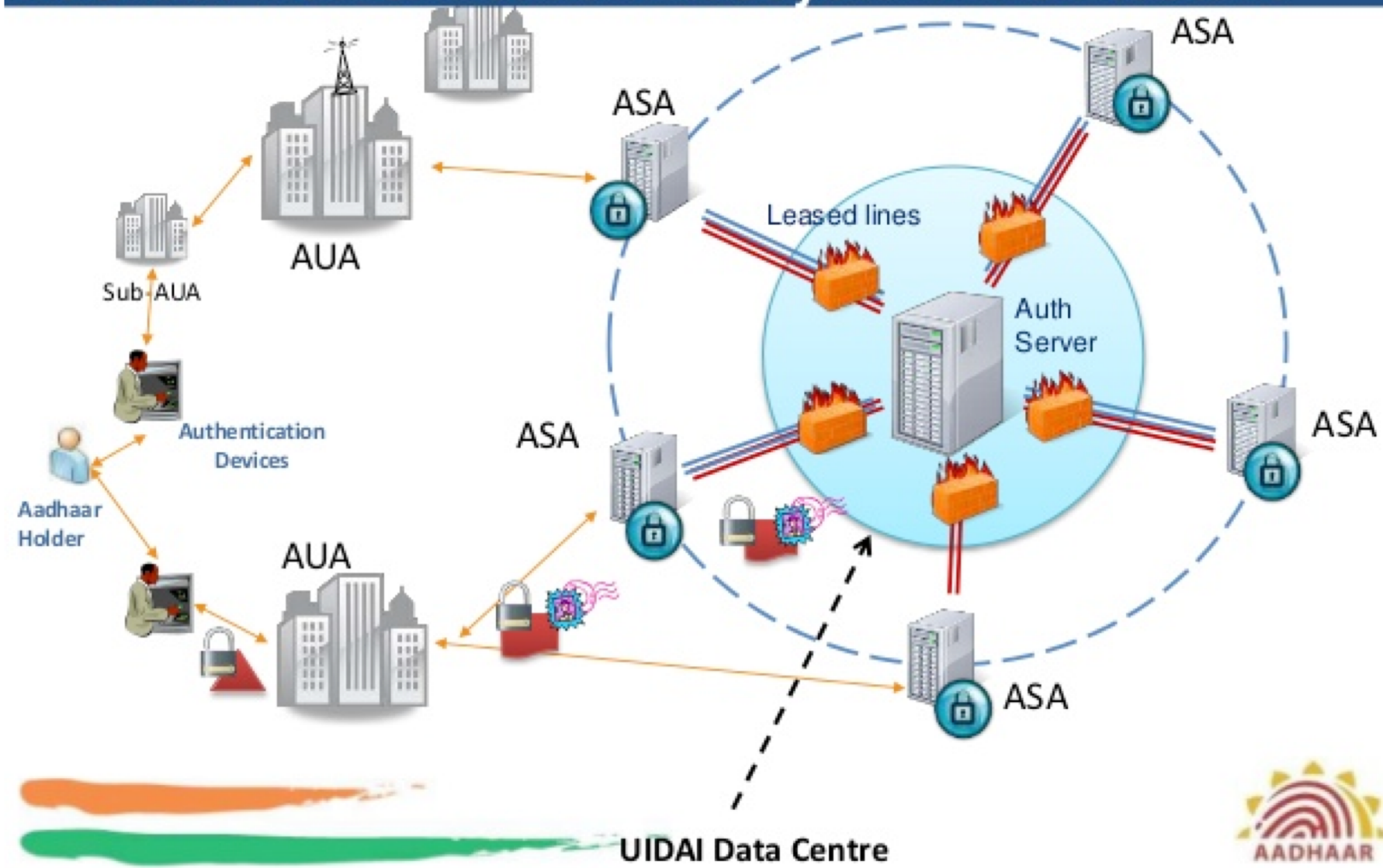


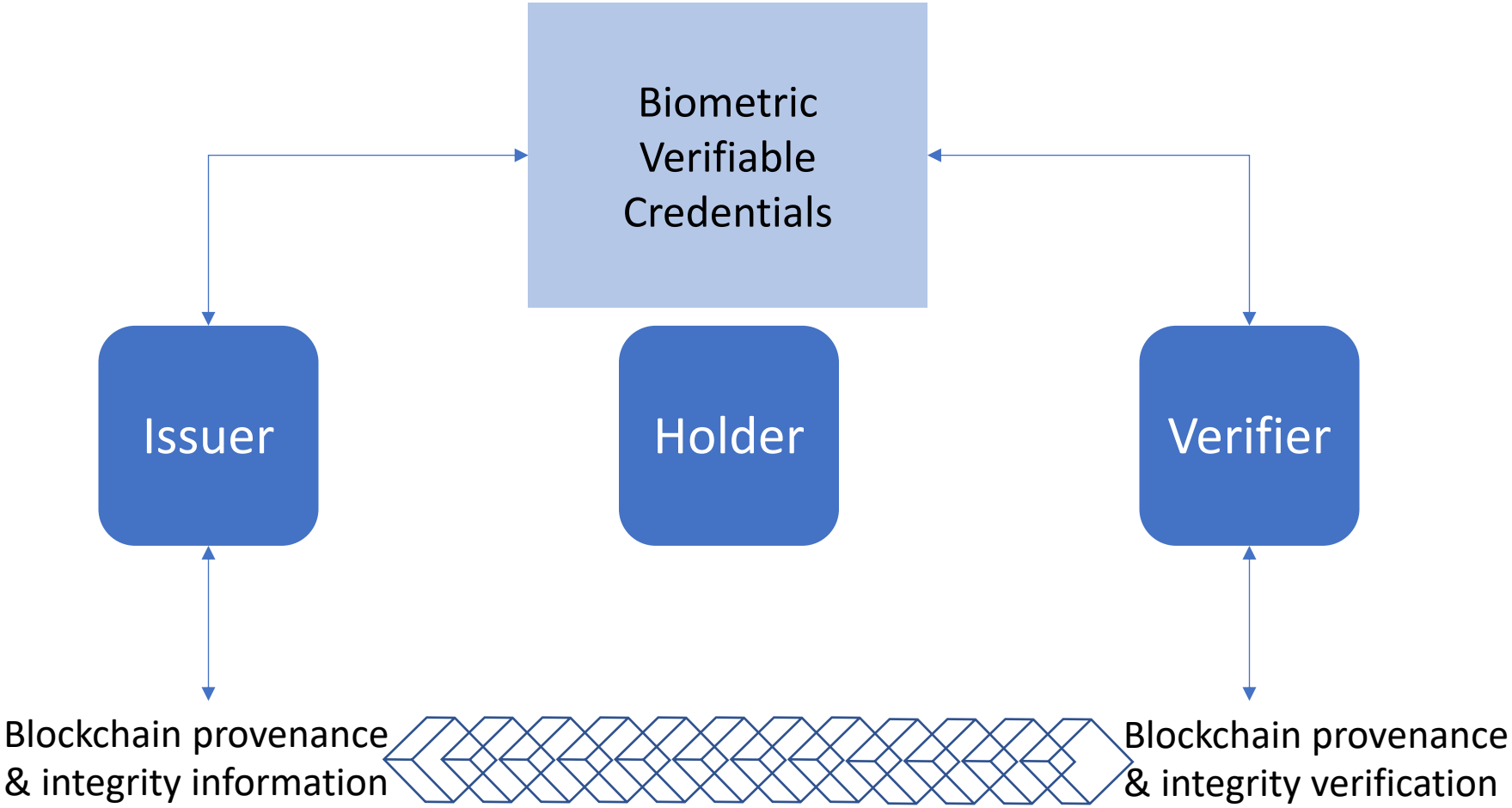
Figure 4-1 (annotated) The Identity Proofing User Journey [source: NIST 800-63-3A]

