DID-based Auth Protocols

Vurucu ve Akillica Alt Başlık

Abdulhamit Kumru

Blokzincir Laboratuvarı

2020

Nelerden bahsedecegiz

DID Core

- w3c DID Spec
- DID-common-java

DID Auth

- DID TLS (Agust 2017) *unresolved*
- RWOT 2018 DID Auth (March 2018)
- indt_auth
- did-auth-jose (October 2018, ietf, dif) *archived sept 22*
  - Javascript Object Signing and Encryption (jwt, jws, jwe, jwa)
- DID SIOP *identity.foundation/did-siop*
  - Javascript Object Signing and Encryption (jwt, jws, jwe, jwa)
  - Current Focus

Nelerden bahsedecegiz

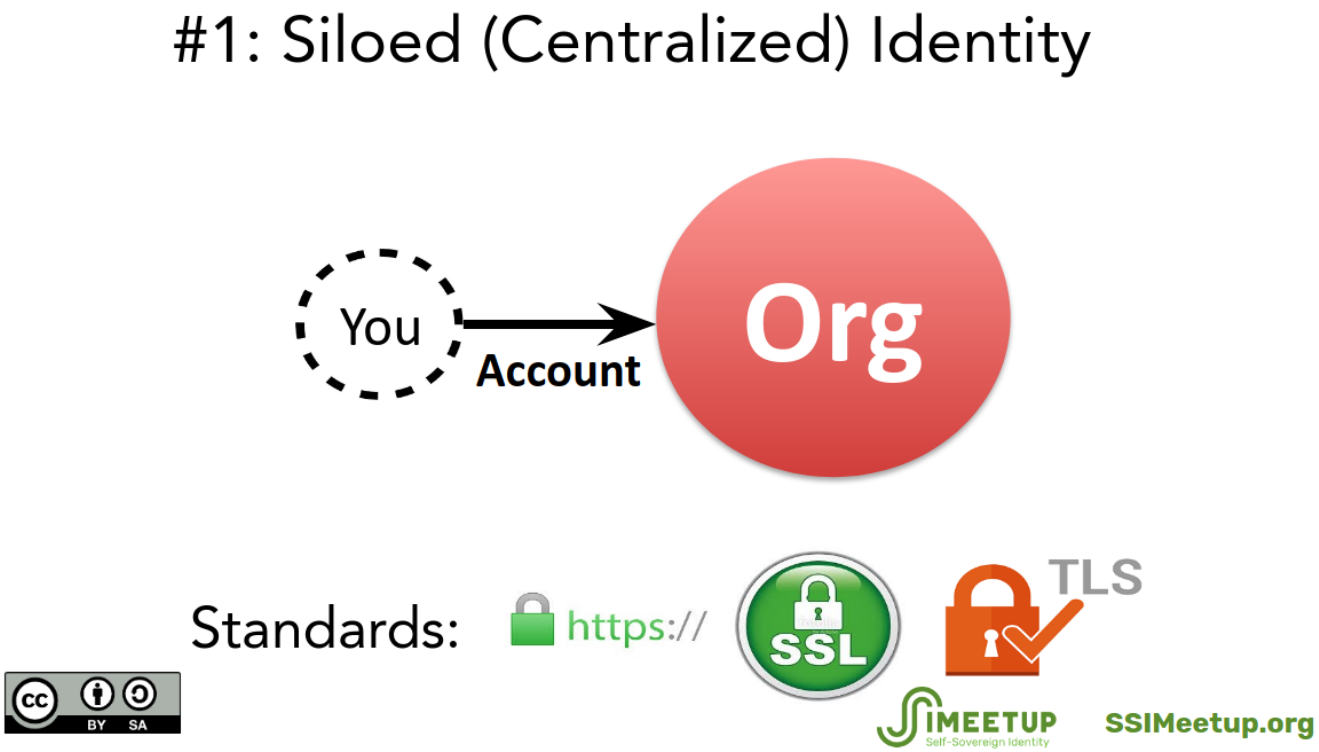
Auth Protocols & DID Auth

- web auth kisa
- single sign on
- single sign on ile basic auth farki
- Hali Hazirdaki Protokoller Yapilar
  - SAML
  - CAS
  - OpenID Connect
- karsilasitirilmalari
- Self-Issued OpenID Connect Provider DID Profile (did-siop, DIF)
- DID SAML ?
- DID CAS ?
- DID Authentication in PAM ?

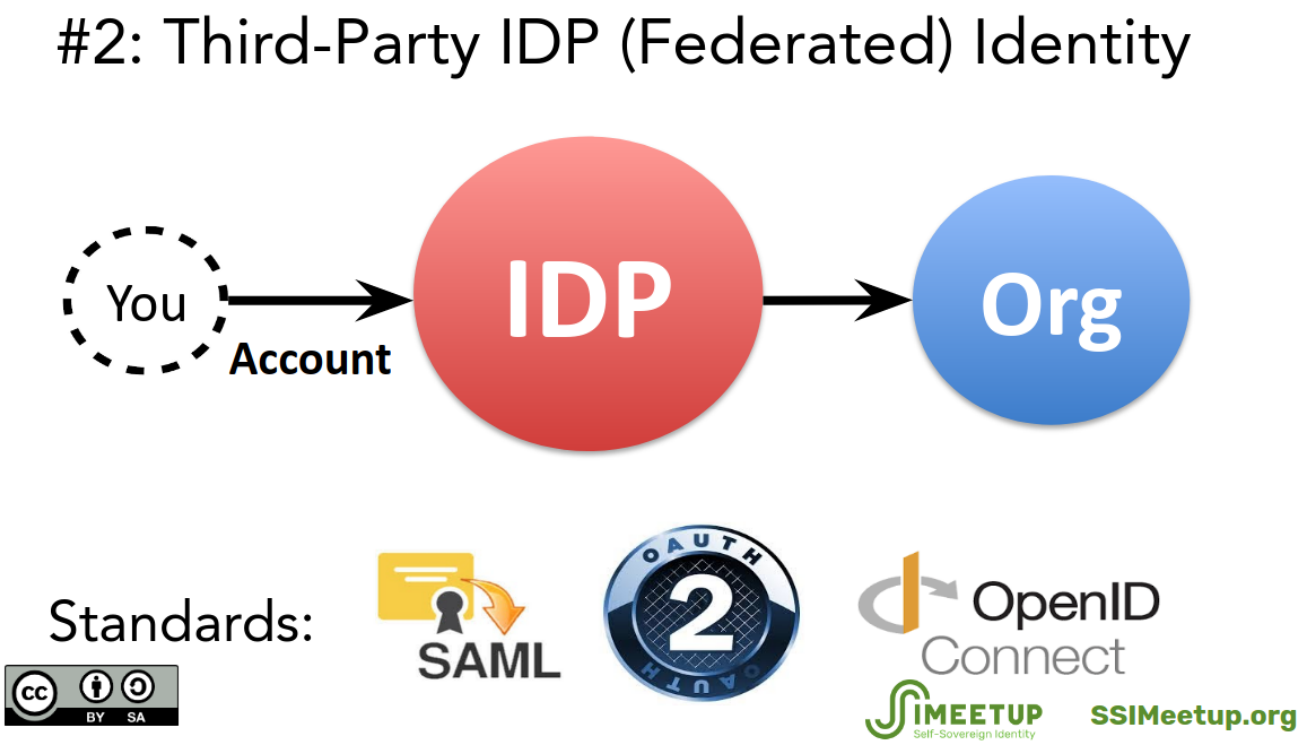
Giris Slayti

!!! gereginden fazla degindigim yerler olabilir !!! giris slayti
!!! ikna edici bir giris hazirla
!!! did in argumanlarini daha belirgin yap
!!! aktif gelistirilen did methodlarindan bahset !!! oncesi 15 daki !!! Authentication a kadar hizli gec !!! json ld yi iyi anla, sunumda bahset !!! kimlik yontemlerini ozetleyen gorselleri ekle !!! didlerin kendini ispat mekanizmalari !!! kurumlardan bahset (w3c, dif, ietf, hypledger(linux fond.)) !!! her specteci her MUSTi kullanmadim !!! bunu nereye eklemeli https://w3c.github.io/did-spec-registries/ !!! her slaytin en az 30 saniye konusulacak materyali olmali !!! gorsel az kaldi gorsel eklemeye calis

Centralised ID

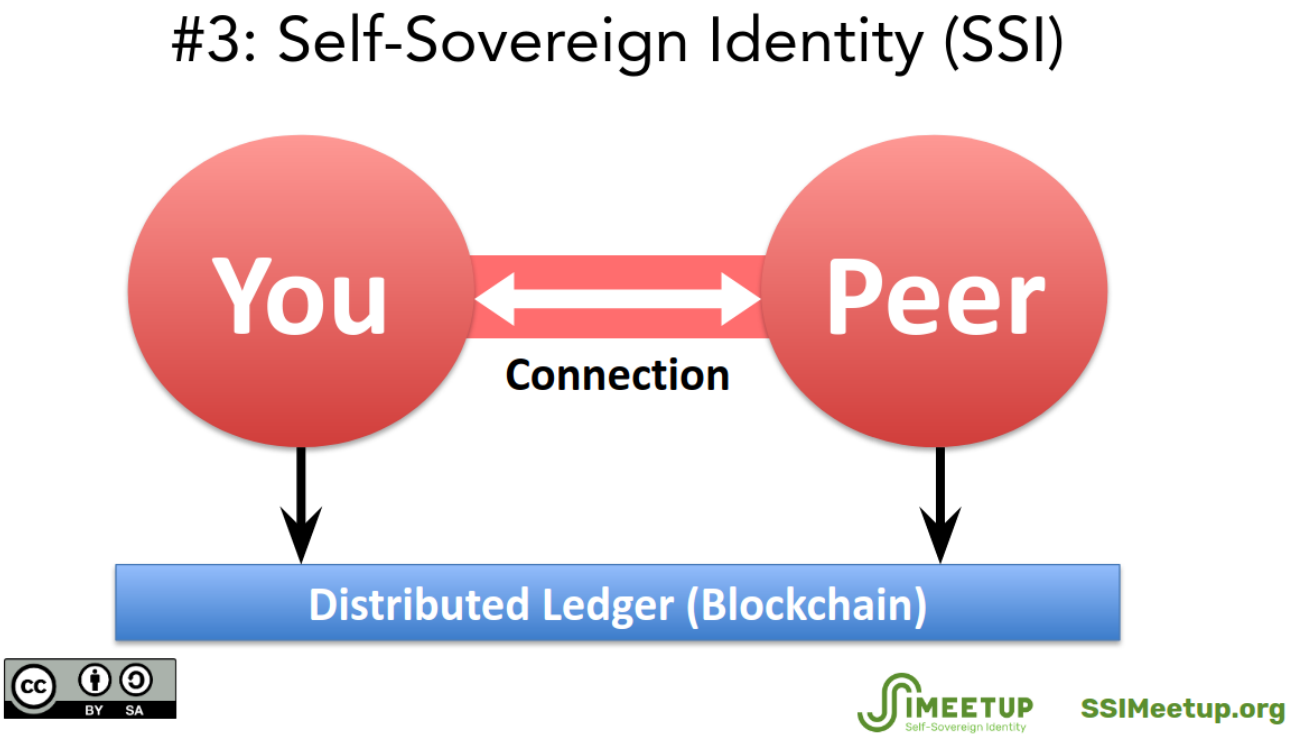


Federated ID



Self-Sovereign Identity (SSI)

