OAuth 2 und OpenID Connect

JAX 2015

23.04.2015, Mainz

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innoQ

Agenda

- OAuth 1, OAuth 2, OpenID Connect, O...?
- How does it work?
- Use Cases
- Should I use it

“Web 2.0” Platforms

and many more…

“Web 2.0” Platforms

= User content on big platforms with APIs

and many more...

“Web 2.0” Platforms

= User content on big platforms with APIs

2010 - ~ 550.000 “Facebook Apps”

2015 - ~ 30 Flickr Apps tagged “geo”

…

and many more…

The access problem

The access problem

Resource Owner

The access problem

Resource Owner

The access problem

Resource Owner

Client

The access problem

Resource Owner

needs Access

Client

The access problem

Resource Owner

gives Permission

needs Access

Client

Resource/Auth Server

The access problem

Resource Owner

gives Permission

needs Access

checks Permission
provides Access

Client

OAuth o

OAuth o

- Client gets user password

OAuth o

- Client gets user password
- Client impersonates user and gets resource

OAuth 1

- Client registers at the service

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- Client asks resource owner for permission via the service

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- Client asks resource owner for permission via the service
- Client gets a token

OAuth 1

- Client registers at the service
- Client asks resource owner for permission via the service
- Client gets a token
- Client can access the resource with the token

OAuth 1

- Authorization Protocol

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- RFC 5849 (38 pages spec)

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- non-trivial request / response creation

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- Authorization Protocol
- RFC 5849 (38 pages spec)
- One security issue (fixed 2009)
- non-trivial request / response creation
- Scope: “web applications”

Why OAuth 2?

- Simplify client development process

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- Desktop Applications / Single-Page-Apps

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- Desktop Applications / Single-Page-Apps
- Mobile Phones

Why OAuth 2?

- Simplify client development process
- Desktop Applications / Single-Page-Apps
- Mobile Phones
- “Living room devices”

OAuth 2 Roles

- Resource Owner
- Client
- Resource Server
- Authentication Server

OAuth 2 Tokens

- Access Token

  "An access token is a string representing an authorization issued to the client."

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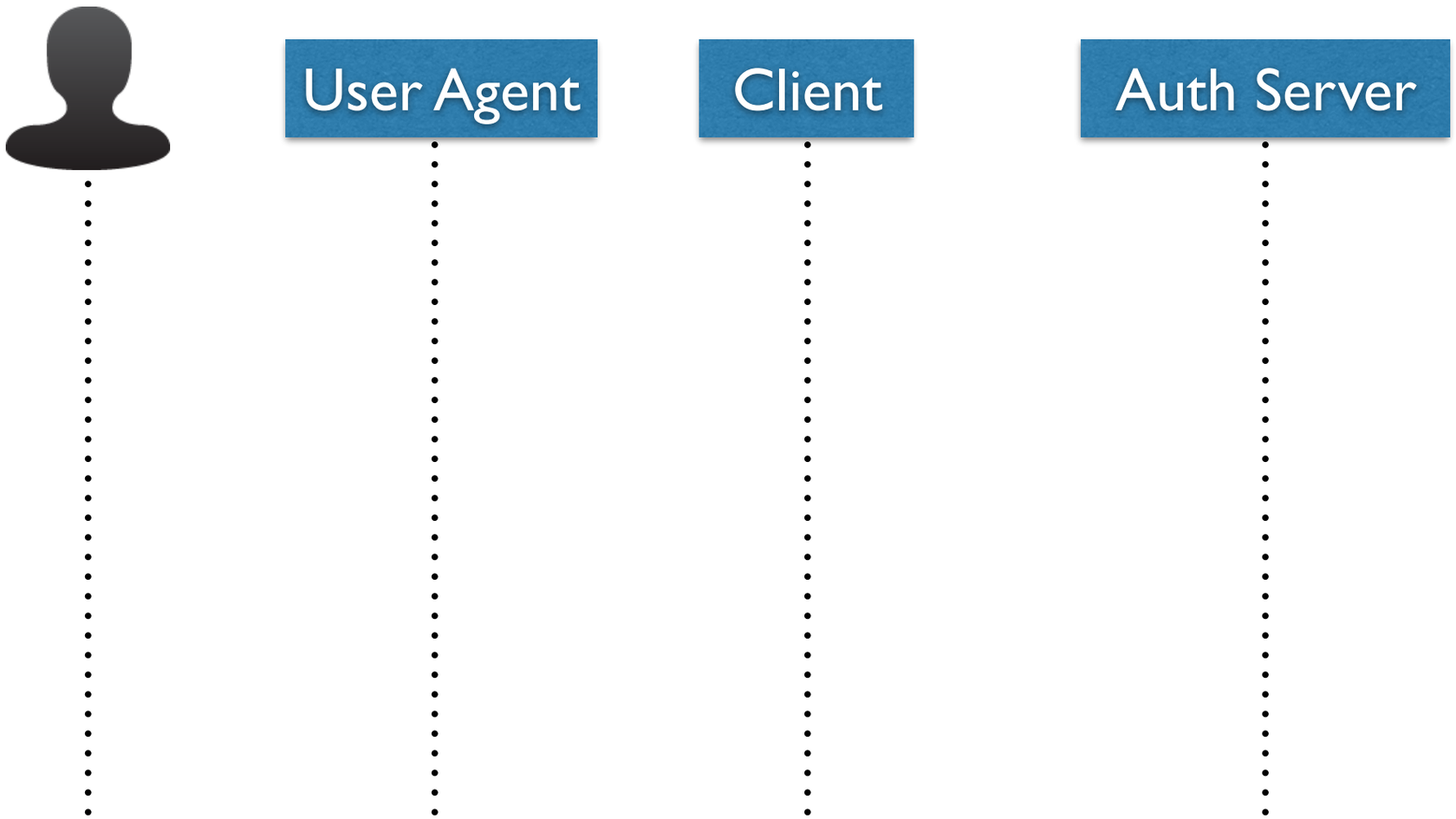
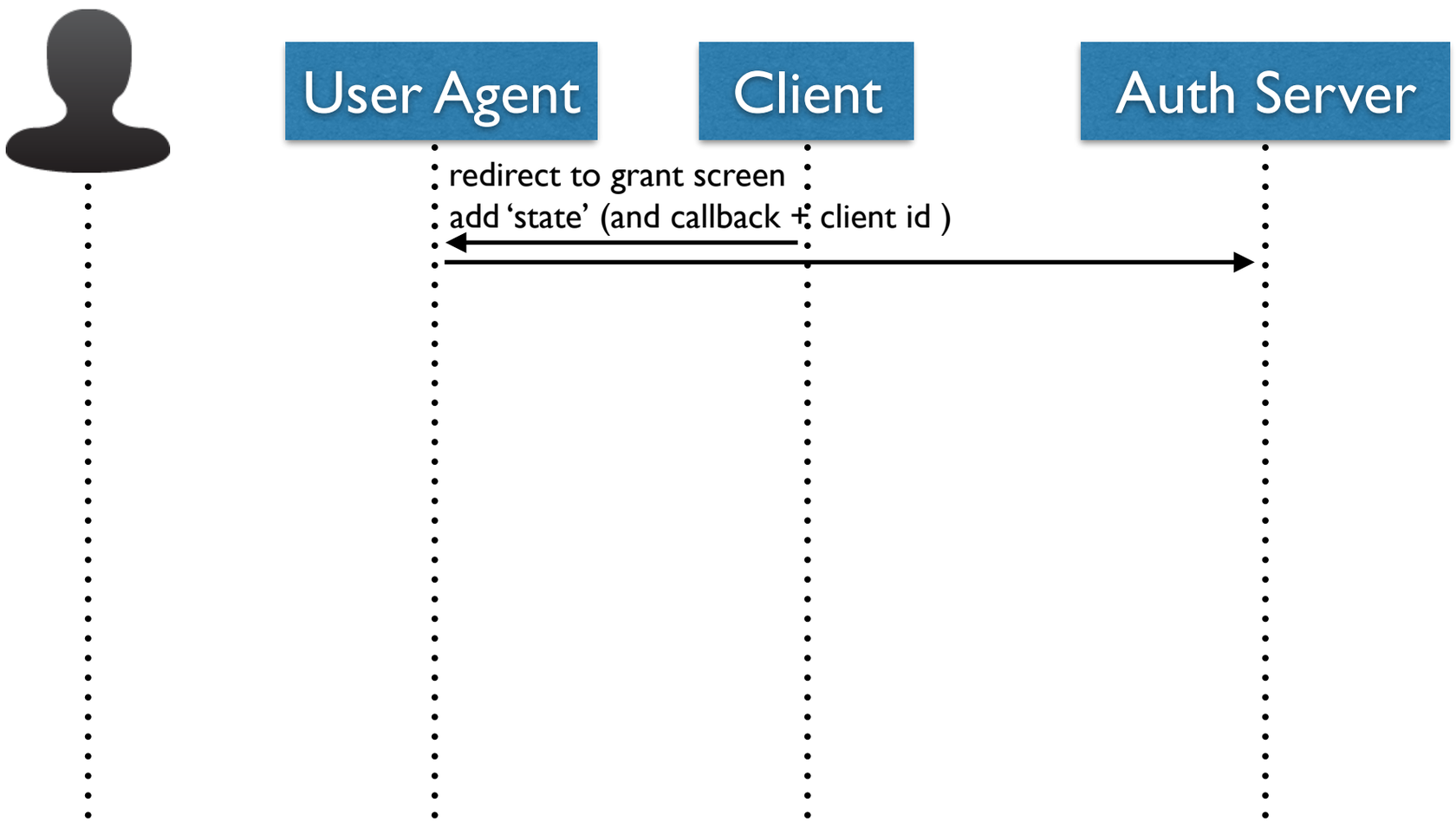
- Refresh Token
- Scope