Aadhaar Authentication Ecosystem Architecture



Biometric ≠ Password

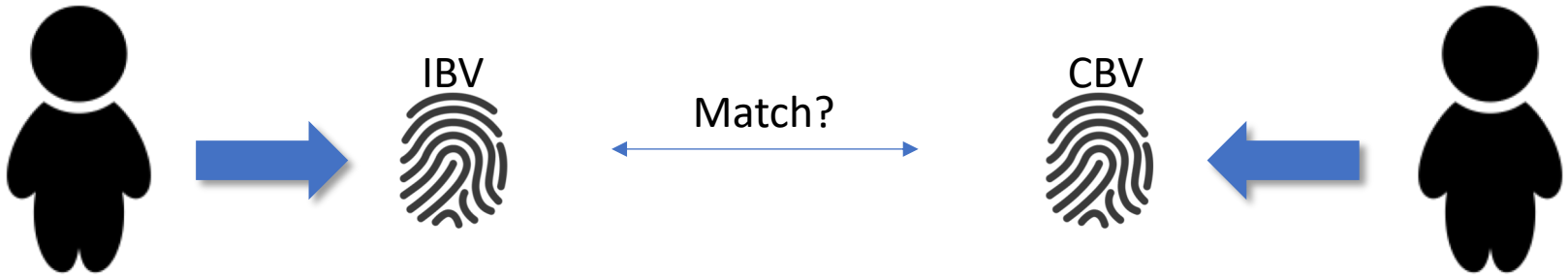
- Typically combined with liveness
  - "IAL3: ***Physical presence is required for identity proofing***. Identifying attributes must be verified by an authorized and trained CSP representative"
- aka Presentation Attack Detection (PAD)
- NIST 800-63-3B Section 5.2.3
  - "Testing of presentation attack resistance ***SHALL*** be in accordance with Clause 12 of ISO/IEC 30107-3. The PAD decision ***MAY*** be made either locally on the claimant's device or by a central verifier."
  - "PAD is being considered as a ***mandatory requirement*** in future editions of this guideline"
- PAD can be performed remotely
  - IAL2 introduces the need for either ***remote*** or ***physically-present*** identity proofing. [NIST 800-63-3A Section 2.2]


Biometric
Verifiable
Credentials
Issuer
Holder
Verifier
Blockchain provenance
& integrity information
Blockchain provenance
& integrity verification

A Range of Biometric Use Cases

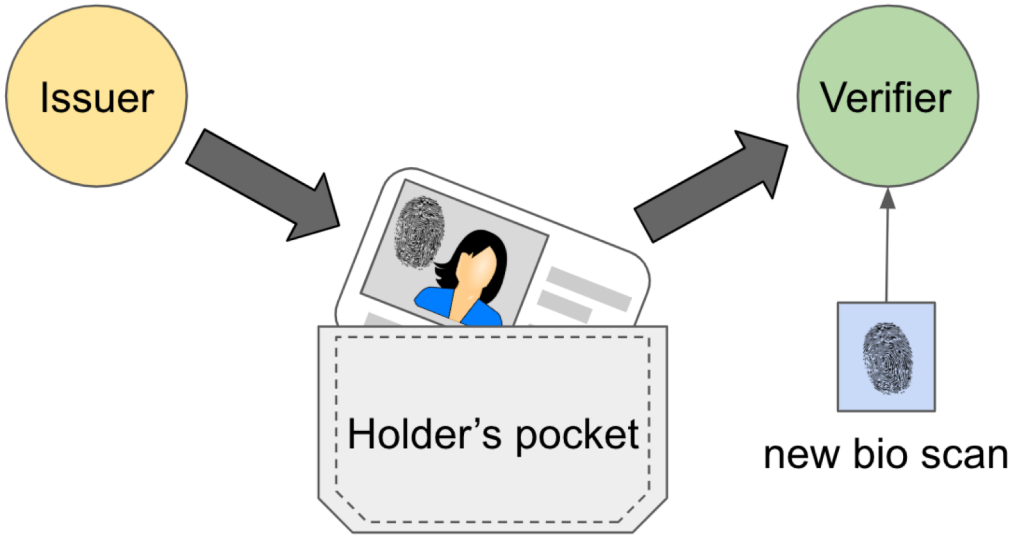
- Device unlocking
- Authentication
- Identification
- Identity Proofing
- Identity Verification
- Deduplication (on enrollment)
- Fraud prevention (on enrollment)