!!! not: ssi did baglantisi acikla, notlarini al !!! kisaca SSI ya degin



DID Core

!!! DID Core giris slayti !!! bu spec hakkinda genel bilgiler

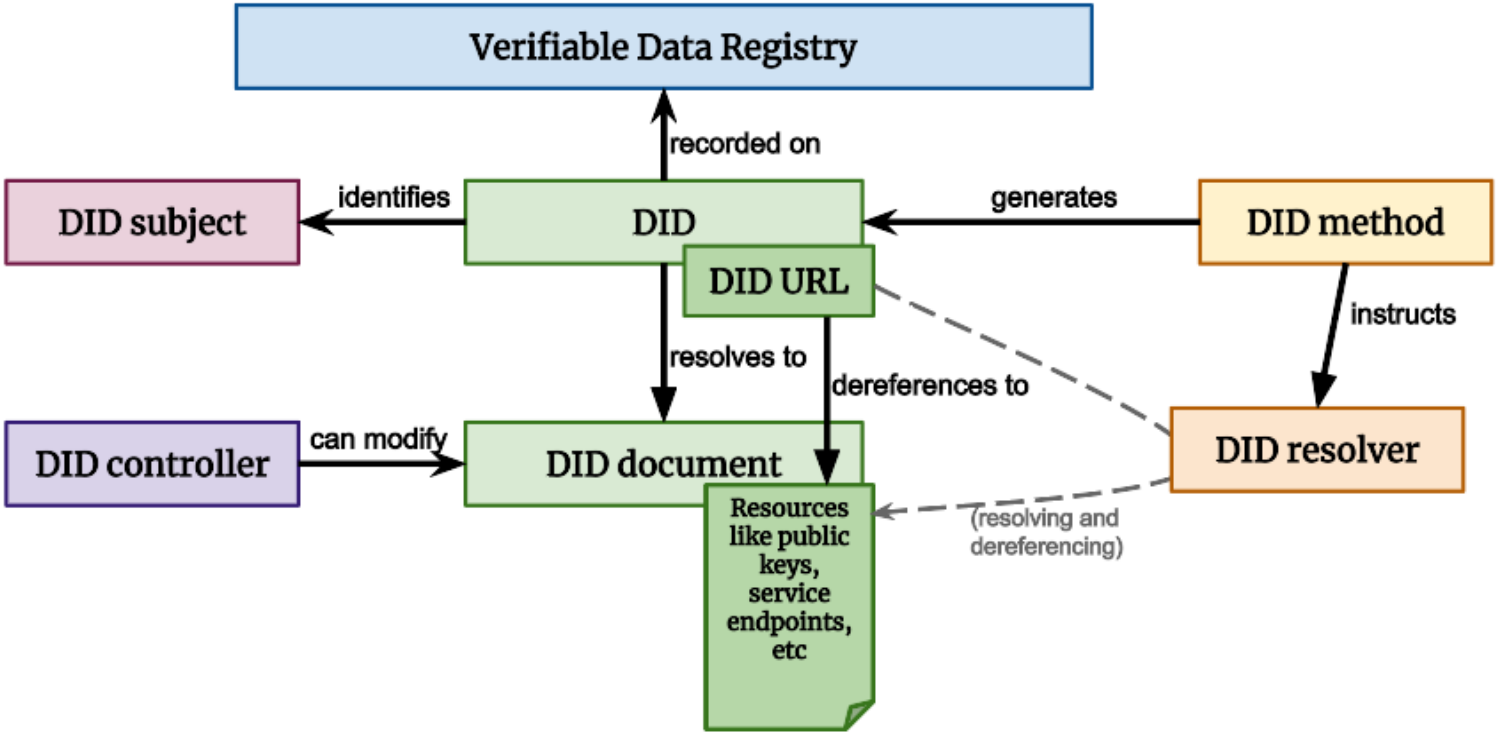
Four Core Properities of DID

!!! notlar ve bura uzerinde biraz dur

1. **A permanent (persistent) identifier**
   It never needs to change
2. **A resolvable identifier**
   You can look it up to discover metadata
3. **A cryptographically-verifiable identifier**
   You can prove control using cryptography
4. **A decentralized identifier**
   No centralized registration authority is required

Architecture Overview

!!! not: bu neyi cozuyor, strongly biding . . . detay ekle, strongly binding identifier and allows key rotation



DIDs and DID URLs

Architecture Overwiew

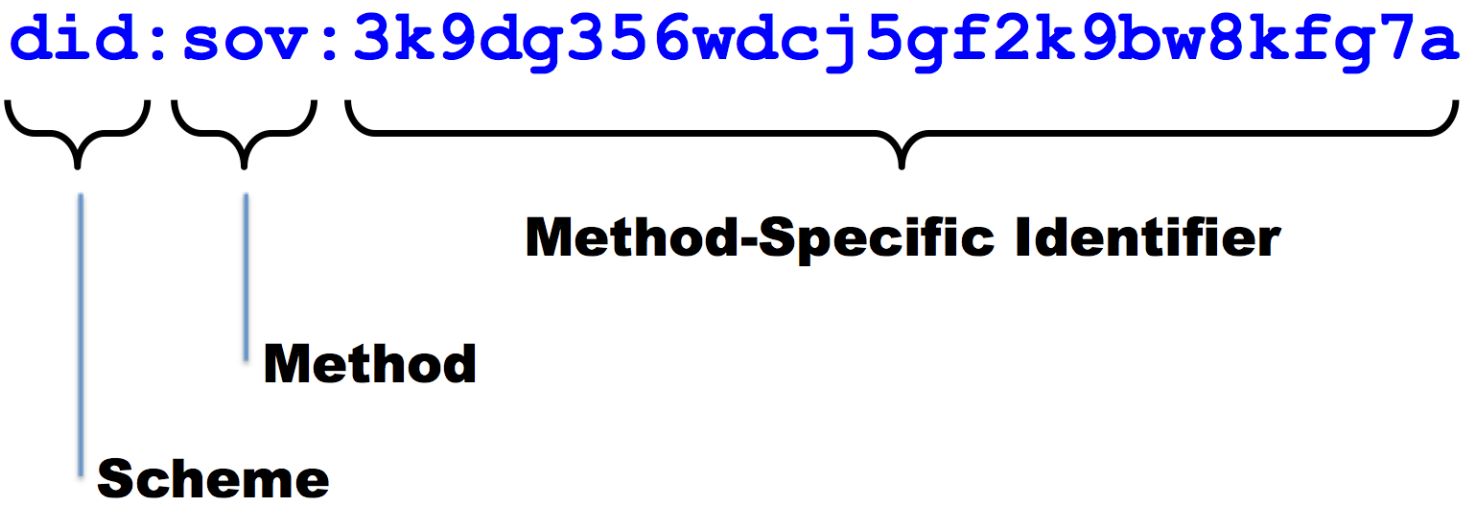
!!! not: query ye detayli deginecegiz

A DID, or Decentralized Identifier, is a URI composed of three parts: ***the scheme*** "did:", a ***method identifier***, and a unique, ***method-specific identifier*** generated by the DID method.

DIDs are resolvable to DID documents. A DID URL extends the syntax of a basic DID to incorporate other standard URI components (path, query, fragment) in order to locate a particular resource.

DID Format

Architecture Overwiew



DID Subjects

Architecture Overwiew

!!! gorsel ekle ?

The subject of a DID is, by definition, the entity identified by the DID. The DID subject may also be the DID controller. Anything can be the subject of a DID: person, group, organization, physical thing, logical thing, etc.

DID Controllers

Architecture Overwiew

!!! kisalt
!!! gorsel ekle ?

The controller of a DID is the entity (person, organization, or autonomous software) that has the capability—as defined by a DID method—to make changes to a DID document. This capability is typically asserted by the control of a set of cryptographic keys used by software acting on behalf of the controller, though it may also be asserted via other mechanisms. Note that a DID may have more than one controller, and the DID subject can be the DID controller, or one of them.

Verifiable Data Registries

Architecture Overwiew

!!! kisalt
!!! gorsel ekle ?
!!! ornekler ekle

In order to be resolvable to DID documents, DIDs are typically recorded on an underlying system or network of some kind. Regardless of the specific technology used, any such system that supports recording DIDs and returning data necessary to produce DID documents is called a verifiable data registry. Examples include distributed ledgers, decentralized file systems, databases of any kind, peer-to-peer networks, and other forms of trusted data storage.

DID documents

Architecture Overwiew

DID documents contain metadata associated with a DID. They typically express verification methods (such as public keys) and services relevant to interactions with the DID subject.

Minimal Self-managed DID document Example

```
{
  "@context": "https://www.w3.org/ns/did/v1",
  "id": "did:example:123456789abcdefghi",
  "authentication": [{
    "id": "did:example:123456789abcdefghi#keys-1",
    "type": "Ed25519VerificationKey2018",
    "controller": "did:example:123456789abcdefghi",
    "publicKeyBase58": "H3C2AVvLMv6gmMNam3uVAjZpfkcJCw..."
  }],
  "service": [{
    "id":"did:example:123456789abcdefghi#vcs",
    "type": "VerifiableCredentialService",
    "serviceEndpoint": "https://example.com/vc/"
  }]
}
```

DID Methods

Architecture Overwiew

DID methods are the mechanism by which a particular type of DID and its associated DID document are created, resolved, updated, and deactivated using a particular verifiable data registry. DID methods are defined using separate DID method specifications.