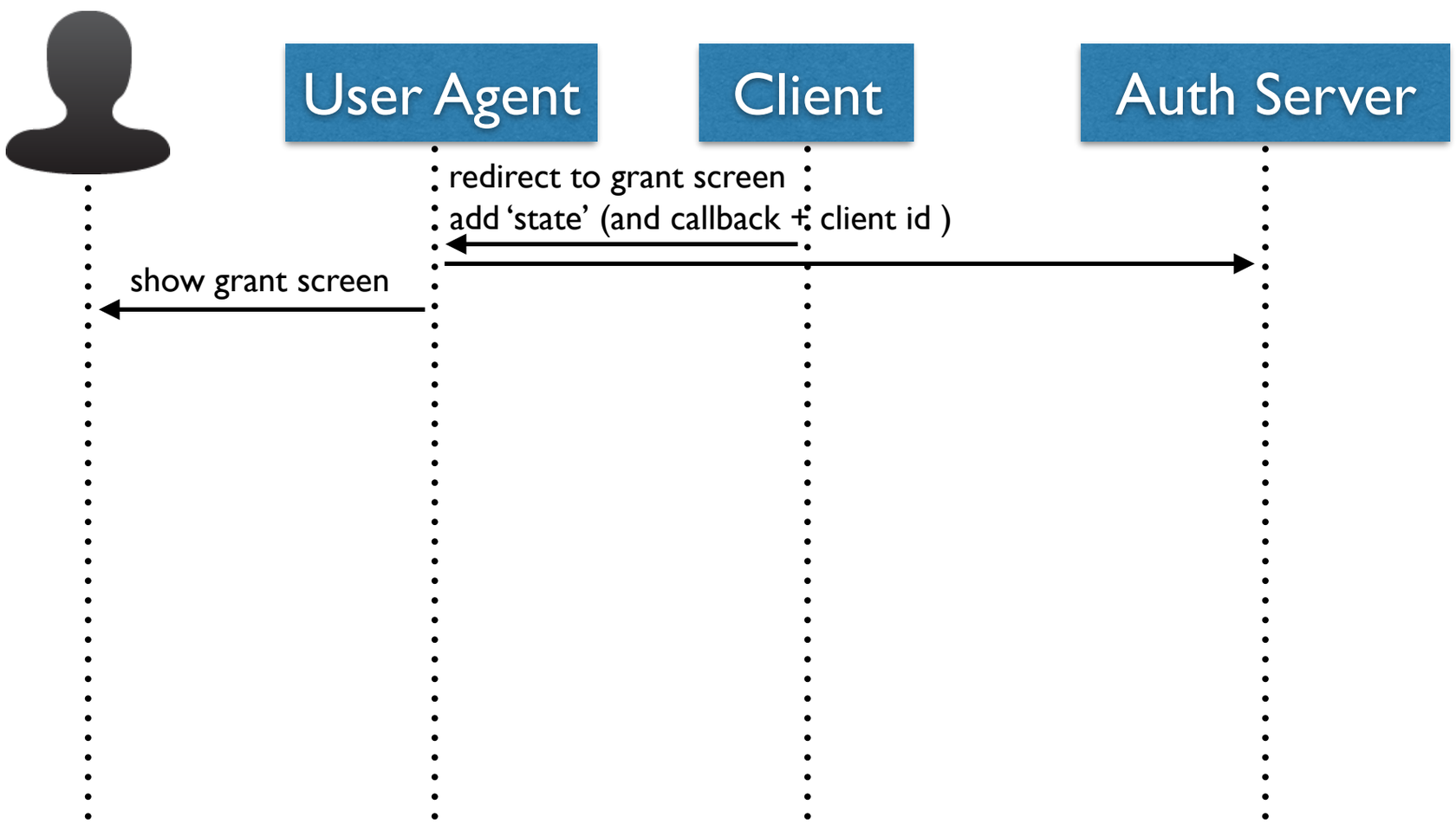
Authorization Code Grant



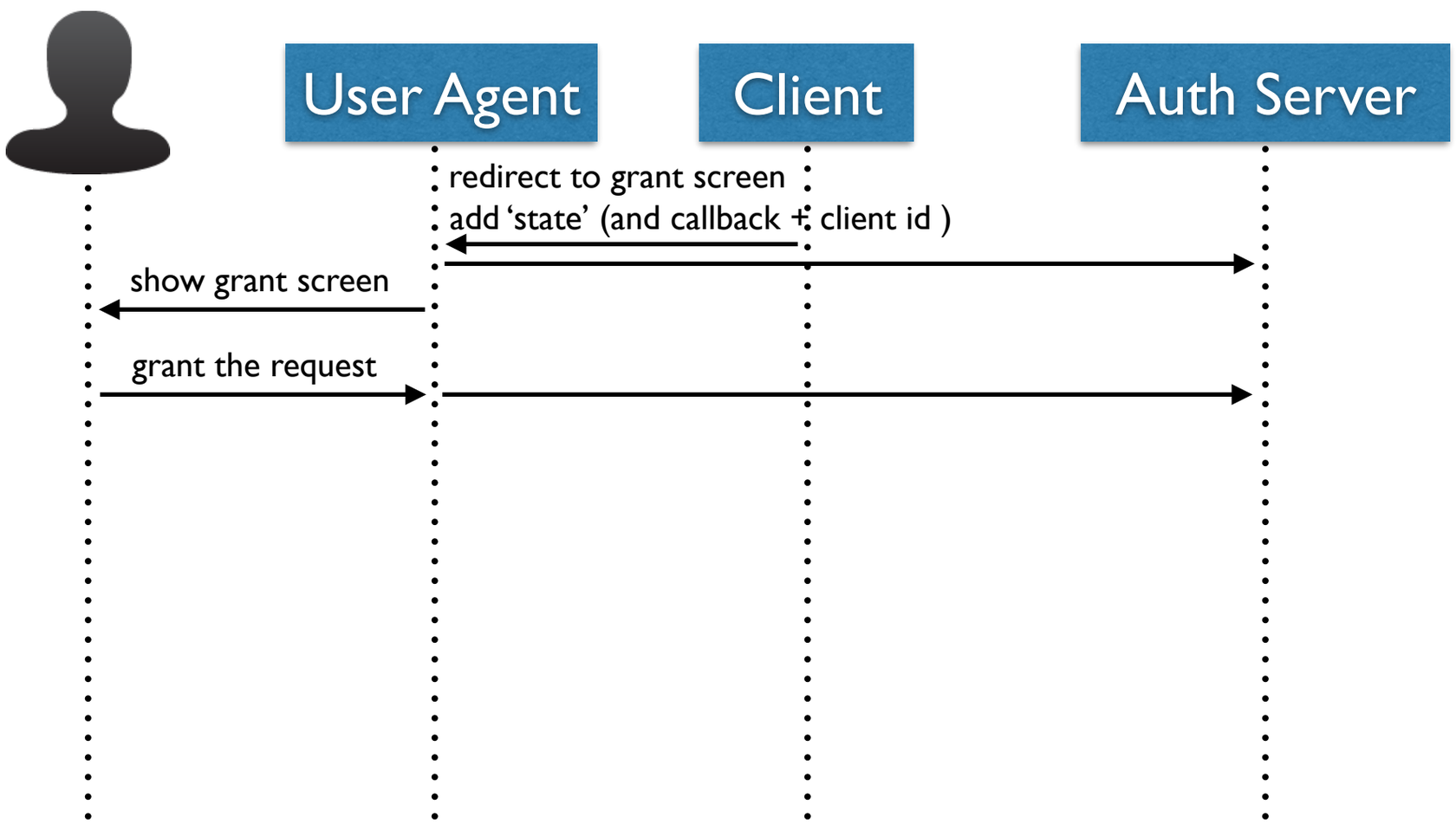
Authorization Code Grant



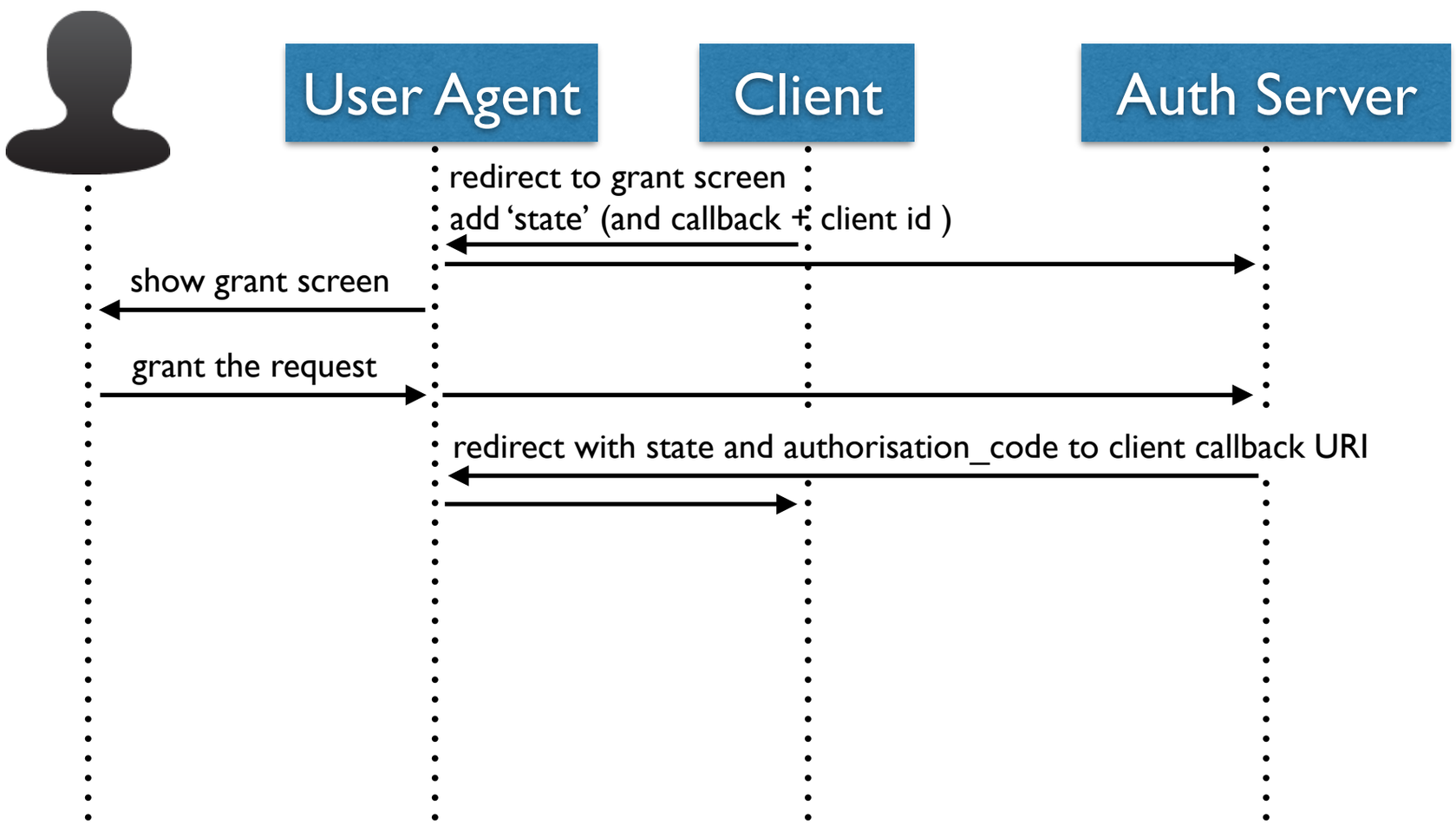
Authorization Code Grant



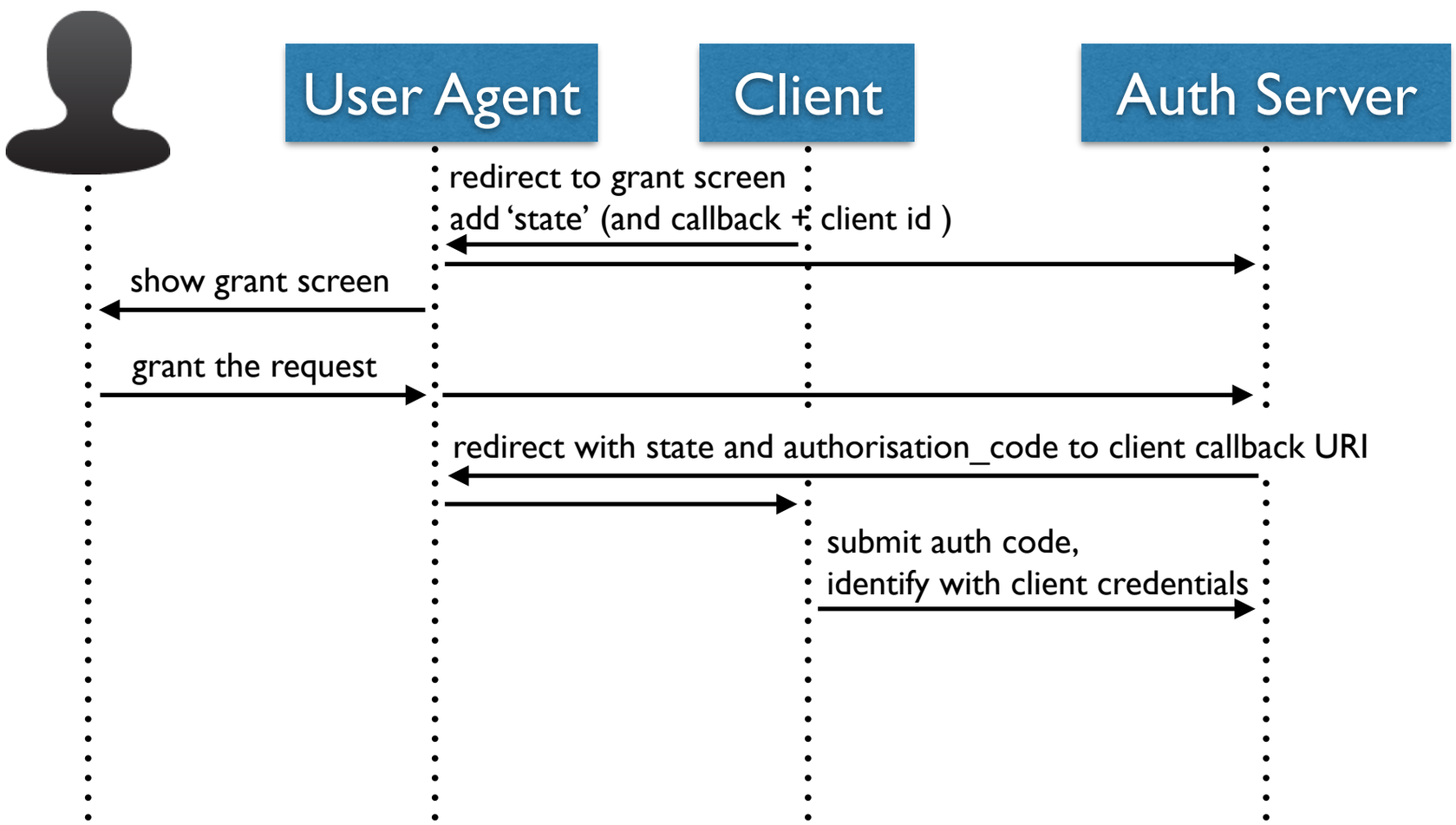