Initial & Candidate Biometric Vectors

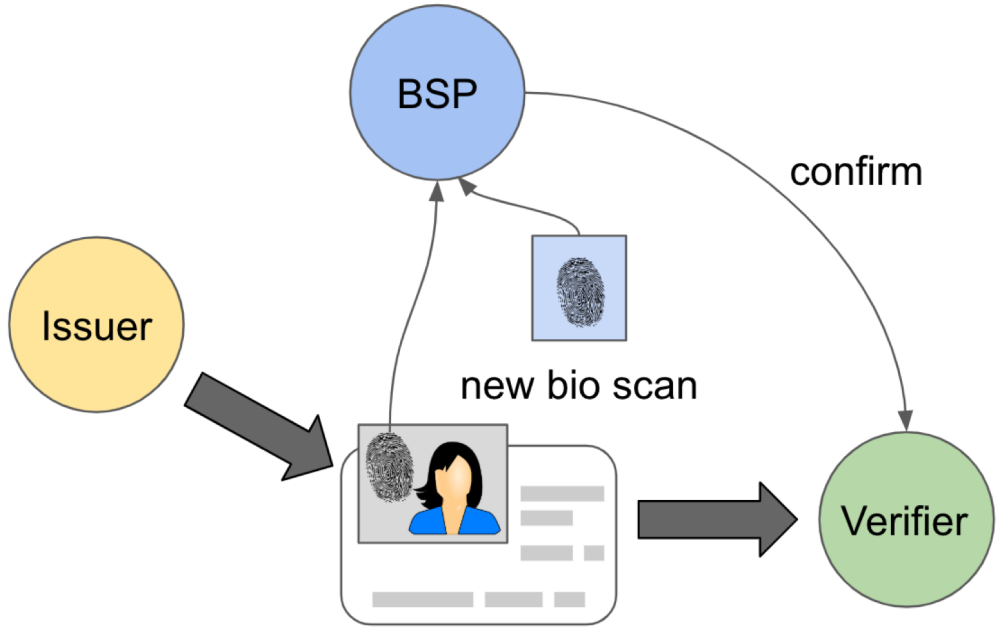


Some Simple Best Practices

- Protect biometric data …
  - at collection (sensor safeguards)
  - at rest (special hardware, TPM/TEE, database encryption)
  - in transit (encrypted communications)
  - during match (volatile memory protections)
- Never log biometric data!
- Candidate Biometric Vector is ephemeral



Pocket Pattern



BSP Pattern

IEEE ComSoc
IEEE Communications Society

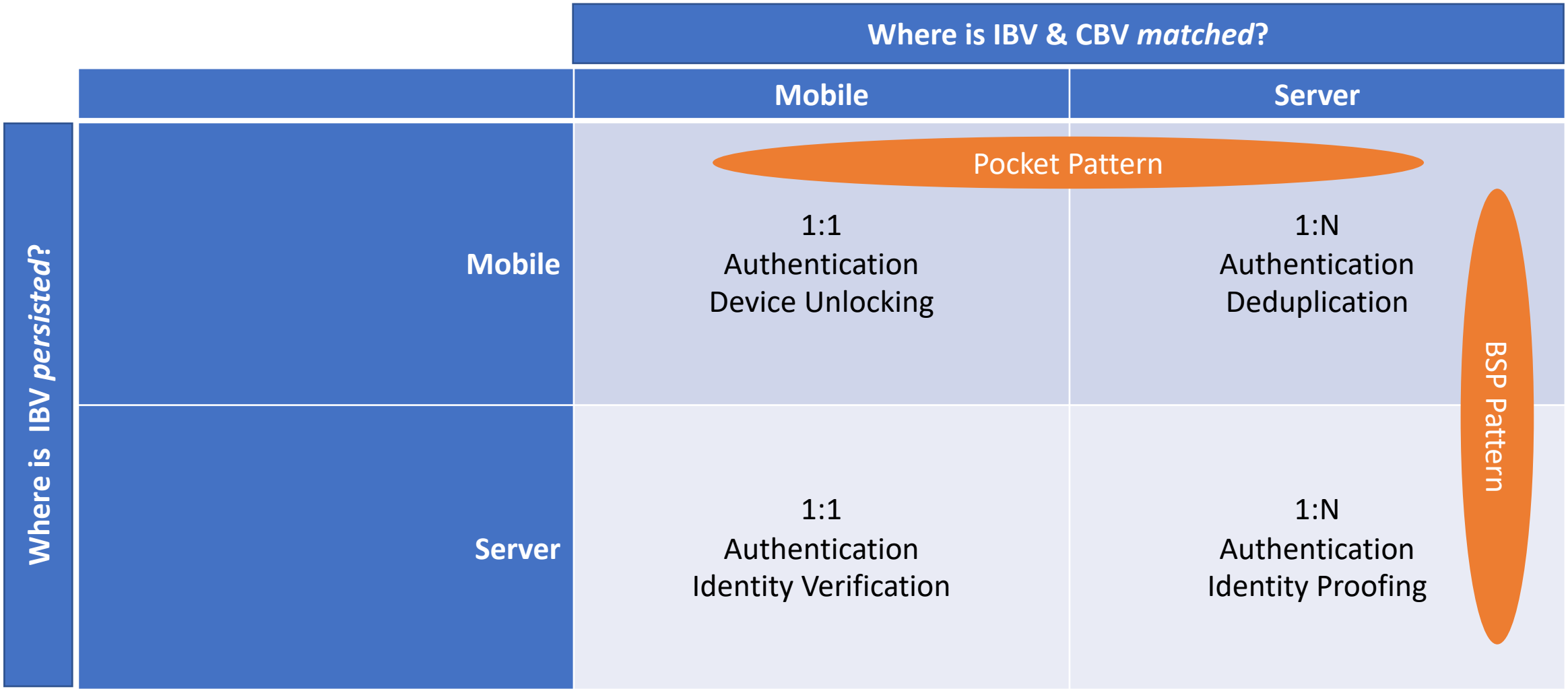
The Dawn of the Internet Identity Layer
Role of Decentralized Identity

