Understanding DID Auth

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W3C Workshop on Strong Authentication & Identification
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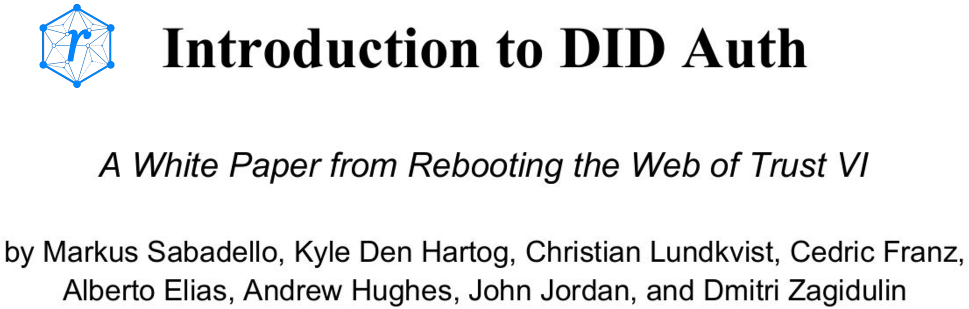
DID Auth

- Background
  - Decentralized Identifiers (DIDs)
  - Decentralized Public Key Infrastructure (DPKI)
- DID Auth
  - Prove that the DID subject controls its DID
  - A concept, with different architectures and implementations



Introduction to DID Auth

A White Paper from Rebooting the Web of Trust VI

by Markus Sabadello, Kyle Den Hartog, Christian Lundkvist, Cedric Franz,
Alberto Elias, Andrew Hughes, John Jordan, and Dmitri Zagidulin