Authorization Code Grant



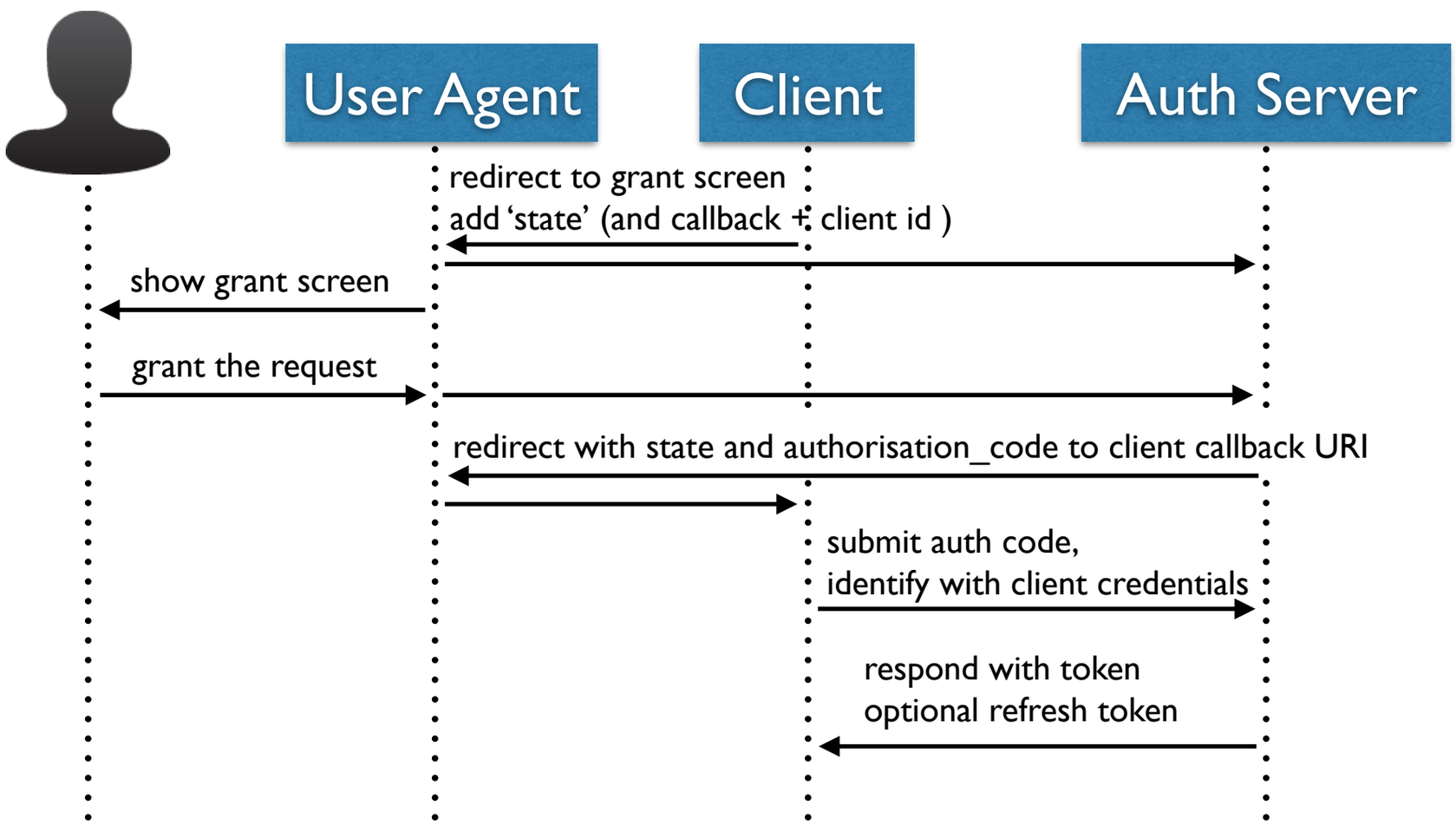
Authorization Code Grant



Authorization Code Grant



Authorization Code Grant



OAuth 2 Grant Types

- Authorization Code

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- Authorization Code
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- User Credentials

OAuth 2 Grant Types

- Authorization Code
- Implicit
- User Credentials
- (Client Credentials)