DID resolvers and DID resolution

Architecture Overwiew

!!! not: detayli spec linkte, burda did res. in detayina girmeyecegiz

A DID resolver is a software and/or hardware component that takes a DID (and associated input metadata) as input and produces a conforming DID document (and associated metadata) as output. This process is called DID resolution.

detailed spec w3c-ccg.github.io/did-resolution/

DID Resolve Example

!!! gecis

```
did:example:1234;version-id=4#keys-1 # resolves to
```

```
{
  "@context": "https://www.w3.org/ns/did/v1",
  "id": "did:example:123456789abcdefghi#keys-1",
  "type": "RsaVerificationKey2018",
  "publicKeyPem": "-----BEGIN PUB...0101010..END PUB -----\r\n"
}
```

Identifier

!!! identifier giris slayti !!! cevir

did ve did urllerinin syntaxini inceleyecegiz, generic terimi burda tanimlanan syntaxin diger did methodlarinda tanimlanabilecek syntaxlardan ayirtd edilmek amaciyla kullanildi

This section describes the formal syntax for DIDs and DID URLs. The term "generic" is used to differentiate the syntax defined here from syntax defined by specific DID methods in their respective specifications.

DID Syntax

!!! not: buradaki notu not al

- The generic DID scheme is a URI scheme conformant with [RFC3988].
- The DID scheme and method name **MUST** be an ASCII lowercase string.

```
# Ethr-DID
did:ethr:0xb9c5714089478a327f09197987f16f9e5d936e8a
```

A DID is expected to be persistent and immutable. That is, a DID is bound exclusively and permanently to its one and only subject. Even after a DID is deactivated, it is intended that it never be repurposed.

DID URL Syntax


```
did-url = did path-abempty [ "?" query ] [ "#" fragment ]
```

DID Parameters

DID URL Syntax

The DID URL syntax supports a simple format for parameters based on the query component. Adding a DID parameter to a DID URL means that the parameter becomes part of the identifier for a resource.

DID Parameters

DID URL Syntax

Relative Reference

A relative URI reference according to RFC3986 Section 4.2 that identifies a resource at a service endpoint, which is selected from a DID document by using the service parameter. Support for this parameter is **REQUIERED**

Relative Reference Example

DID URL Syntax

```
{
  "@context": "https://www.w3.org/ns/did/v1",
  "id": "did:example:1234",
  "verificationMethod": [{
    "id": "did:example:1234#key-1",
    "type": "Ed25519VerificationKey2018",
    "controller": "did:example:1234",
    "publicKeyBase58": "H3C2AVvLMv6gmMNam3uVAjZpfkcJCwDwn..."
  }, ...],
  "authentication": [
    // relative DID URL to `did:example:1234#key-1
    "#key-1"
  ]
}
```

DID Parameters

DID URL Syntax

service parameter

Identifies a service from the DID document by service ID. Support for this parameter is **REQUIRED**

`did:foo:21tDAKCERh95uGgKbJNHYp?service=agent`

DID Parameters

DID URL Syntax

version-id parameter

Identifies a specific version of a DID document to be resolved (the version ID could be sequential, or a UUID, or method-specific). Support for this parameter is **OPTIONAL**

DID Parameters

DID URL Syntax

version-time parameter

Identifies a certain version timestamp of a DID document to be resolved. Support for this parameter is **OPTIONAL**

`did:foo:21tDKJNHYp?version-time=2002-10-10T17:00:00Z`

DID Parameters

DID URL Syntax

!!! not: iyi bir ozellik ama mekanizmasini tam olarak anlayamadim

hl patameter

A resource hash of the DID document to add integrity protection, as specified in Hashlink RFC. This parameter is *non-normative*

```
 url encoded hash link
hl:zm9YZpCjPLPJ4Epc:z3TSgXTuaHxY2ts...7DYuQ9QTPQyLHy
```

DID URL Syntax

Path

A DID path is identical to a generic URI path

`did:example:123456/path`

Query

A DID query is derived from a generic URI query and **MUST** conform to DID URL Syntax rules.

If a DID query is present, it **MUST** be used with DID Parameters.

`did:example:123456?query=true`

DID URL Syntax

Fragment

A DID fragment is used as method-independent reference into a DID document or external resource. DID fragment syntax and semantics are identical to a generic URI fragment and **MUST** conform to RFC 3986

```
did:example:123#agent # service endpoint
did:example:123#public-key-0 # verification method
```

Relative DID URLs

!!! buraya biraz daha bak !!! ornegine deginmistik

A relative DID URL is any URL value in a DID document that does not start with `did:<method-name>:<method-specific-id>`.

```
// ... relative DID URL to `did:example:1234#key-1`
"authentication": [ "#key-1" ]
// ...
```

Example DID URLs

!!! gecis !!! not: did url ye degin

```
# A DID URL with a 'service' DID parameter
did:foo:21tDAKCERh95uGgKbJNHYp?service=agent
# A DID URL with a 'version-time' DID parameter
did:foo:21tD...gKbJNHYp?version-time=2002-10-10T17:00:00Z

did:example:1234/
did:example:1234#keys-1
did:example:1234;version-id=4#keys-1
did:example:1234/my/path?query#fragment
did:example:1234;service=hub/my/path?query#fragment
```

Core Properties

!!! core prop giris slayti !!! hepsini anlatmaya gerek yok

- id
- authentication
- controller
- service
- verificationMethod
- assertionMethod
- keyAgreement
- capabilityDelegation
- capabilityInvocation

id Property

DID Subject

The DID subject is denoted with the ***id*** property at the top level of a DID document.

- The DID subject is the entity that the DID document is about
- DID documents **MUST** include the id property at the top level.

```
{
  "id": "did:example:21tDAKCERh95uGgKbJNHYp"
}
```

alsoKnownAs

- A DID subject can have *multiple identifiers* for different purposes, or at different times.
- The assertion that two or more DIDs (or other types of URI) identify the same DID subject can be made using the ***alsoKnownAs*** property.

Control

!!! not: did doc may have controller, illa controller olacak diye birsey yok
!!! not: no longer has access to their keys, or key compromise, where the DID controller's trusted third parties need to override malicious activity by an attacker. bunu anla

Authorization is the mechanism used to state how operations are performed on ***behalf*** of the DID subject. ***A DID controller is authorized*** to make changes to the respective DID document.

Note: Authorization vs Authentication !

DID Document With a Controller Property

```
{
  "@context": "https://www.w3.org/ns/did/v1",
  "id": "did:example:123456789abcdefghi",
  "controller": "did:example:bcehfew7h32f32h7af3",
  "service": [{

    "type": "VerifiableCredentialService",
    "serviceEndpoint": "https://example.com/vc/"
  }]
}
```

Verification Methods

!!! not: did controller vs verification method anla not al !!! not: A DID document MAY include a verificationMethod property. !!! not: cok detayli, her detaya gerek yok

A DID document can express verification methods, such as cryptographic keys, which can be used to authenticate or authorize interactions with the DID subject or associated parties. A DID document MAY include a verificationMethod property.

- The information expressed often includes globally unambiguous identifiers and public key material, which can be used to verify digital signatures.
- Verification methods might take many parameters. An example of this is a set of five cryptographic keys from which any three are required to contribute to a threshold signature.
- In order to maximize interoperability, support for public keys as verification methods is restricted

verificationMethod Property

Verification Methods

!!! not: cok detayli, her detaya gerek olmayabilir !!! not: notu not al,

- The properties **MUST** include the ***id, type, controller, and specific verification method properties*** , and MAY include additional properties.
- The value of the ***id*** property for a verification method **MUST be a URI**.

Note: Verification method controller(s) and DID controller(s)

As well as the ***verificationMethod*** property, verification methods can be embedded in or referenced from properties associated with various verification relationships

Embedding and referencing verification methods

```
{ ...  "authentication": [
  // this key is referenced
  it may be used with more than one verification relationship
  "did:example:123456789abcdefghi#keys-1",
  // this key is embedded
  and may *only* be used for authentication
  {
    "id": "did:example:123456789abcdefghi#keys-2",
    "type": "Ed25519VerificationKey2018",
    "controller": "did:example:123456789abcdefghi",
    "publicKeyBase58": "H3C2AV...z3wXmqPV"
  }
], ... }
```

Key types and formats

Verification Methods

!!! not: burada bircok issue var onlari not al

Key Type (type value)	Support
RSA (`RsaVerificationKey2018`)	RSA public key values *MUST* be encoded as a JWK [RFC7517] using the `publicKeyJwk` property.
ed25519 (`Ed25519VerificationKey2018`)	Ed25519 public key values *MUST* either be encoded as a JWK [RFC7517] using the `publicKeyJwk` or be encoded as the raw 32-byte public key value in Base58 Bitcoin format [BASE58] using the `publicKeyBase58` property.
secp256k1	Secp256k1 public key values *MUST* either be encoded as a JWK [RFC7517] using the `publicKeyJwk` or be encoded as the raw 33-byte public key value in Base58 Bitcoin format [BASE58] using the `publicKeyBase58` property.
Curve25519 (`X25519KeyAgreementKey2019`)	Curve25519 (also known as X25519) public key values *MUST* either be encoded as a JWK [RFC7517] using the `publicKeyJwk` or be encoded as the raw 32-byte public key value in Base58 Bitcoin format [BASE58] using the `publicKeyBase58` property.
JWK (`JsonWebKey2020`)	Key types listed in JOSE, represented using [RFC7517] using the `publicKeyJwk` property.

Verification Relationships

!!! not: detaylarini not al

A verification relationship expresses the relationship between the DID subject and a verification method.

Different verification relationships enable the associated verification methods to be used for different purposes

Verification Relationships

Authentication

!!! not: note u al, alt basliklarin detaylarini not al

The ***authentication*** verification relationship is used to specify how the DID subject is expected to be authenticated, such as for the purposes of logging into a website

Assertion

The ***assertionMethod*** verification relationship is used to specify how the DID subject is expected to express claims, such as for the purposes of issuing a Verifiable Credential

Key Agreement

The ***keyAgreement*** verification relationship is used to specify how to encrypt information to the DID subject, such as for the purposes of establishing a secure communication channel with the recipient

Verification Relationships

Capacity Invocation

The ***capabilityInvocation*** verification relationship is used to specify a mechanism that might be used by the DID subject to invoke a cryptographic capability, such as the authorization to access an HTTP API

Capacity Delegation

The ***capabilityDelegation*** verification relationship is used to specify a mechanism that might be used by the DID subject to delegate a cryptographic capability to another party, such as delegating the authority to access a specific HTTP API to a subordinate

Service Endpoints

!!! not: detaylari not al

Service endpoints are used in DID documents to express ways of communicating with the DID subject or associated entities. Services listed in the DID document can contain information about privacy preserving messaging services, or more public information, such as social media accounts, personal websites, and email addresses although this is discouraged

One of the primary purposes of a DID document is to enable discovery of service endpoints. A service endpoint can be any type of service the DID subject wants to advertise, including decentralized identity management services for further discovery, authentication, authorization, or interaction

Various service endpoints

```
{ // ...
  "service": [{
    "id": "did:example:123456789abcdefghi#openid",
    "type": "OpenIdConnectVersion1.0Service",
    "serviceEndpoint": "https://openid.example.com/"
  }, {
    "id": "did:example:123456789abcdefghi#vcr",
    "type": "CredentialRepositoryService",
    "serviceEndpoint": "https://repository.example.com/service/8
  }, {
    "id": "did:example:123456789abcdefghi#xdi",
    "type": "XdiService",
    "serviceEndpoint": "https://xdi.example.com/8377464"
  }]
// ... }
```

Core Representations

!!! kisa gec
!!! yeniden duzenle

All concrete representations of a DID document are serialized using a deterministic mapping that is able to be unambiguously parsed into the data model defined in this specification

Producers MUST indicate which representation of a document has been used via a media type in the document's metadata. Consumers MUST determine the representation of a DID document via the content-type DID resolver metadata field (see § 8.1 DID Resolution), not through the content of the DID document alone.