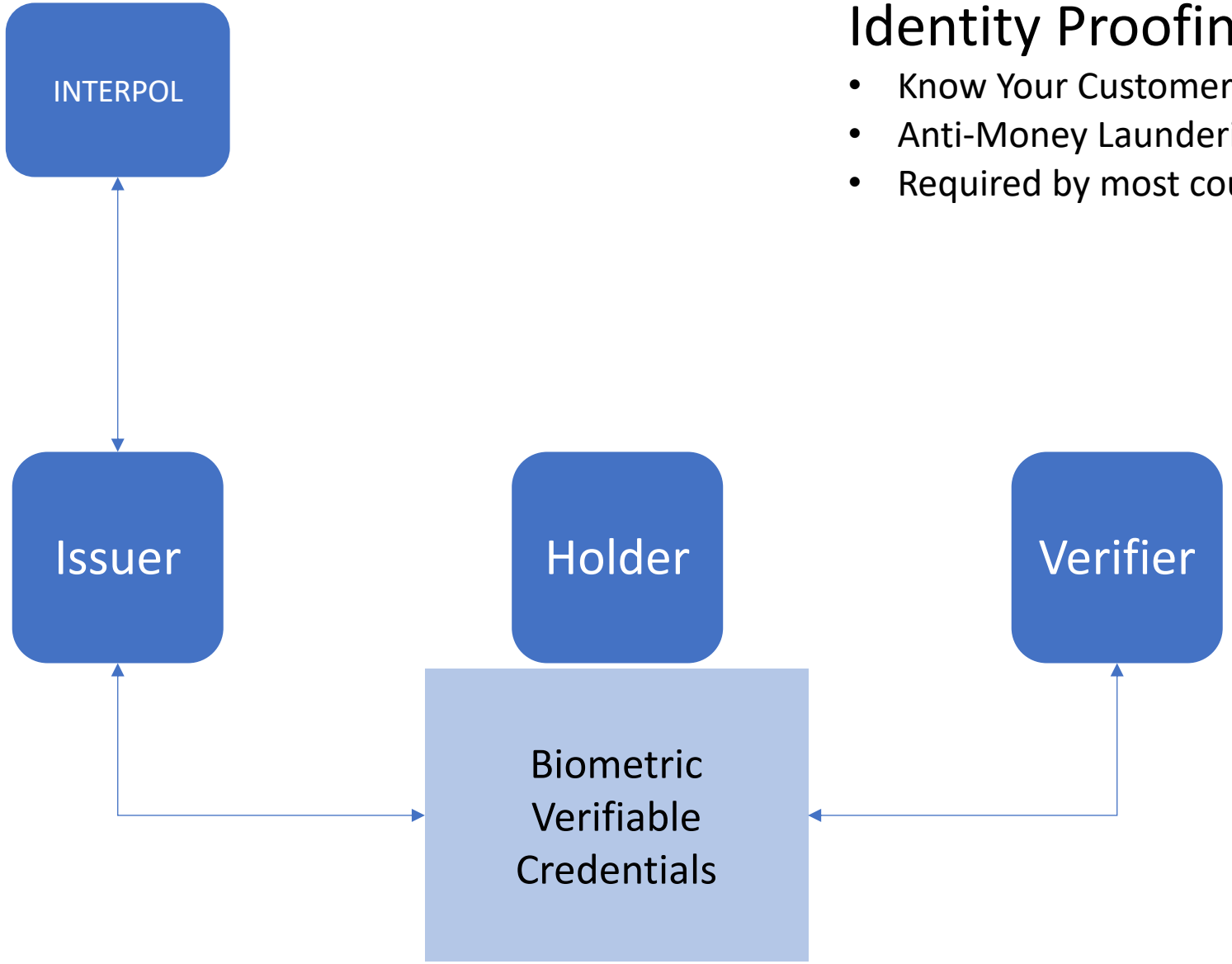
Using Biometrics to Fight Credential Fraud

Daniel Hardman, Lovesh Harchandani, Asem Othman, Ph.D., John Callahan, Ph.D.