OAuth 2 Spec Overview

Framework

OAuth 2 Spec Overview

Framework

Security

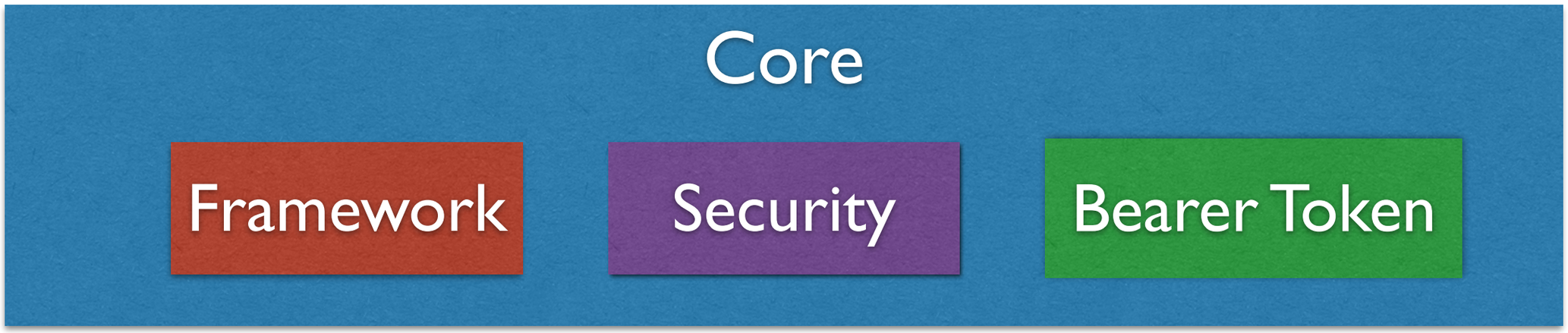
OAuth 2 Spec Overview

Framework

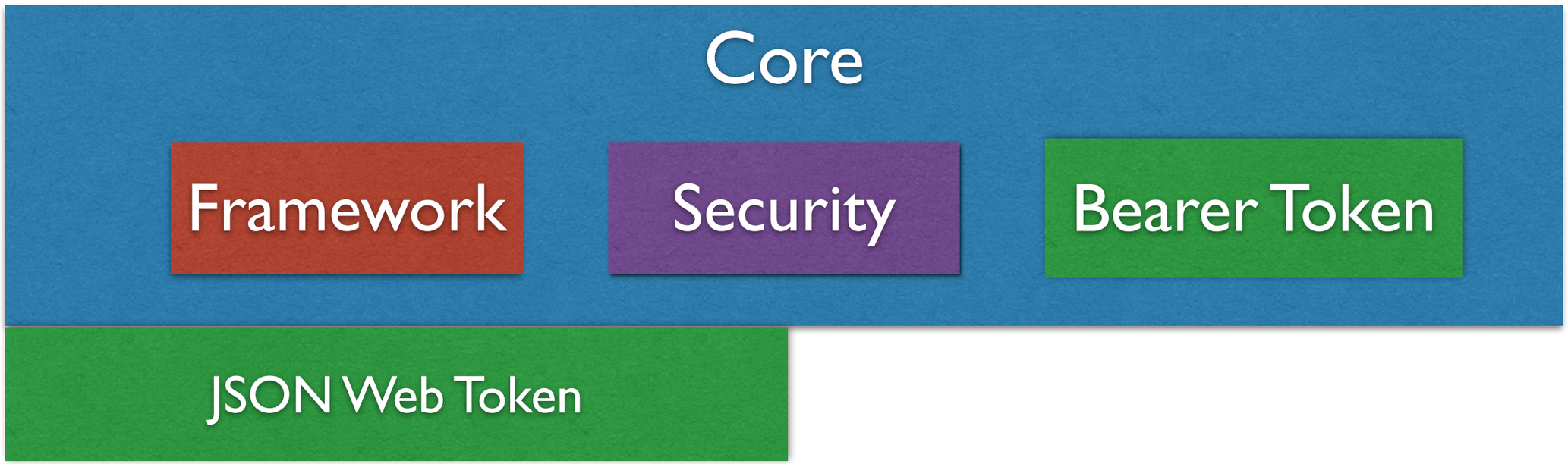
Security

Bearer Token