- JSON
- JSON-LD
- Concise Binary Object Representation (CBOR)

Methods

!!! not: Because there is no central authority for allocating or approving DID method names, there is no way to know for certain if a specific DID method name is unique
!!! not: The authors of a new DID method specification SHOULD use a method name that is unique among all DID method names known to them at the time of publication.

DID methods provide the means to implement did core specification on different *verifiable data registries*.

- The DID method specification **MUST** specify how to generate the *method-specific-id* component of a DID.
- The *method-specific-id* value **MUST** be able to be generated without the use of a centralized registry service.
- Each DID method **MUST** define how authorization is implemented, including any necessary cryptographic operations.

Method Operations

!!! not: not al

Create

The DID method specification **MUST** specify how a DID controller creates a DID and its associated DID document on the verifiable data registry, including all cryptographic operations necessary to establish proof of control.

Read/Verify

The DID method specification **MUST** specify how a DID resolver uses a DID to request a DID document from the verifiable data registry, including how the DID resolver can verify the authenticity of the response.

Method Operations

!!! not: not al

Update

The DID method specification **MUST** specify how a DID controller can update a DID document on the verifiable data registry, including all cryptographic operations necessary to establish proof of control, or state that updates are not possible

Deactivate

The DID method specification **MUST** specify how a DID controller can deactivate a DID on the verifiable data registry, including all cryptographic operations necessary to establish proof of deactivation, or state that deactivation is not possible.
Note: Check Out Method Security & Privacy Requirements

Resolution

!!! giris !!! not: kesin implementasyon did core specinin disnda bundan dolayi cok detaya girmeyecegim !!! gorsel ekle

DID Resolution

!!! not: detaylari not al The DID resolution functions resolve a DID into a DID document by using the "Read" operation of the applicable DID method.

```
resolve ( did, did-resolution-input-metadata )
     -> ( did-resolution-metadata, did-document,
     did-document-metadata )
```

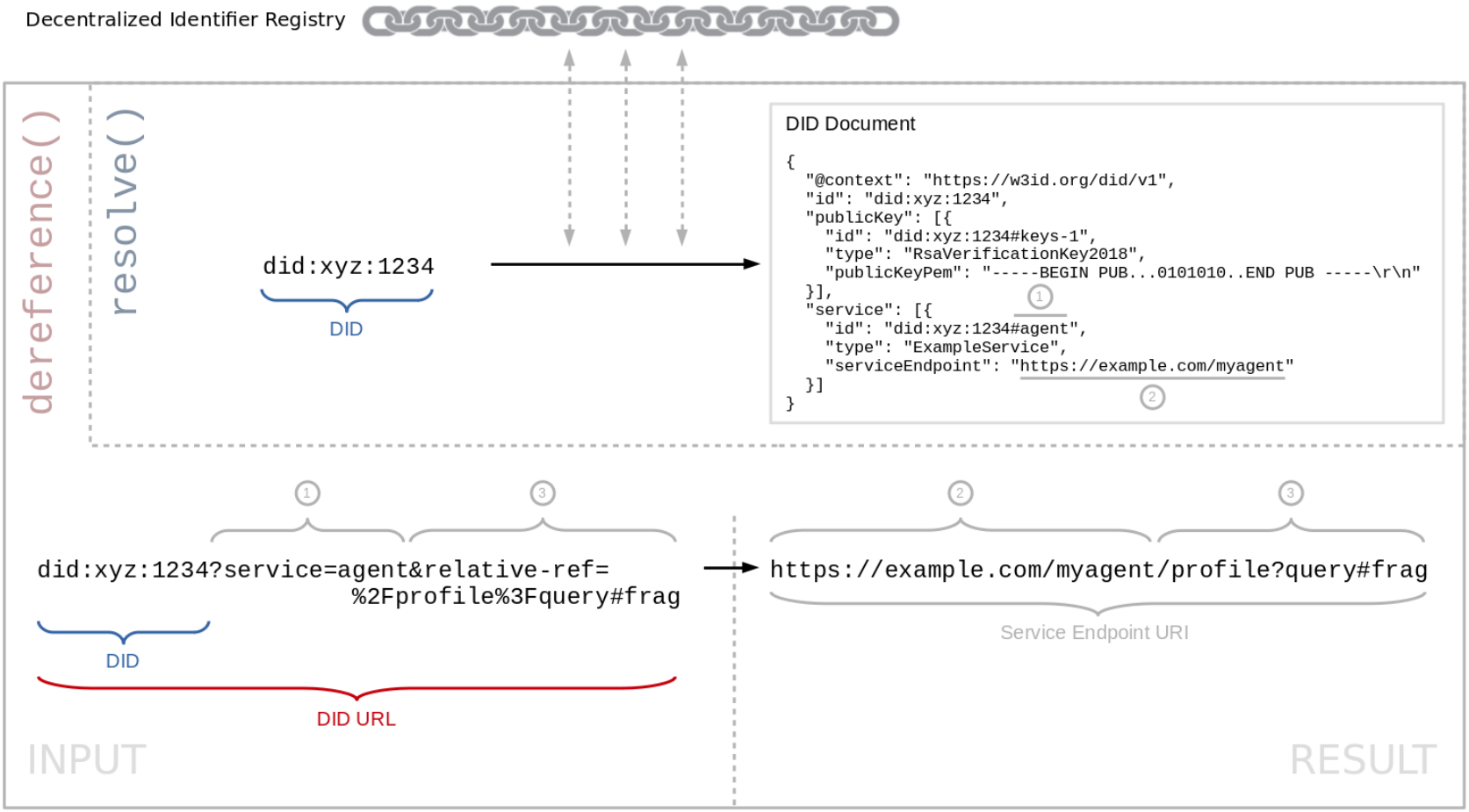
DID URL Dereferencing

!!! not: detaylari not al

The DID URL dereferencing function dereferences a DID URL into a resource with contents depending on the DID URL's components, including the DID method, method-specific identifier, path, query, and fragment

```
dereference ( did-url, did-url-dereferencing-input-metadata )
          -> ( did-url-dereferencing-metadata,
          content-stream, content-metadata )
```

DID URL Dereferencing



Software / Repos

- dif/did-common-java

DID Auth Development

- DID TLS (Agust 2017) *unresolved*
  - TLS mutual Auth with DIDs
- RWOT 6 DID Auth (March 2018)
  - Introduction to DID Auth

DID Auth Development

- did-auth-jose (October 2018, ietf, dif) *archived sept 22*
- DID SIOP (Sep 12, 2019, dif) *Current focus*
  - successor of did-auth-jose
- DID Authentication WG (Jan 14 2020)

DID TLS (Agust 2017, Hyperledger) *unresolved*

!!! not: detaylari not al
DID TLS feature proposed as indy SDK feature.

- Using chain anchored keys to facilitate mutual authentication via TLS.
- Extends the TLS SNI Specification and provides additional methods for certificate validation that does not rely on established Root Certificate Authorities.

Links

- github.com/TelegramSam/DID-TLS
- jira.hyperledger.org/browse/IS-268

DID TLS (Agust 2017, Hyperledger) *unresolved*

Issues

!!! not: detaylari not al

- Setting custom SNI hint from client
- Inability to disable client certificate validation
- Lack of certificate validation callbacks

Future Work

- OpenSSL: Allow non-validated client certificates. (removes signer tls sni hint requirement.)
- OpenSSL: Add support for newer elliptic curve certificates.
- SNI Spec: Updated to use different server_type than HostName
- HTTP Libraries: Easier methods to specify SNI hint.

DID TLS (Agust 2017, Hyperledger) *unresolved*

!!! not: suanki auth calismalarinin yonunden bahset

- Current Agent2Agent communication in Aries Cloud Agent is Inbound and Outbound TCP ports with *DIDcomm*
- DIF Auth WG Open is currently focused on developing DID OpenID Connect Provider (did-siop)

Rebooting Web-of-Trust (RWoT) 6 DID Auth

!!! not: bu specte sonlara dogru did siop a goz kirpmalar basliyor

Core idea: providing control of a did

- Definition of DID Auth term
- DID Auth defines data formats and challenge and response transports allowing an identity owner to prove control of a DID to a relying party

DID Authn and Verifiable Credentials

RWoT 6 DID Auth

!!! yerini ayarla
!!! not: detaylari not al, did auth paperinda
!!! did auth vs verifiable credentials nuanslarina degin

- DID Auth and Verifiable Credentials exchange are separate.
- Verifiable Credentials exchange is an extension to (or part of) DID Auth.
- DID Auth is a certain kind of Verifiable Credential. bunu tamamla

Authentication of a DID

RWoT 6 DID Auth

Authentication of a DID

Similar to other authentication methods, DID Auth relies on a challenge-response cycle in which a relying party authenticates the DID of an identity owner.

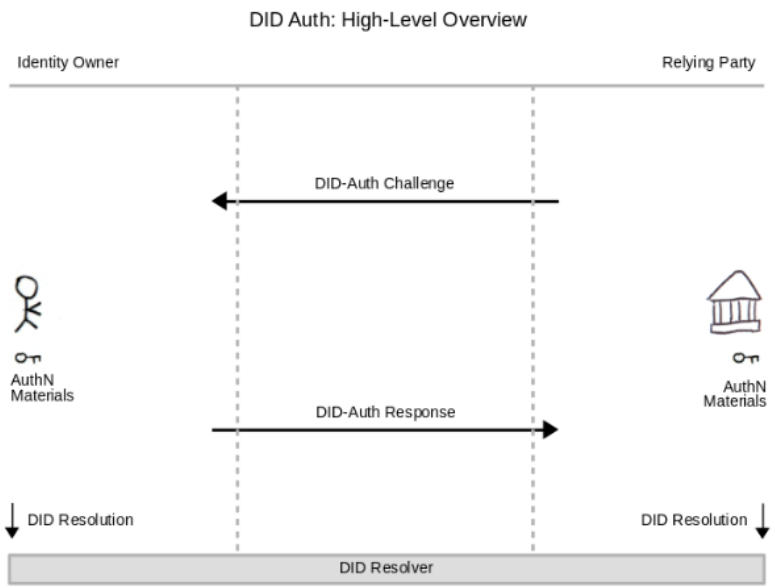
Challenge

The way an identity owner or their agent encounters an authentication challenge, as well as the format of the challenge, will vary depending on the situation. For example, they can come across a "Sign in with DID Auth" button or a QR code on a website

Generic DID Auth Architecture

!!! not: bu auth arch bircok farkli yerde uygulanabilir, ornek olarak . . .