DID Document

- DID Document tells us how control of the DID can be proven
- DID Document contains service endpoints, public keys, authentication methods

```
{
  "@context": "https://w3id.org/did/v1",
  "id": "did:sov:WRfXPg8dantKVubE3HX8pw",
  "service": {
    "type": "hub",
    "serviceEndpoint": "https://azure.microsoft.com/dif/hub/did:sov:WRfXPg8dantKVubE3H"
  },
  "publicKey": [
    {
      "id": "did:sov:WRfXPg8dantKVubE3HX8pw#key-1",
      "type": "Ed25519VerificationKey2018",
      "publicKeyBase58": "H3C2AVvLMv6gmMNam3uVAjZpfkcJCwDmqPV"
    }
  ],
  "authentication": {
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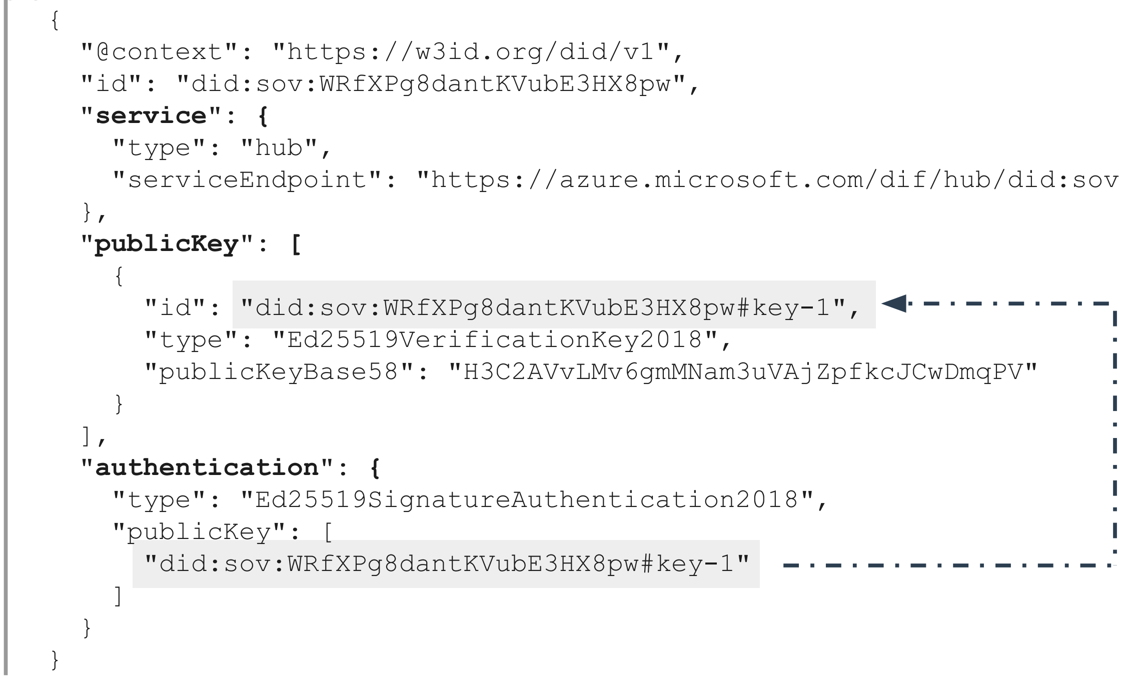

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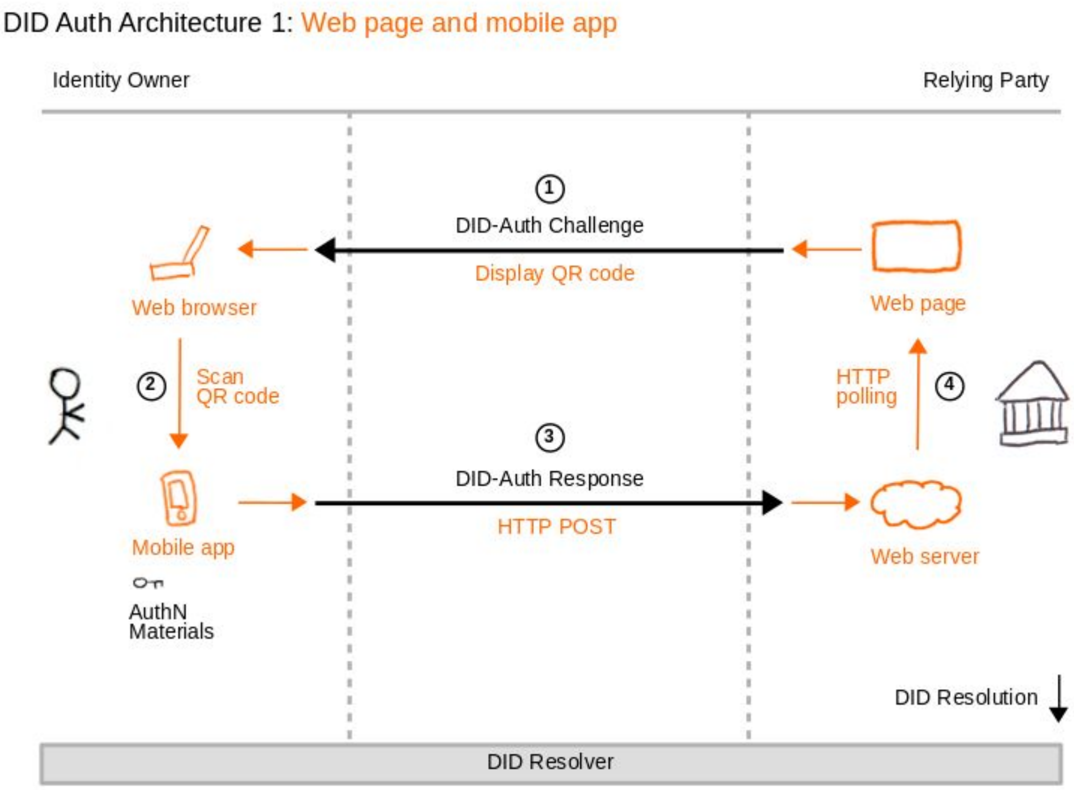


DID Auth Example Architecture

Challenges, Responses, Transports

- Challenge-response flow to prove that the DID subject controls its DID.

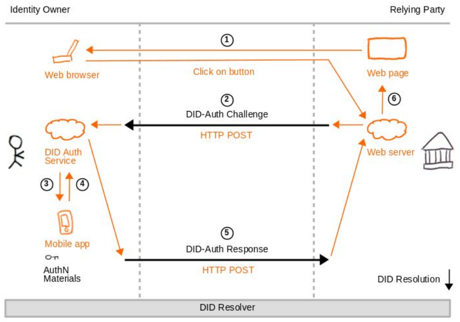
- **Challenge:**
  - Identity owner's DID may or not be known.
  - May or may not contain proof of control of a DID of the relying party.

- **Response:**
  - Linked to a challenge (e.g. using a nonce).
  - Contains proof of control of a DID of the identity owner.

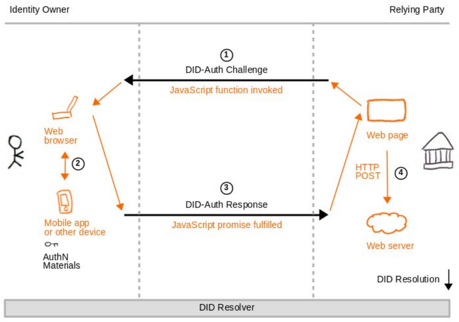
- **Transports:** HTTP POST, QR code, Mobile deep link, JavaScript browser API, Bluetooth, NFC, etc.
- Transports may require additional information such as endpoint URIs that may be included in the challenge, or discoverable from a DID.

DID Auth Example Architectures

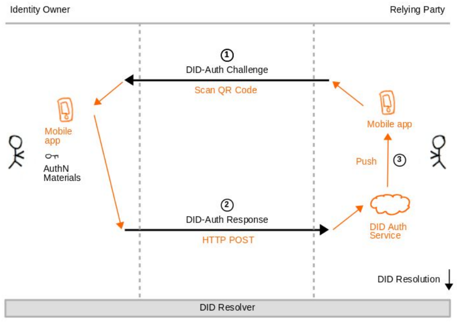
DID Auth Architecture 4: Web page and DID Auth service (2)



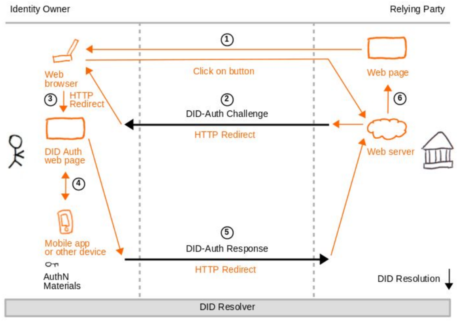
DID Auth Architecture 6: Web page and web browser



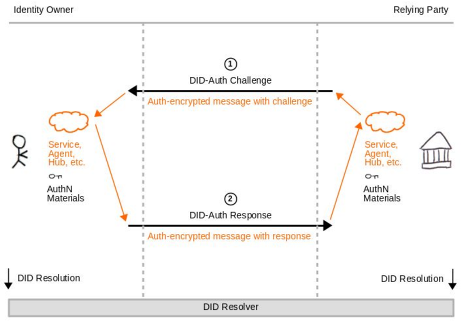
DID Auth Architecture 7: Mobile apps and DID Auth service



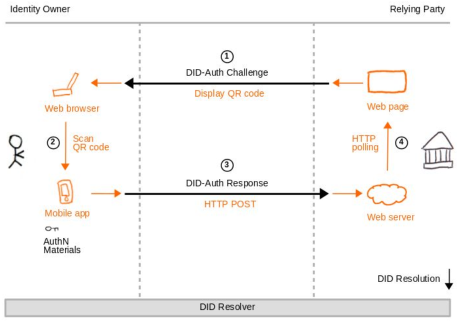
DID Auth Architecture 5: Web page and DID Auth web page



DID Auth Architecture 10: Authenticated Encryption



DID Auth Architecture 1: Web page and mobile app



DID Auth Data Formats

- Example JWT:

```
{
        "header": {
                "typ": "JWT",
                "alg": "ES256"
        },
        "payload": {
                "iss": "did:example:123456789abcdefg",
                "sub": "did:example:123456789abcdefg",
                "iat": 1479850830,
                "exp": 1511305200,
        },
        "signature": "..."
}
```

- Example JSON-LD VC:

```
{
        "type": ["Credential"],
        "issuer": "did:example:123456789abcdefg",
        "issued": "2018-03-07",
        "credentialSubject": {
                "id": "did:example:123456789abcdefg",
                "publicKey": "did:example:123456789abcdefg#keys-2"
        },
        "proof": {
                "type": "Ed25519Signature2018",
                "created": "2018-01-01T21:19:10Z",
                "creator": "did:example:123456789abcdefg#keys-2",
                "nonce": "c0ae1c8e-c7e7-469f-b252-86e6a0e7387e",
                "signatureValue": "..."
        }
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```

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```

Relation to OIDC, WebAuthn

OIDC + DID

- Self-Issued OpenID Provider
- Discover OIDC endpoint from DID

```
{
   "@context": "https://w3id.org/did/v1",
   "id": "did:example:123456789abcdefg",
   "service": [{
      "id": "did:example:123456789abcdefg;openid",
      "type": "OpenIdConnectVersion1.0Service",
      "serviceEndpoint": "https://openid.example.com/"
   }]
}
```