Abstract

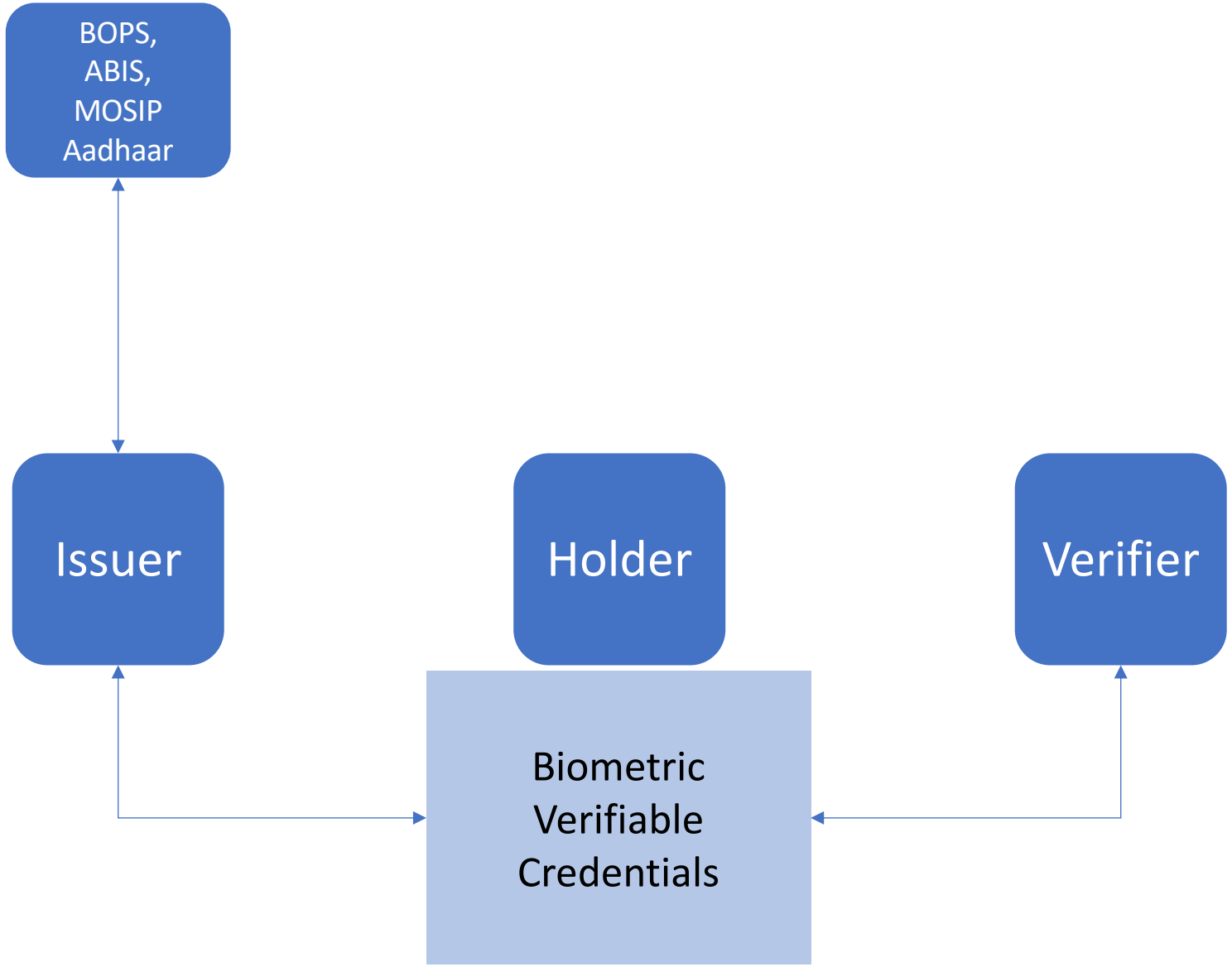
Verifiable credentials are an exciting innovation in decentralized and self-sovereign identity. However, the ease of copying digital files and sharing cryptographic keys makes an old problem from physical credential space more pressing: *How do we prevent a credential from being used by someone other than its legitimate holder?* Biometrics provide an answer—but they also introduce some complexity and some trust and privacy concerns that need careful treatment. In this paper, we explore three patterns of biometric use with verifiable credentials, identify appropriate use cases for each, and recommend best practices that make the patterns trustworthy, robust, and interoperable.

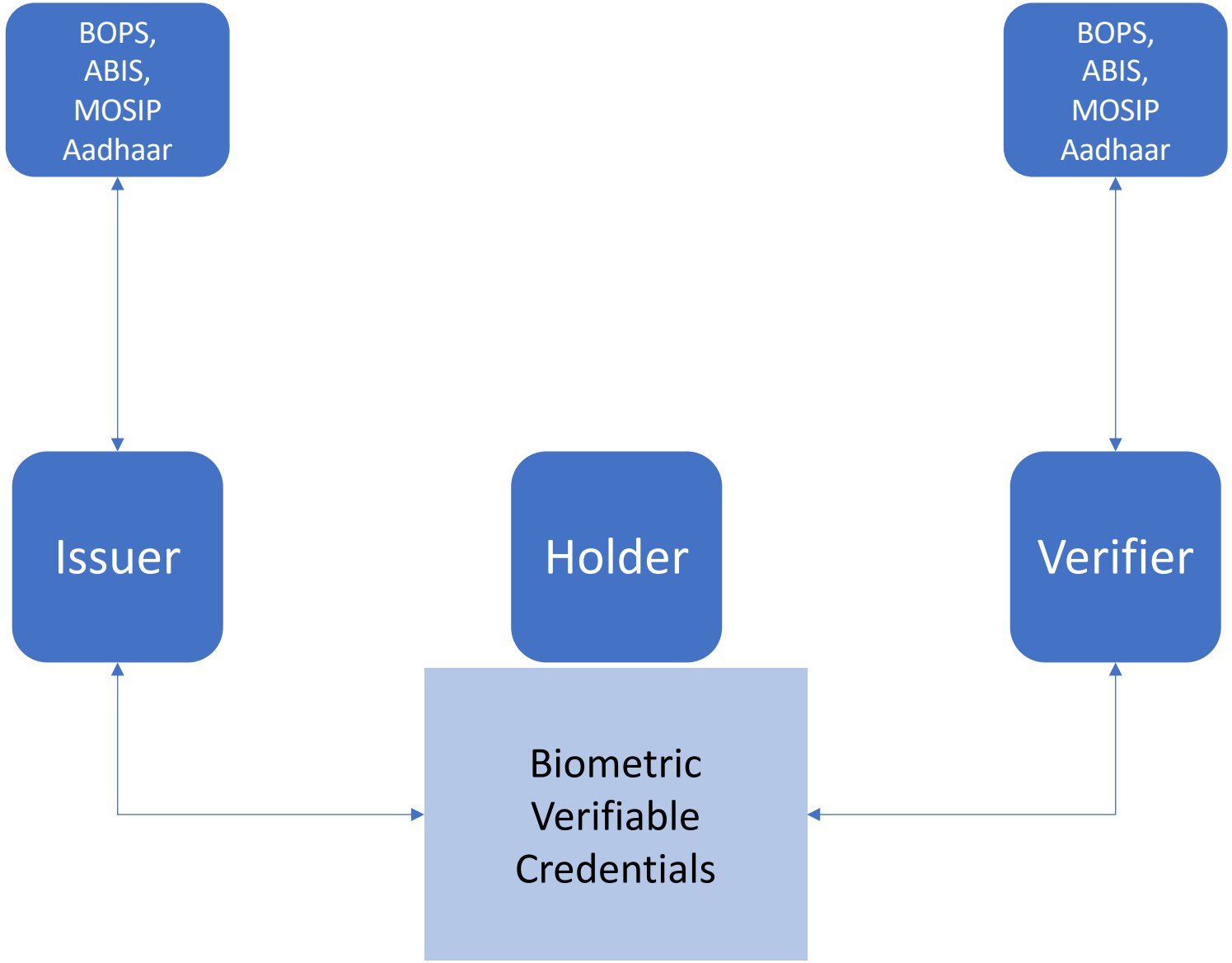

Where is IBV & CBV *matched*?
Mobile
Server
Where is IBV *persisted*?
Mobile
Server
Pocket Pattern
1:1
Authentication
Device Unlocking
1:N
Authentication
Deduplication
1:1
Authentication
Identity Verification
1:N
Authentication
Identity Proofing
BSP Pattern