Introduction to DID Auth



DANUBE TECH GMBH

SIMEETUP Self-Sovereign Identity

SSIMeetup.org

Javascript Object Signing and Encryption (JOSE)

!!! not: jose den kisaca bahsetmek lazim diduth ve sonraki yerlerde siklikla kullaniliyor, bahsedecegiz.

- Used in DID Auth and DID SIOP
- Adapted in many similar area

JSON Web Algorithms (JWA)

JWA specification registers cryptographic algorithms and identifiers to be used with the JSON Web Signature (JWS), JSON Web Encryption (JWE), and JSON Web Key (JWK) specifications

JSON Web Signature (JWS)

JSON Web Signature (JWS) represents content secured with digital signatures or Message Authentication Codes (MACs) using JSON-based data structures

Javascript Object Signing and Encryption (JOSE)

JSON Web Encryption (JWE)

JSON Web Encryption (JWE) represents encrypted content using JSON-based data structures

JSON Web Key (JWK)

A JSON Web Key (JWK) is a JavaScript Object Notation (JSON) data structure that represents a cryptographic key

JSON Web Token (JWT)

JSON Web Token (JWT) is a compact, URL-safe means of representing claims to be transferred between two parties.

Javascript Object Signing and Encryption (JOSE)

JWT + JOSE Overview

- JavaScript Object Signing and Encryption (JOSE)
  - JSON Web Signature (JWS)
    - A way of representing content secured with a digital signature or MAC using JSON data structures and base64url encoding
  - JSON Web Encryption (JWE)
    - Like JWS but for encrypting content
  - JSON Web Key (JWK)
    - JSON data structures representing cryptographic keys
  - JSON Web Algorithms
    - Defines the use cryptographic algorithms and identifiers for JWS, JWE and JWK
- JSON Web Token (JWT)
  - A compact URL-safe means of representing claims/attributes to be transferred between two parties
  - A JWT is a JWS and/or a JWE with JSON claims as the

DID Authn Challenge

RWoT 6 DID Auth

JWT challenge example, uPort

```
{ "typ": "JWT", "alg": "ES256K" }
{
  "iss": "2oeXufHGDpU51bfKBsZDdu7Je9weJ3r7sVG",
  "iat": 1525865398,
  "requested": [
    "name", // ...
  ],
  "permissions": [ "notifications" ],
  "callback": "https://.../api/v1/topic/Go...Bft7PZ9",
  "exp": 1525865998,
}
```

Challenge Transports

RWoT 6 DID Auth

!!! not: detaylari not al

A DID Auth challenge may be delivered by a relying party to an identity owner in different ways. DID Auth defines a few common ways that this can be done.

- DID Auth Service Endpoint
- Custom Protocol Handler
- Mobile Deep Link
- Custom Protocol Handler
- Invoke User Agent's JavaScript API
- Form Redirect
- Device-to-device Communication

DID Authn Challenge

RWoT 6 DID Auth

!!! not: challange illa jwt olmak zorunda degil

JWT challenge resoponse example

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

Response Transports

RWoT 6 DID Auth

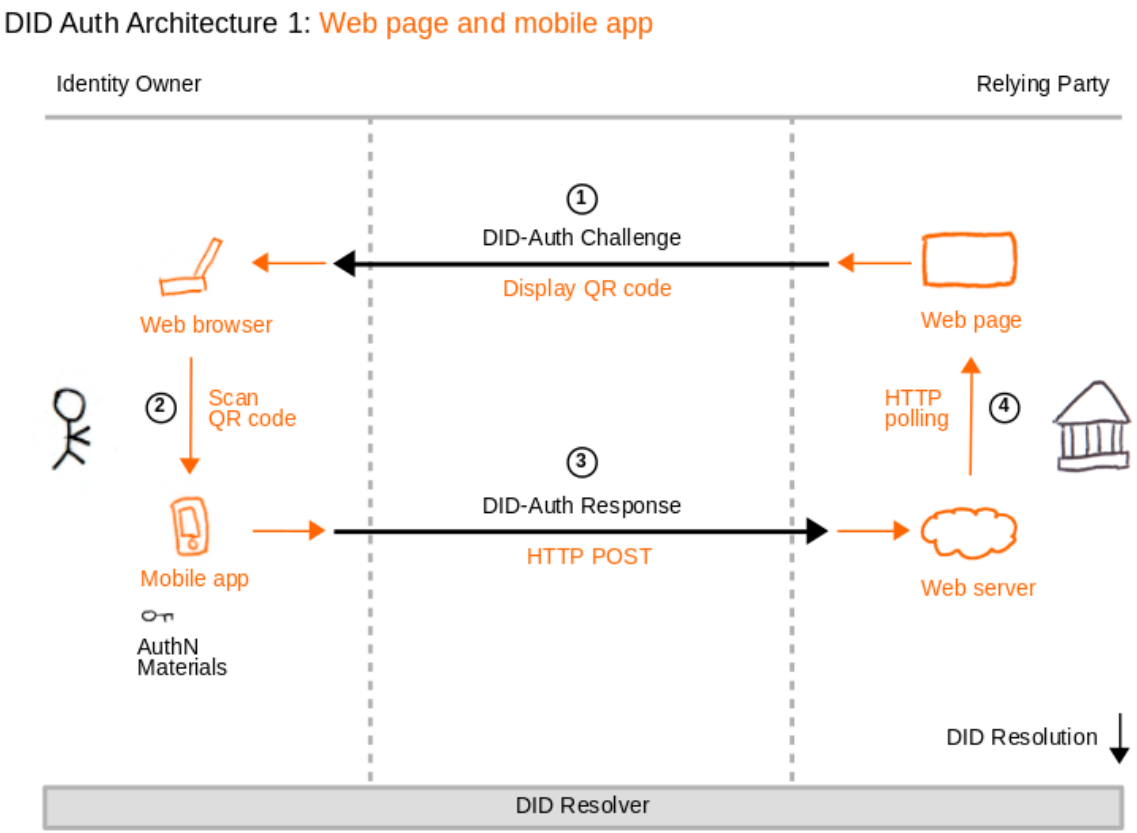
!!! not: detaylari not al

- HTTP POST to Callback URL
- Scan QR Code from Mobile App
- Fulfill JavaScript Promise
- Device-to-device Communication

Auth Architecture Web page and mobile app

RWoT 6 DID Auth

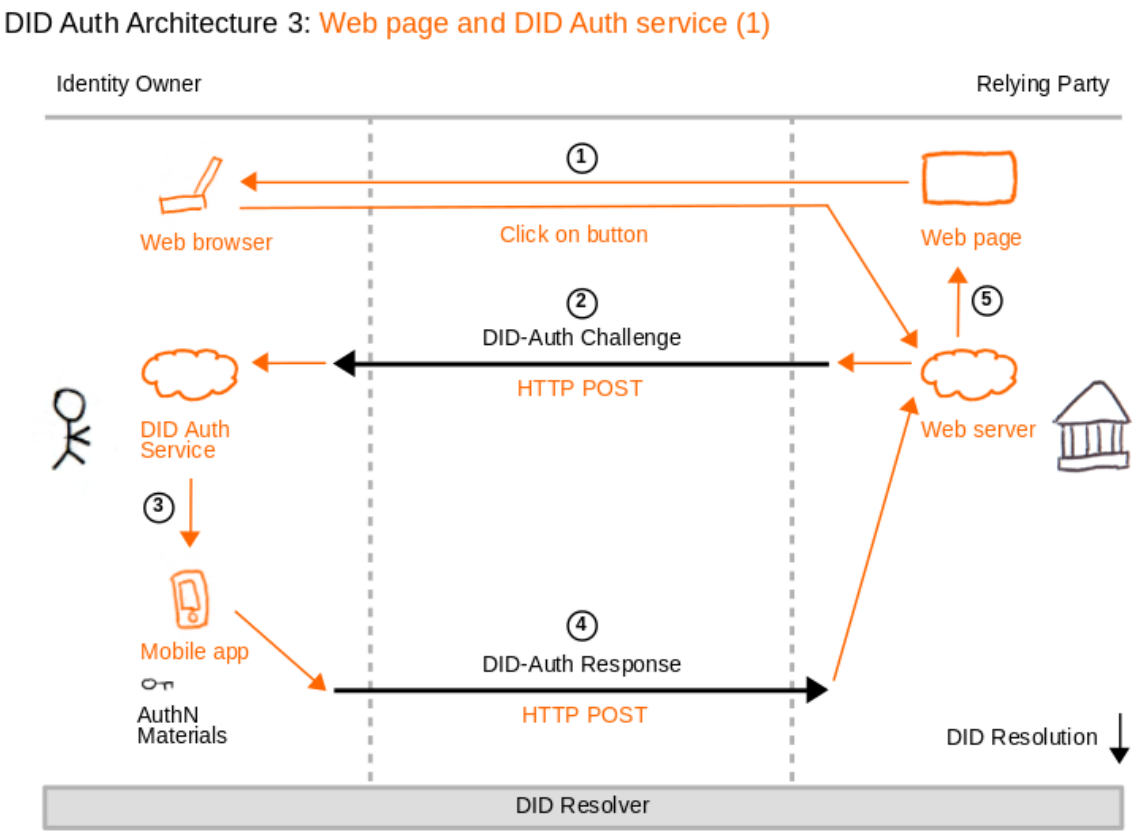
!!! Auth architecture gorselleri ekle !!! not: detaylari not al