WebAuthn + DID

- Registration

  `Register(Account, Origin)`

- Registration Response (without DID)

  `RegisterResponse(`**`PublicKeyCredential`**`, Attestation, Origin)`

- Registration Response (with DID)

  `RegisterResponse(`**`DIDCredential`**`, Attestation, Origin)`

And more! DID-TLS, DID-HTTP-Signatures, DID-PGP, DID-SSH

For the Workshop

- Come up with a list of core DID Auth principles
  1) The identifier that is being authenticated is a DID.
  2) All elements of the DID Document can change, the DID stays the same.
  3) DID Resolution is performed to discover how to authenticate the DID.
  4) ... more?

- **Workshop Question #1:** Relation to OIDC, FIDO, WebAuthn?
- **Workshop Question #2:** Relation to VC exchange protocols?

Community Resources

- **W3C Credentials Community Group**
  https://www.w3.org/community/credentials/
- **Decentralized Identity Foundation**
  http://identity.foundation/
- **Rebooting-the-Web-of-Trust**
  http://www.weboftrust.info/
- **Internet Identity Workshop**
  http://internetidentityworkshop.com/

Thank You

- **Markus Sabadello**
- Danube Tech
  https://danubetech.com/
- markus@danubetech.com

The Internet Identity Workshop

W3C Credentials Community Group

Rebooting the Web of Trust

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Backup Slides

Verifiable Credentials

DKMS, DID Auth

Hubs, Agents, XDI

Yadis, XRI, XRD, XRDS,
JRD, Webfinger

W3C Web Payments CG

OASIS XDI TC

DIDs: W3C Credentials CG
v0.11 Draft Community Report

DIDs: W3C DID WG
Charter now being written

Rebooting-the-Web-of-Trust
Internet Identity Workshop

DID registered
prov. URI scheme

DID method specs

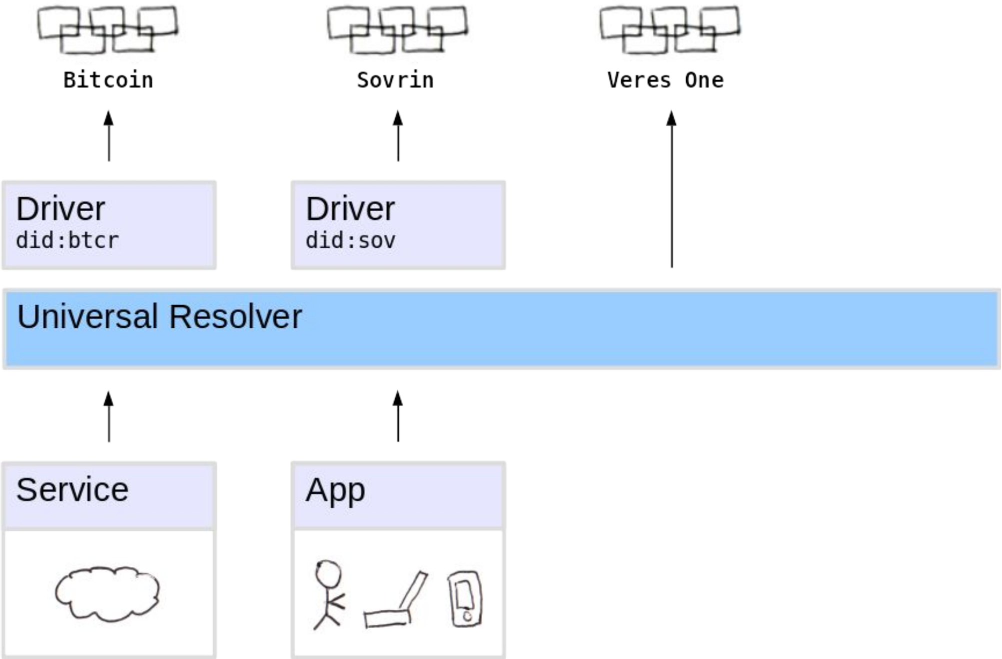
W3C JSON-LD 1.1

W3C Cryptographic Suites

RFC 7517: JWK

DID Universal Resolver

- Looks up ("resolves") DID to its DID Document.
- Provides a universal API that works with all DID methods.
- Uses a set of configurable "drivers" that know how to connect to the target system.
- **https://uniresolver.io/**



Bitcoin
Sovrin
Veres One
Driver
did:btcr
Driver
did:sov
Universal Resolver
Service
App