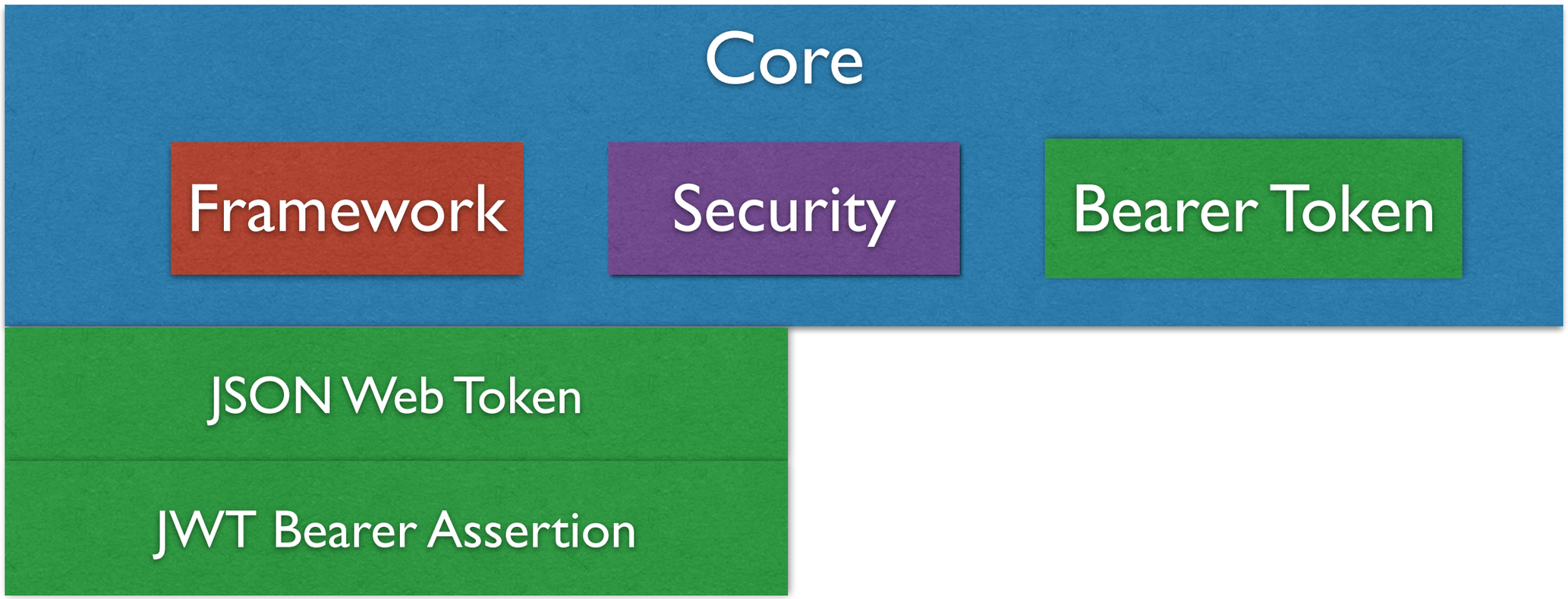
OAuth 2 Spec Overview



OAuth 2 Spec Overview



OAuth 2 Spec Overview



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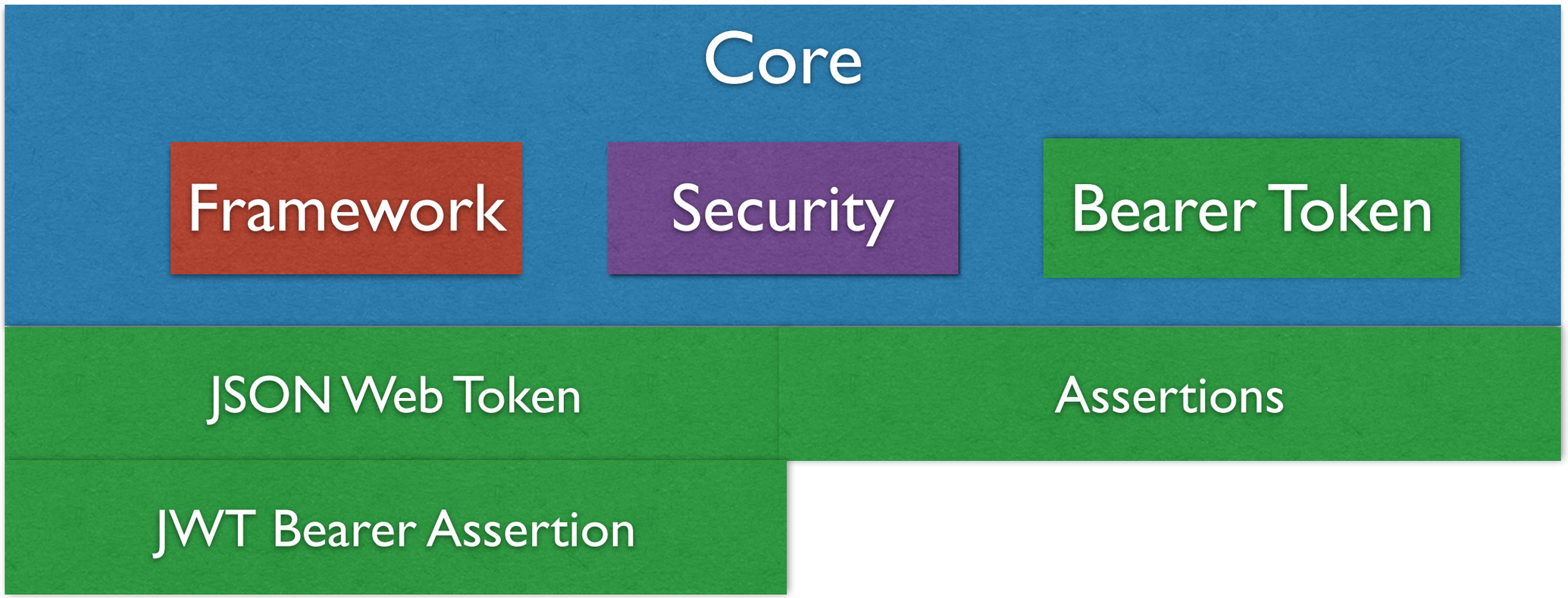
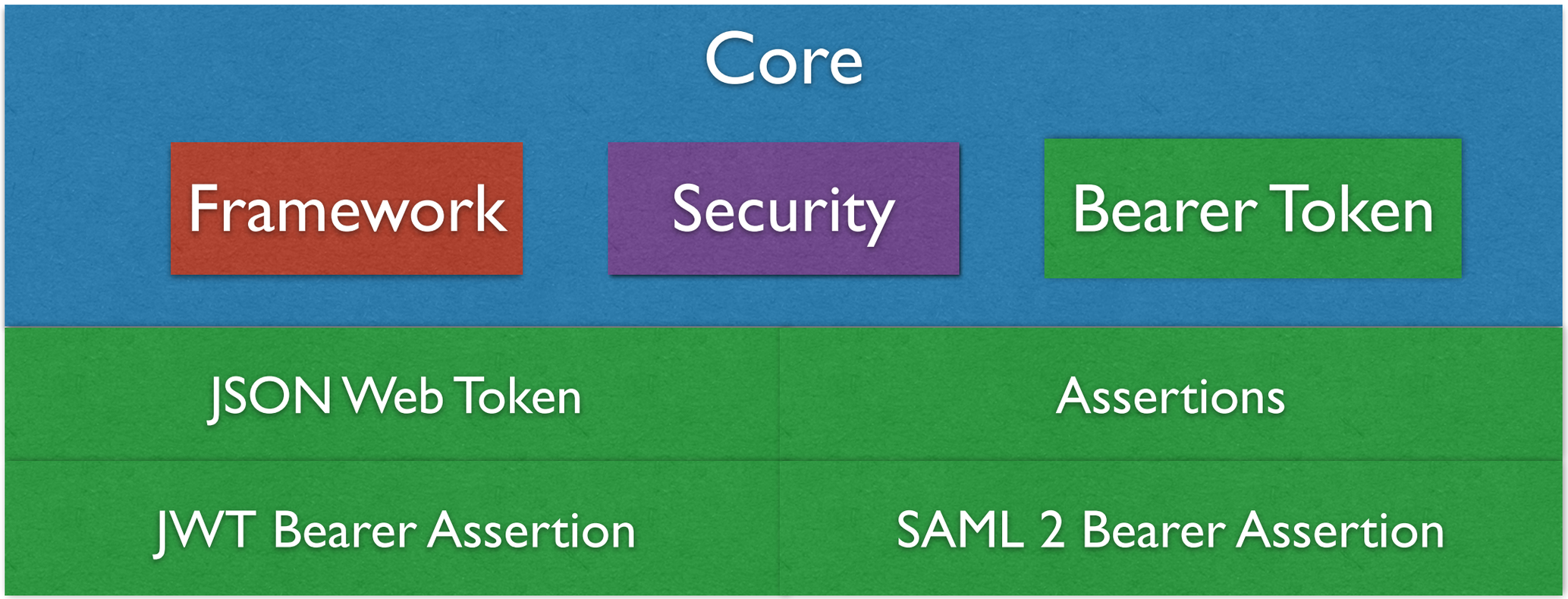