Auth Architecture Web page and DID Auth service

RWoT 6 DID Auth

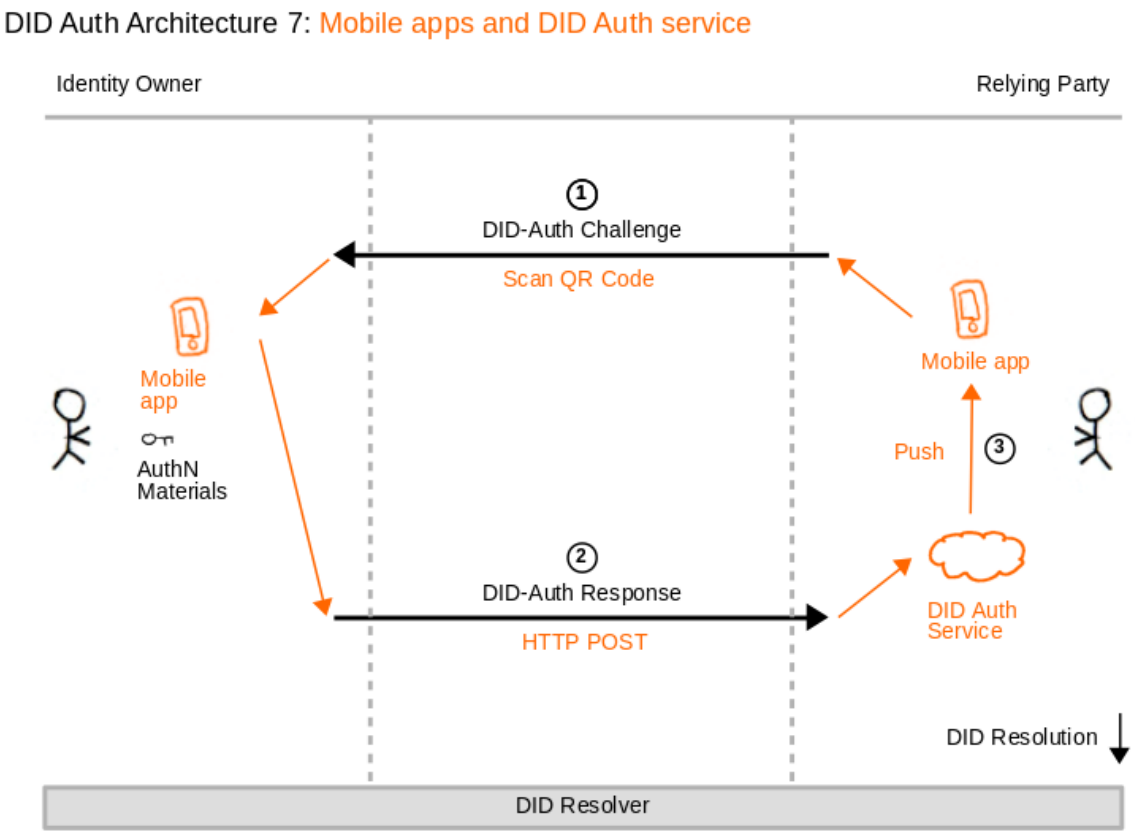
!!! Auth architecture gorselleri ekle !!! not: detaylari not al



Auth Architecture Mobile apps and DID Auth services

RWoT 6 DID Auth

!!! Auth architecture gorselleri ekle !!! not: detaylari not al



Relation to Other Technologies

RWoT 6 DID Auth

!!! not: detaylara notta degin, diger teknolijer ile baglantisi, uygulanabilirligi

- Other Public Key Infrastructure (PGP, SSH, etc.)
- WebAuthn (FIDO Authentication)

OpenID Connect *(DIF Auth Current Focus)*

!!! not: burayi iyi anla not al

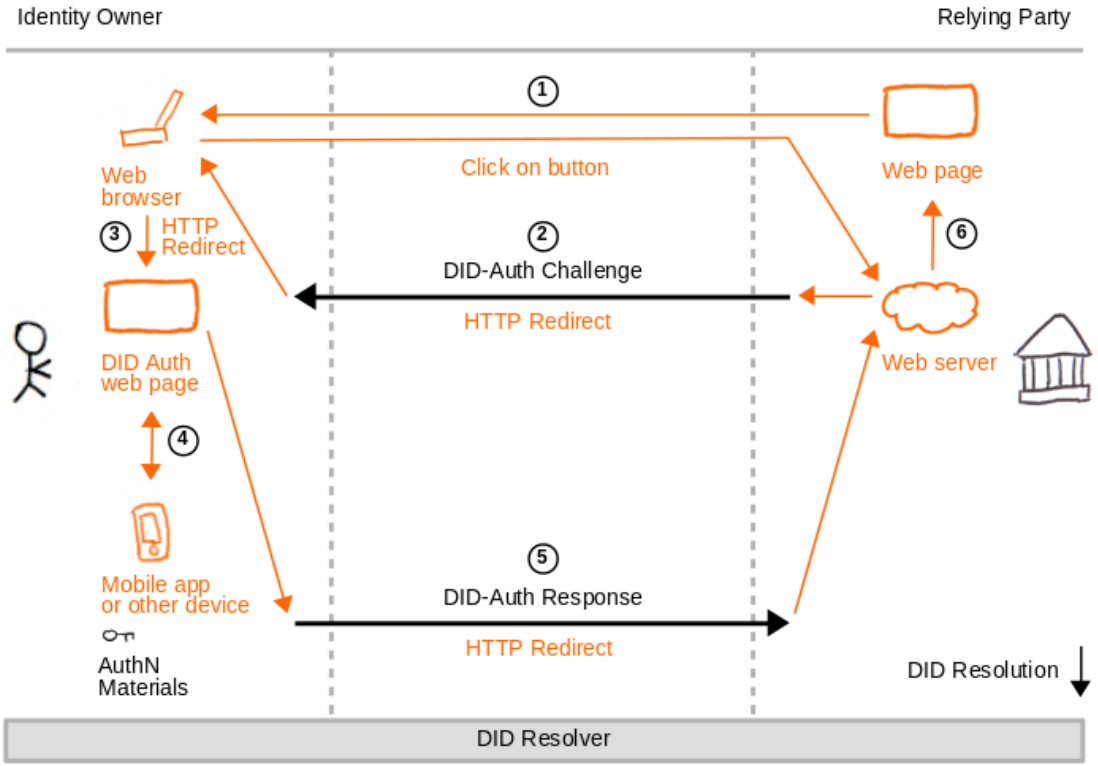
OpenID Connect (OIDC) is an authentication protocol built on the OAuth 2.0 protocol. In its most common web-based form, an end-user's user agent is redirected by a relying party (OAuth 2.0 client) to an OpenID Provider (OAuth 2.0 authorization server), which authenticates the end-user and redirects them back to the relying party.

Relation to Other Technologies

RWoT 6 DID Auth

!!! not: aciklamayi not al

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



indy_auth

!!! not: stajdayken yaptigimiz proje
!!! basettigimiz kavramlari teknolojileri anlamak icin gelistirdigimiz projemiz.

Internship Project, Application of DID Auth scenarios with DIDs using `did:sov` / Hyperledger Indy.

Gitlab Repo

bag.org.tr/proje/abdulhamit.kumru/indy_tls

Presentations

https://bag.org.tr/proje/abdulhamit.kumru/indy_tls/tree/master/presentations

indy_auth

!!! not: icerdigi alt projeler, proof of concept nitelidinde calismalar.

did_tls

- Generic DID Auth over TCP using generic JSON Object
- DH Session key generated
- TLS Socket created.

Tools

- Python OpenSSL
- indy-sdk

Other works

- http signatures
- auth encryption

indy-sdk

indy_auth

!!! not: not ekle

Everything needed to build applications that interact with an Indy distributed identity ledger.

libindy

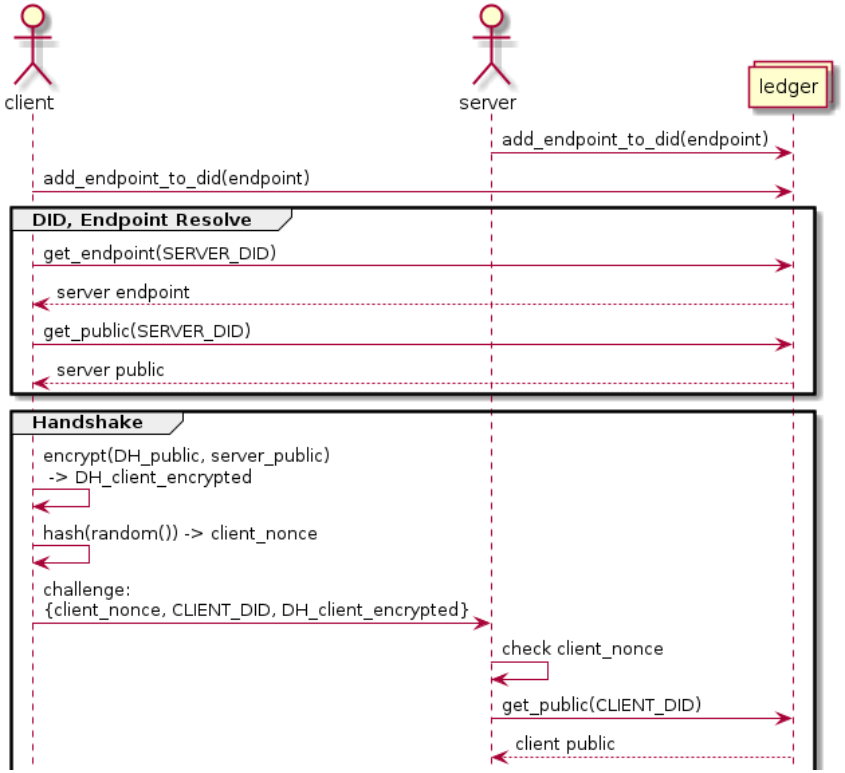
The major artifact of the SDK is a C-callable library that provides the basic building blocks for the creation of applications on the top of Hyperledger Indy

Libindy wrappers

A set of libindy wrappers for developing Indy-based applications in your favorite programming language

did_tls

indy_auth



did_tls

indy_auth

did-auth-jose (October 2018, ietf, dif) *archived sept 22*

did-auth-jose is a library that provides JOSE encryption, decryption, signing, and verifying capabilities through a key and algorithm extensible model, as well as two authentication flows for use with decentralized identities (DIDs).

evolved to did-siop #### OIDC Authentication Flow

DIF Authentication Working Group (Jan 14 2020)

!!! not: did auth a bu arkadaslar bakiyor

DID Authentication Profile for SIOP

!!! not: browser extentiondan bahset

!!! not: not al !!! detaylara bir sonraki bolumde girecegiz

SIOP DID AuthN flavor to use OpenID Connect (OIDC) together with the strong decentralization, privacy and security guarantees of DID for everyone who wants to have a generic way to integrate SSI wallets into their web applications.

- Status: DRAFT, WIP
- Use Case: Use your identity wallet to authenticate against a Web Application

SIOP DID is an unapproved DIF working group draft specification being developed within the Decentralized Identity Foundation (DIF).

DIF Authentication Working Group (Jan 14 2020)

Encrypted Envelope

This concept is borrowed from the HL Aries project to create a standardized means of authenticated general message passing between DID controllers. DIF provides an implementation of pack/unpack that intends to meet the requirements of the DIF community.