Identity Proofing

- Know Your Customer (KYC)
- Anti-Money Laundering (AML)
- Required by most countries for banking


BOPS,
ABIS,
MOSIP
Aadhaar
Issuer
Holder
Verifier
Biometric
Verifiable
Credentials


BOPS,
ABIS,
MOSIP
Aadhaar
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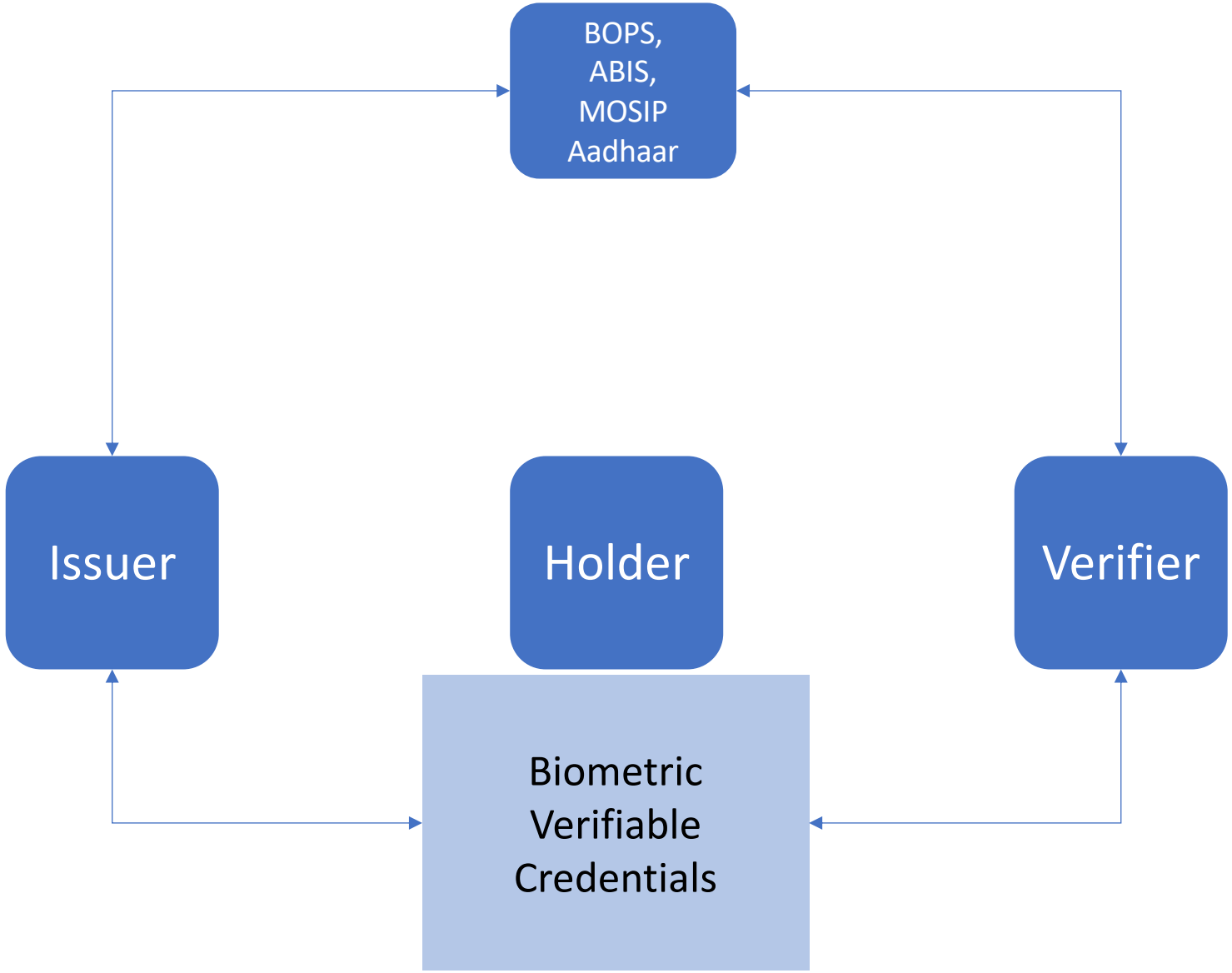
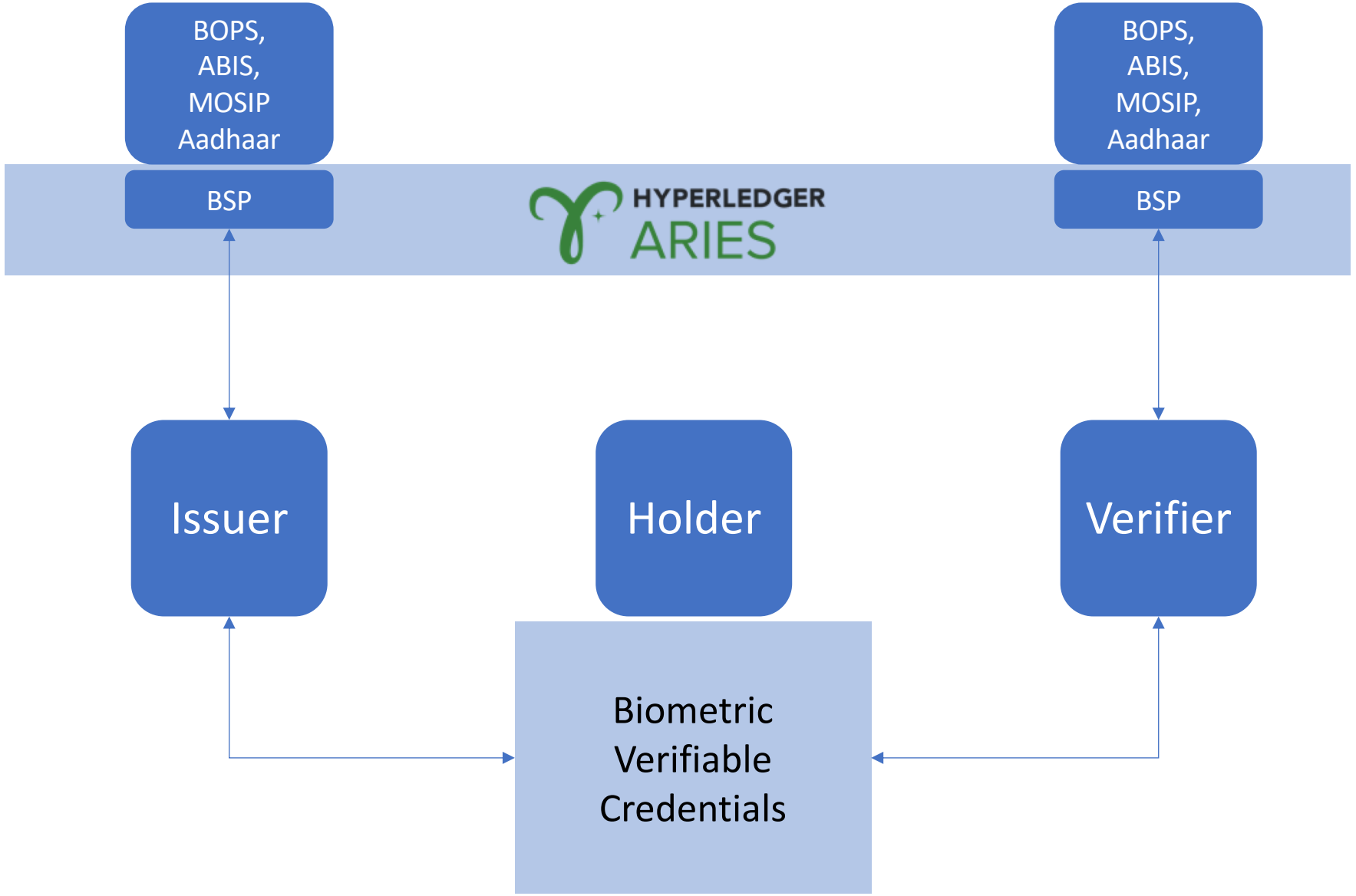
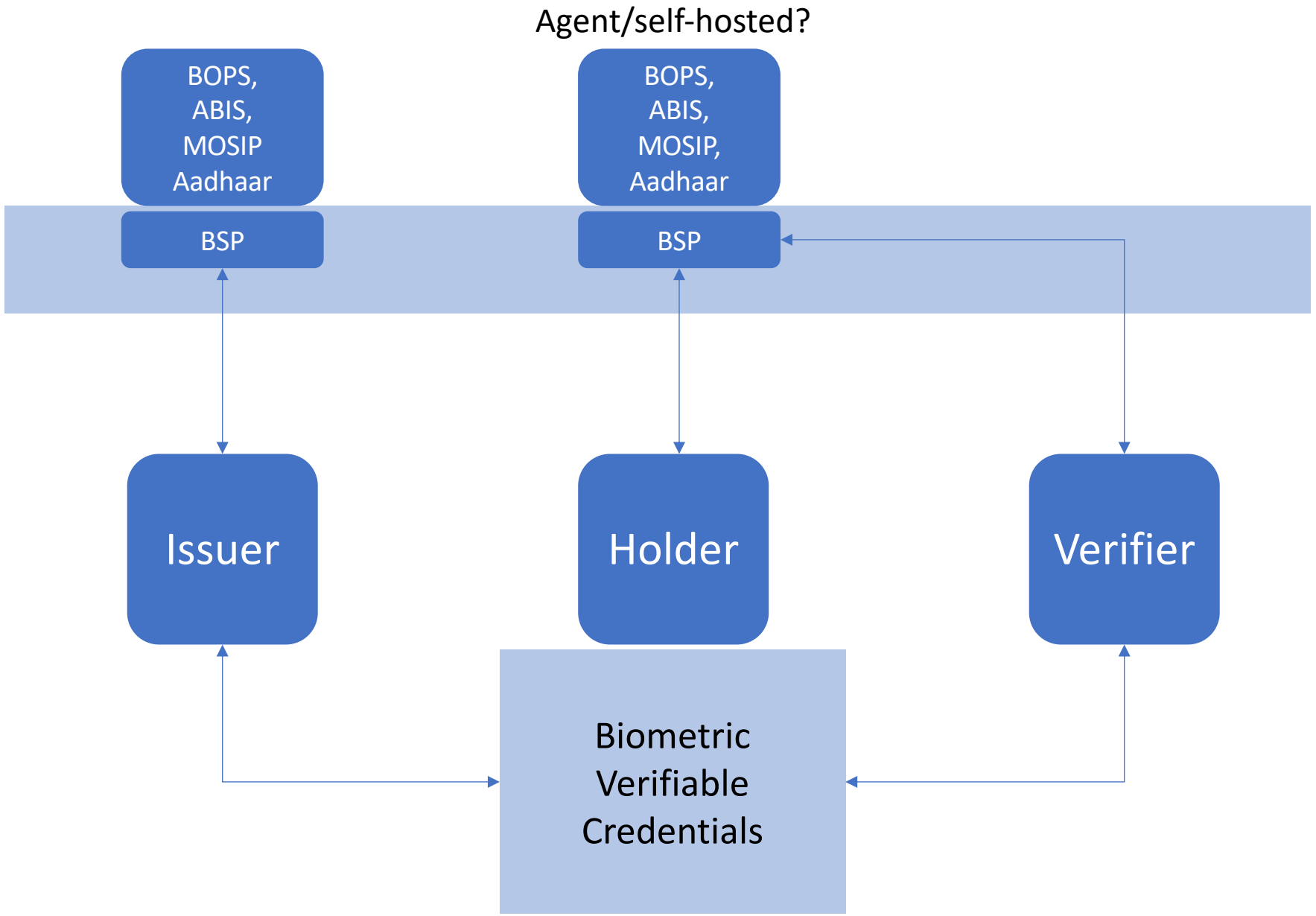
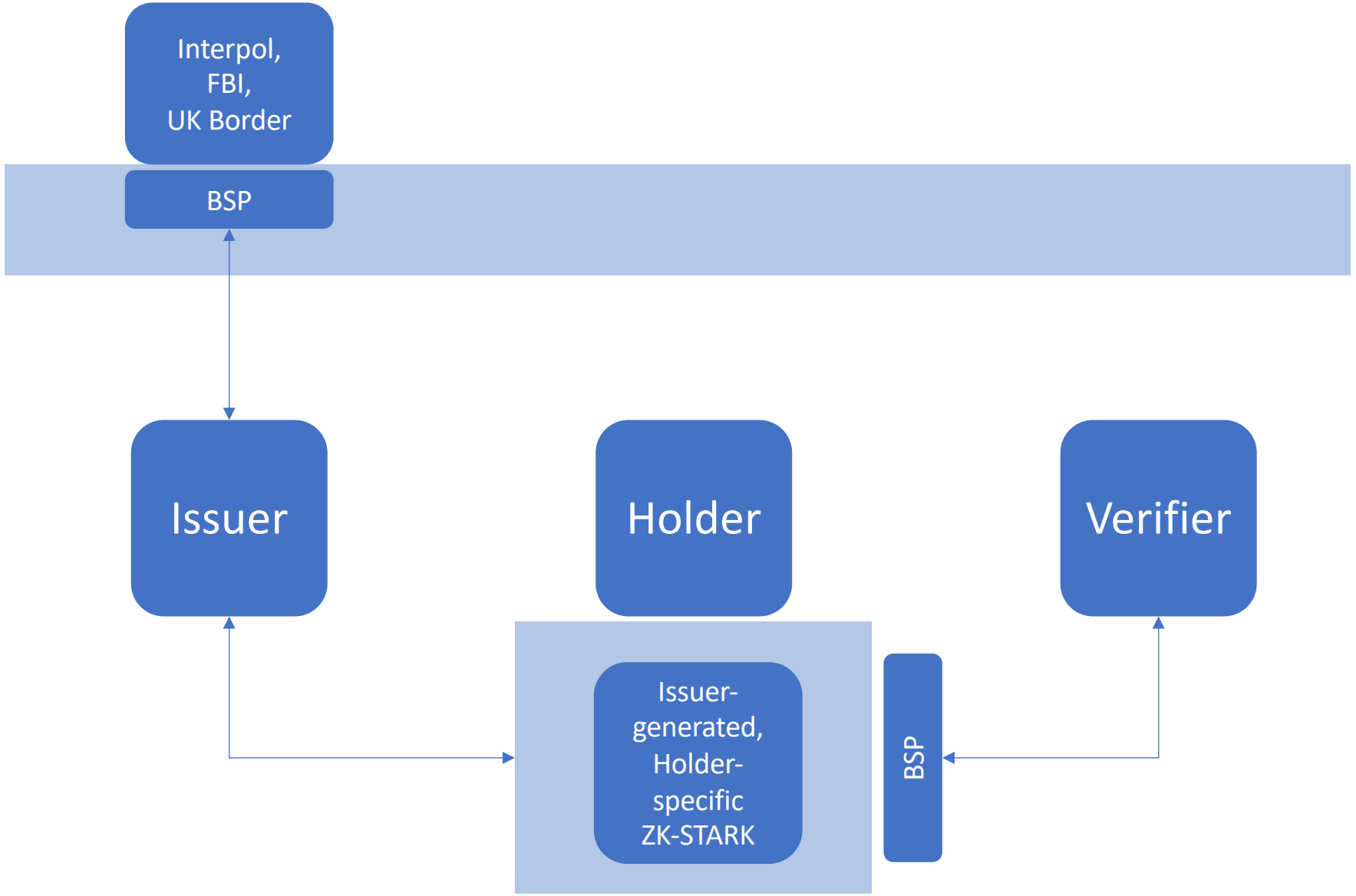