OAuth 2 Spec Overview



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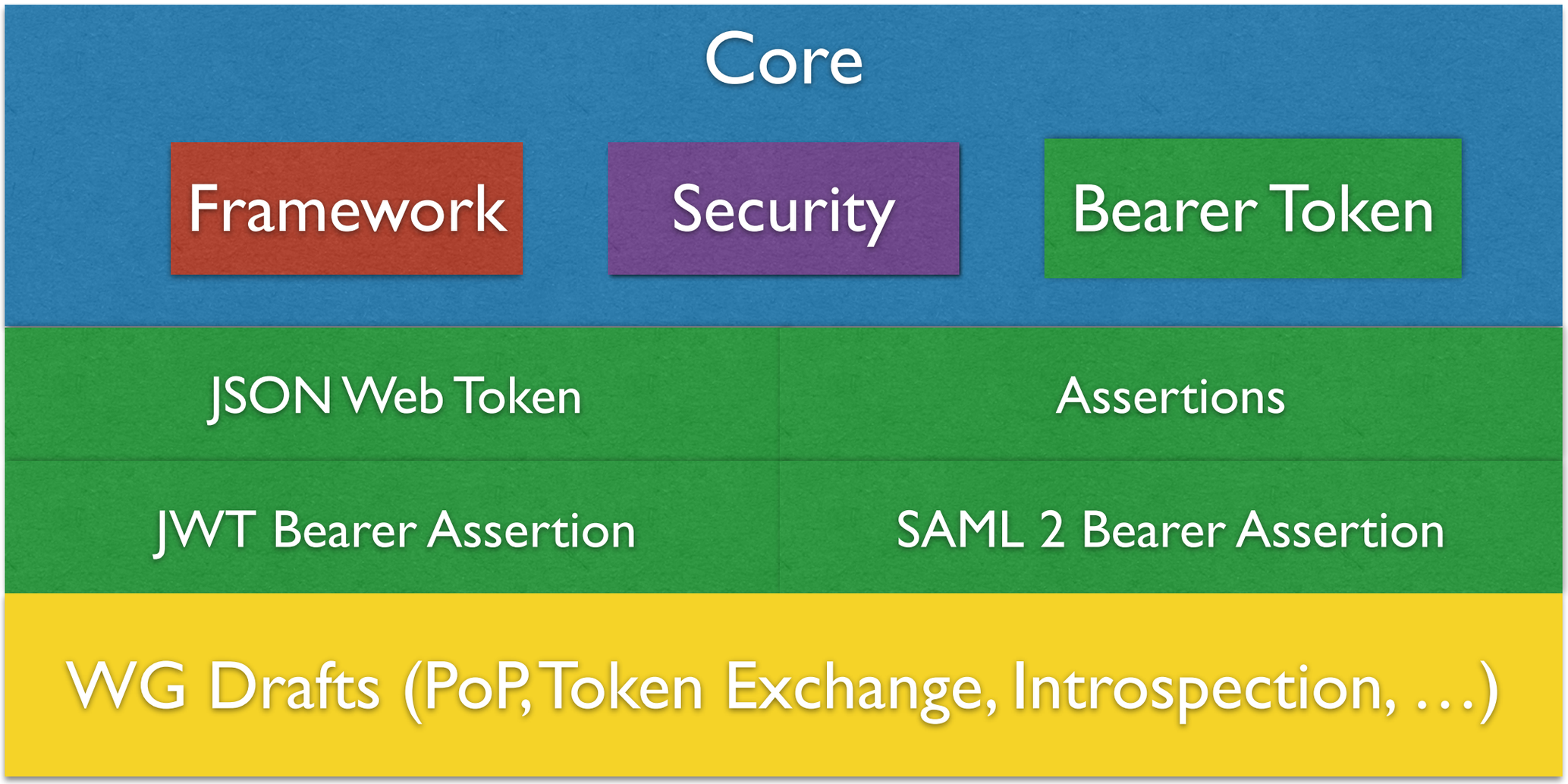