- Status: PROPOSAL
- Use Case: Secure communication between DID controllers.

decentralized-identity/DIDComm-js

!!! pack unpack details
JS implementation of pack and unpack

Auth Protocols & DID Auth

!!! open id connect ssi baglantisini vurgula !!! open id yi detaylandir !!! oAuthu yi detaylandir !!! Cas detay ekle !!! not: neledern bahsedecegimizi genel olarak not al

Auth Protocols & Schemes

- OAuth
- CAS
- OpenID Connect

Auth Protocols & DID Auth

- Self-Issued OpenID Connect Provider DID Profile (did-siop, DIF)
- DID IdP for CAS ?
- DID Authentication in PAM ?

Auth Protocols & Schemes

!!! not: hali hazirdaki protokollerden bahsedeceigz

- OAuth
- OpenID Connect
- CAS

OAuth

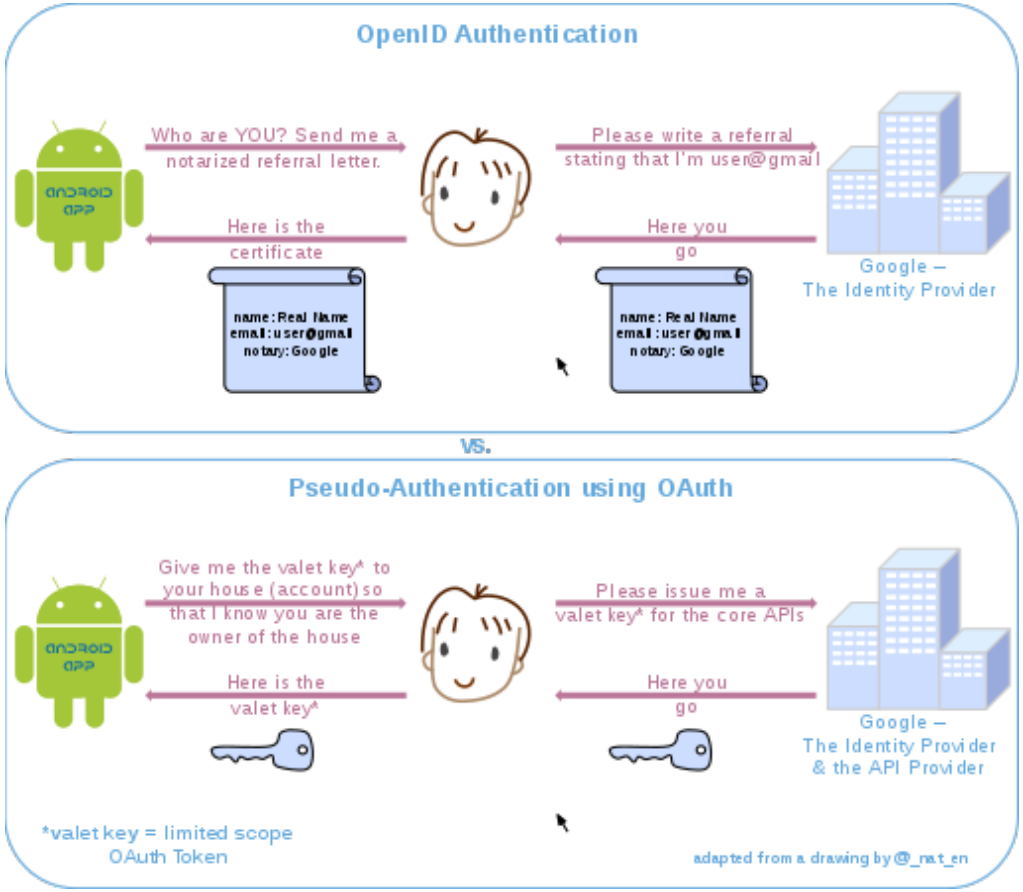
!!! not: bir uygulumaya tum izinleri vermektense sadece gerekli olan izinleri vermek, ben google a login olayim ama benim google a login oldugumu goren servis sadece izin verdigim ismim ve mailimi alabilsin

OAuth is an open standard for access delegation, commonly used as a way for Internet users to grant websites or applications access to their information on other websites but without giving them the passwords

- Authz protocol, doesnt provide Authentication,
- Doesnt allow federated SSO

OAuth

OpenID vs OAuth

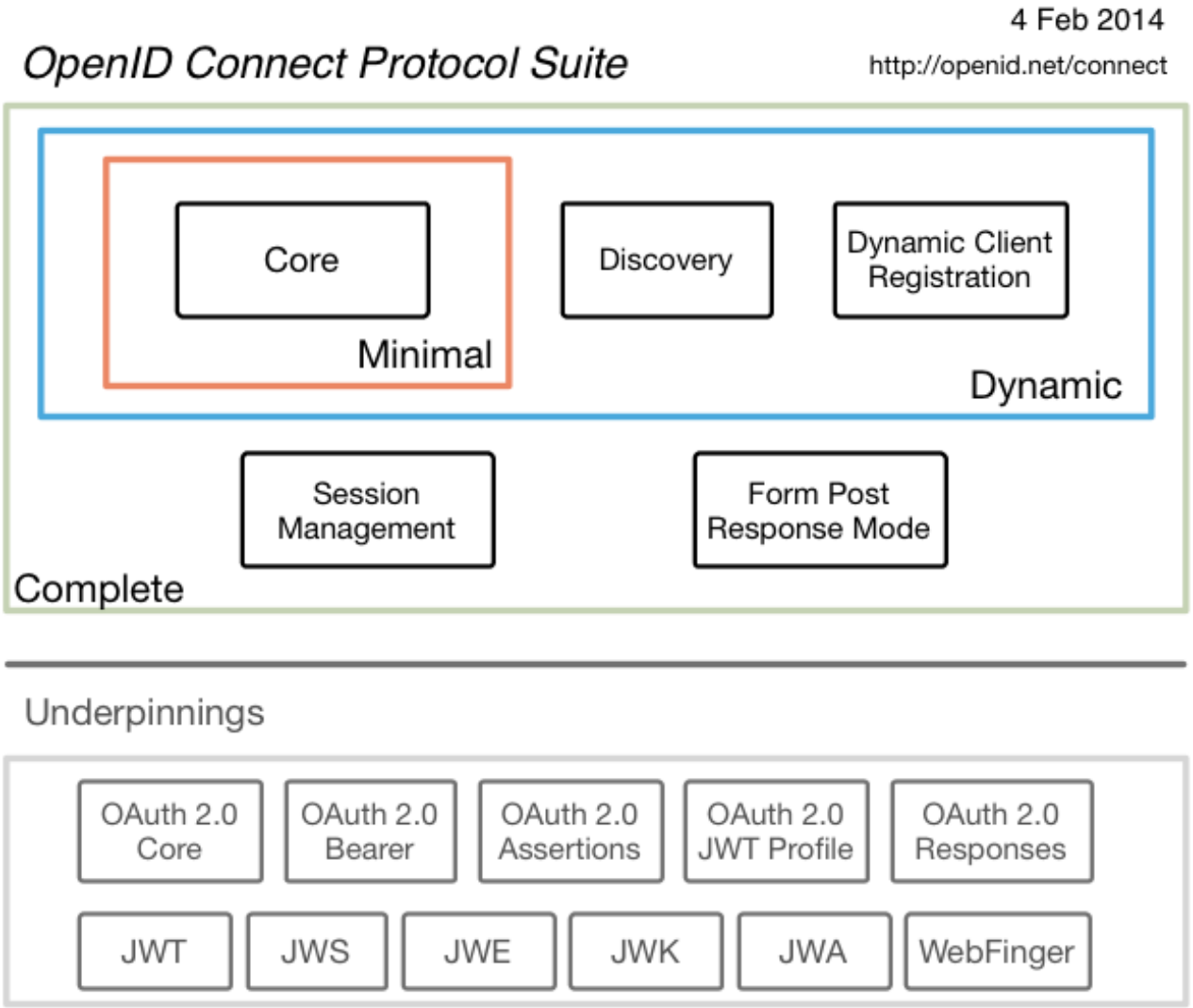


OpenID Connect

!!! not: oauth iliskisine degin

- *OpenID Connect 1.0 is a simple identity layer on top of the OAuth 2.0 protocol.* It allows Clients to verify the identity of the End-User based on the authentication performed by an Authorization Server, as well as to obtain basic profile information about the End-User in an interoperable and REST-like manner
- Based on OAuth 2.0, REST, JSON, JWT, JOSE
- OpenID is an open standard and decentralized authentication protocol. Promoted by the non-profit OpenID Foundation, it allows users to be authenticated by co-operating sites (known as relying parties, or RP) using a third-party service, eliminating the need for webmasters to provide their own ad hoc login systems.

OpenID Connect



OpenID Connect

!!! not: openid idp isi nasil isliyor

OpenID provider (OP)

An identity provider, or OpenID provider (OP) is a service that specializes in registering OpenID URLs or XRIs. OpenID enables an end-user to communicate with a relying party
With OpenID, your password is only given to your identity provider, and that provider then confirms your identity to the websites you visit

OpenID Connect

ID Token

!!! not: id token notu al

OpenID Connect

ID Token


```
{
    "iss": "https://self-issued.me",
    "nonce": "n-0S6_WzA2Mj",
    "exp": 1311281970,
    "iat": 1311280970,
    "sub_jwk" : {
        "crv":"secp256k1",
        "kid":"did:example:0xcd#verikey-1",
        "kty":"EC",
        "x":"7KEKZa5xJPh7WVqHJyUpb2MgEe3nA8Rk7eUlXsmBl-M",
        "y":"3zIgl_ml4RhapyEm5J7lvU-4f5jiBvZr4KgxUjEhl9o"
    },
    "sub": "9-aYUQ7mgL2SWQ_LNTeVN2rtw7xFP-3Y2EO9WV22cF0",
    "did": "did:example:0xcd"
}
```

OpenID Connect

Security

- Registration between RP and OP is mandatory, can be done with public metadata exchange and selfregistration
- JSON messages can be signed and/or encrypted with the help of asymmetric keys (public keys published in JWKS) or symmetric keys (client secret)

Single Sign On

!!! yukardaki protokollerin tek olayi sso degil fakat genellikle bu amacla kullaniliyorlar. !!! not: open id den alinan id tokenler birden fazlo uygulamada login olabilir, session acabilir yanit sso !!! not: cas zaten sso implementasyonu, samlin ana kullanim amaci zaten sso implement etmek

Single sign-on (SSO) is an authentication scheme that allows a user to log in with a single ID and password to any of several related, yet independent, software systems.