BOPS,
ABIS,
MOSIP
Aadhaar
Issuer
Holder
Verifier
Biometric
Verifiable
Credentials


BOPS,
ABIS,
MOSIP
Aadhaar
BSP
HYPERLEDGER
ARIES
BOPS,
ABIS,
MOSIP,
Aadhaar
BSP
Issuer
Holder
Verifier
Biometric
Verifiable
Credentials

Biometric Service Provider (BSP)

- A protocol?
- Should define biometric verifiable credential schema(s)
  - Biometric modality agnostic
  - Accommodate Biometric shards
  - Integrate with Ursa crypto
  - Integrate with service endpoint model
- Allows Issuers, Verifiers, and Holder wallets & agents to invoke services like:
  - Registration
  - Matching
  - Deduplication
  - Verification
- Provides new services
  - Fuzzy matching
  - Shard management (for DKMS)
  - Holder-specific biometric matching “machine” (using ZK-STARKs)
- Compatible with trust relationships
  - Supports DID connections/Trust relationships (Holder ⟷ BSP ⟷ Verifier)


Agent/self-hosted?
BOPS, ABIS, MOSIP Aadhaar
BOPS, ABIS, MOSIP, Aadhaar
BSP
BSP
Issuer
Holder
Verifier
Biometric Verifiable Credentials


Interpol,
FBI,
UK Border
BSP
Issuer
Holder
Verifier
Issuer-generated, Holder-specific ZK-STARK
BSP

Next Steps

- Feedback
- Draft RFC aligned with
  - Distributed Key Management RFC
  - Credential Fraud RFC (Threat model, Patterns & Anti-Patterns)
- BSP threat model?
- Prototype implementation(s)
- Relation to
  - IEEE 2410 (BOPS)
  - FIDO and new FIDO IDV