Web Single Sign On protocols

- Based on the principle of an authentication server, a lot of SSO standards have been created:
  - CoSign (Weblogin), Pubcookie, Webauth, CAH, CAS, WebID, BrowserID (Persona), SAML, WS-*, Liberty alliance, SAML 2, Shibboleth, OpenID, OpenID Connect...
- But nowadays, only a few are really used:
  - CAS, SAML 2, OpenID Connect

CAS

CAS

The Central Authentication Service (CAS) is a single *sign-on* protocol for the web.

Its purpose is to permit a user to access multiple applications while providing their credentials (such as userid and password) only once. It also allows web applications to authenticate users without gaining access to a user's security credentials, such as a password.

CAS

Security

- No obligation to declare CAS clients in CAS server (open mode)
- Trust between CAS client and CAS server relies on CAS server certificate validation

Protocol Comparison

- CAS: simple protocol, no strong security, fits internal usage
- SAML: complex protocol, very used for SaaS authentication, good security, well established
- ***OpenID Connect:*** easy adoption with new technologies (JSON/REST/OAuth2), mobile ready, good security, *still not wide spread

Auth Protocols & DID Auth

- Self-Issued OpenID Connect Provider DID Profile (did-siop, DIF)
- DID IdP for CAS ?
- DID Authentication on PAM ?

self-issued openid connect provider

!!! not: Self-Issued OpenID Connect Provider bunu acikla, protokolde ne gibi farkliliklara yol acabilir !!! not: SIOP OP tan ne farki var, OP internette duruken, SIOP sende localde duruyor.

- A normal provider such as Google, is available at an HTTP endpoint. Requests to normal providers use the http:// protocol.
- A self-issued provider is usually installed on the end-user's device. Requests to self-issued providers use the openid:// protocol.

self-issued openid connect provider DID Profile (did-siop, DIF)

The work on DIF SIOP DID Profile specification has moved to OIDF AB WG to work on a new SIOP v2 specification that will either introduce breaking changes to the DIF SIOP DID Profile specification or will replace it with an implementation guide document on how to use SIOP v2 in an SSI context.

DID SIOP

Terminology

Term	Description
DID	Decentralized Identifier as per [DID]
DID Document	DID Document as per [DID]
SIOP DID	Self-Issued OpenID Connect Provider DID profile. Refers to a specific flavor of DID AuthN used in the OIDC SIOP flow.
JWT	JSON Web Token as per [RFC7797]
JWE	JSON Web Encryption as per [RFC7516]
JWS	JSON Web Signature as per [RFC7515]
JWK	JSON Web Key as per [RFC7517]
JWKS	JWK Set as per [RFC7517]
OIDC	OpenID Connect as per [OIDC.Core]
OIDC client	Used synonymously with Relying Party (see RP)
OP	OpenID Provider as per [OIDC.Core]
SIOP	Self-Issued OpenID Provider as per [OIDC.Core]
RP	Relying Party, as used in [OIDC.Core]
Identity Wallet	An Identity Wallet refers to a application that is under the control and acts on behalf of the DID holder. This Also known as an identity agent. The Identity Wallet can have different form factors such as a mobile app, browser extension/ plugin etc.
DID AuthN	Refers to a method of proofing control over a DID for the purpose of authentication.

Introduction

DID SIOP

!!! not: While this specification focuses on the integration of Identity Wallets in the form of browser extensions/ plugins, or smartphone apps, it does not prevent implementers using the proposed flow in different scenarios as well, e.g., between two web services with pre-populated DIDs. !!! not: cevir, nota ekle

An everyday use case that the Decentralized Identity community identified is the sign-up or login with web applications. Nowadays, this is often achieved through social login schemes such as Google Sign-In. *While the Decentralized Identity community has serious concerns about social login, the underlying protocol, OIDC, does not have these flaws by design.* SIOP DID provides great potential by leveraging an Identity Wallet, e.g., as a smartphone app, on the web. This will increase and preserve the user's privacy by preventing third-parties from having the ability to track which web applications a user is interacting with.

Introduction

DID SIOP

Purpose

The main purpose is to sign up with/ login to an RP (Relaying Party), i.e., web application. It assumes the user operates a mobile or desktop browser or a browser-based app that can respond to SIOP requests according to this specification.

Goals

- Staying backward compatible with existing OIDC clients and OPs (OpenID Provider) that implement the SIOP specification which is part of the OIDC core specification as per [OIDC.Core] to reach a broader community.
- Adding validation rules for OIDC clients that have DID AuthN support to make full use of DIDs.
- Not relying on any intermediary such as a traditional centralized public or private OP while still being OIDC-compliant.

Protocol Flow

DID SIOP

- First, the user clicks on the sign up or login UX element. The RP will then generate the redirect to openid:// which will be handled by the SIOP.
- The SIOP will generate the based on the specific DID method that is supported. The will be signed and optionally encrypted and will be provided according to the requested response mode.

Protocol Flow

DID SIOP

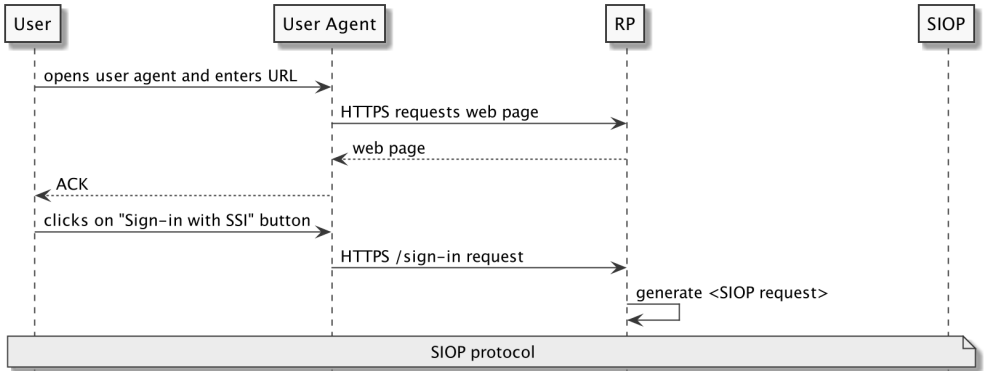
!!! not: detaylari anla not al

- Unlike the OIDC Authorization Code Flow as per [OIDC.Core], the SIOP will not return an access token to the RP
- SIOP also differs from Authorization Code Flow by not relying on a centralized and known OP. The SIOP can be unknown to the RP until the user starts to interact with the RP using its Identity Wallet
- OIDC Authorization Code Flow is still a useful approach and should be used whenever the OP is known, and OP discovery is possible, e.g., exchanged or pre-populated DID Document containing an openid element in the service section.
- The SIOP flow allows to integrate Identity Wallets with plain OIDC clients if they implemented the SIOP specification. In contrast, using DID AuthN as the authentication means in the OIDC Authorization Code Flow would require integration with the OP vendor itself

Protocol Flow

DID SIOP

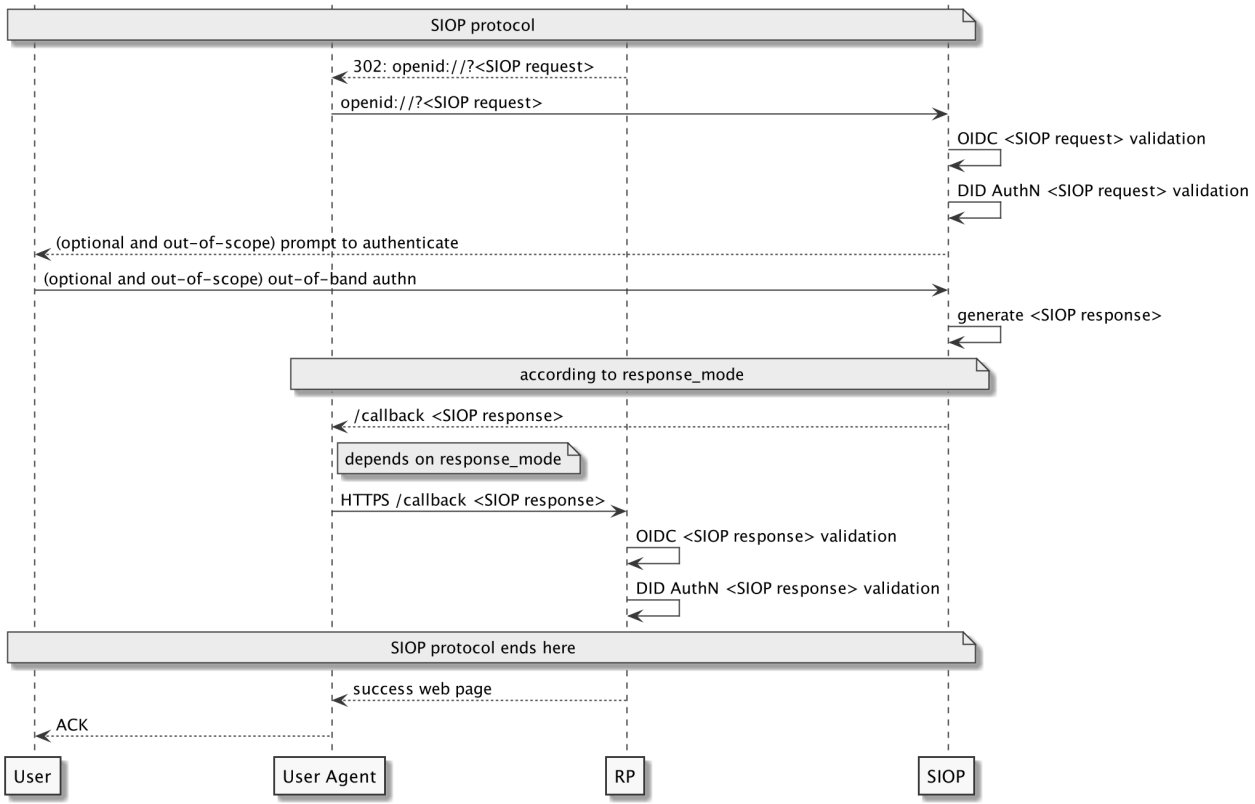
Example SIOP flow



Protocol Flow

DID SIOP

Example SIOP flow



DID PAM

!!! not: bu bolumleri tartisma soru seklinde yap ve bitir

Pluggable Authentication Module (PAM)

!!! not: bu bolumleri tartisma soru seklinde yap ve bitir, normalde saml da olcakti fakat karisik oldugu icin gectim

did authn Pluggable Authentication Modullerde kullanilabilir mi ?

PAM Recepies

- Encrypted Home Directories
- Working with Secure Shell
- Apache htaccess Made Smart
- Directory Services

DID IdP for CAS ?

!!! not: bu bolumleri tartisma soru seklinde yap ve bitir