Short Comparison

OAuth 1	OAuth 2

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› Authorization protocol	

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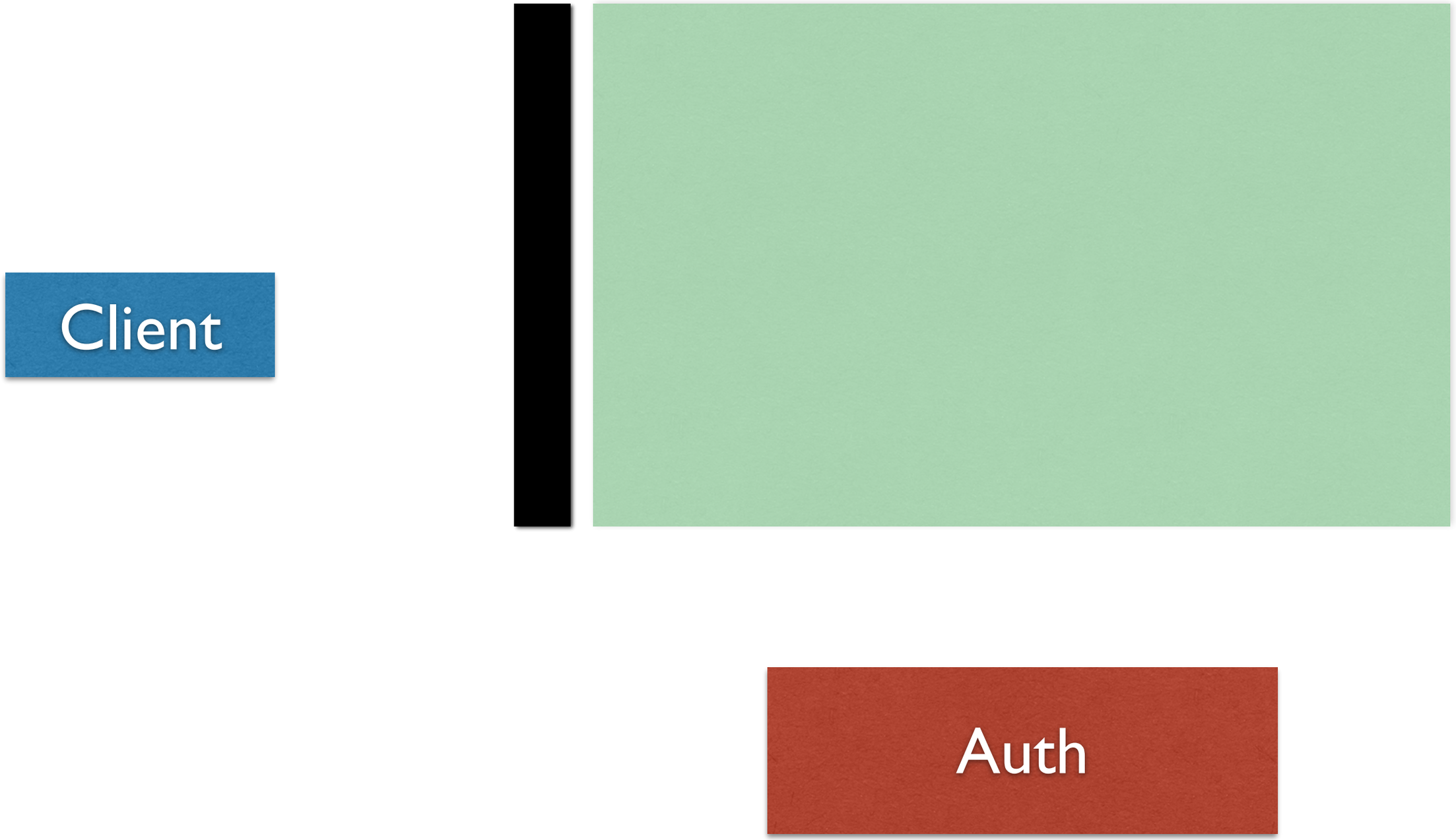
Short Comparison

OAuth 1	OAuth 2
› Authorization protocol	› Delegation framework
› Spec finalized	› Many extensions
› Additional crypto to TLS	› TLS only (Core)
› Production ready libs	› Incompatible implementations

Example: Traditional System



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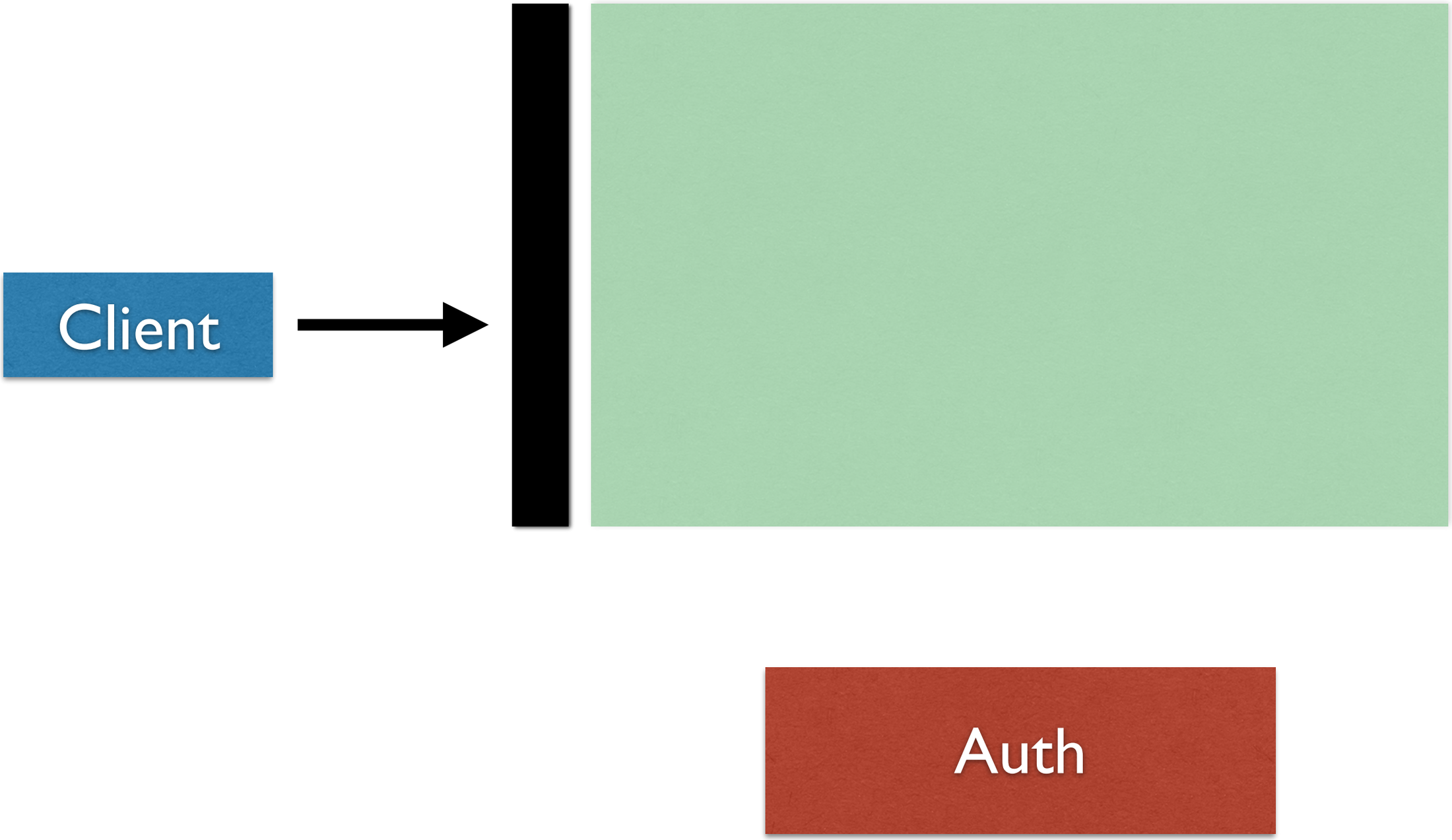

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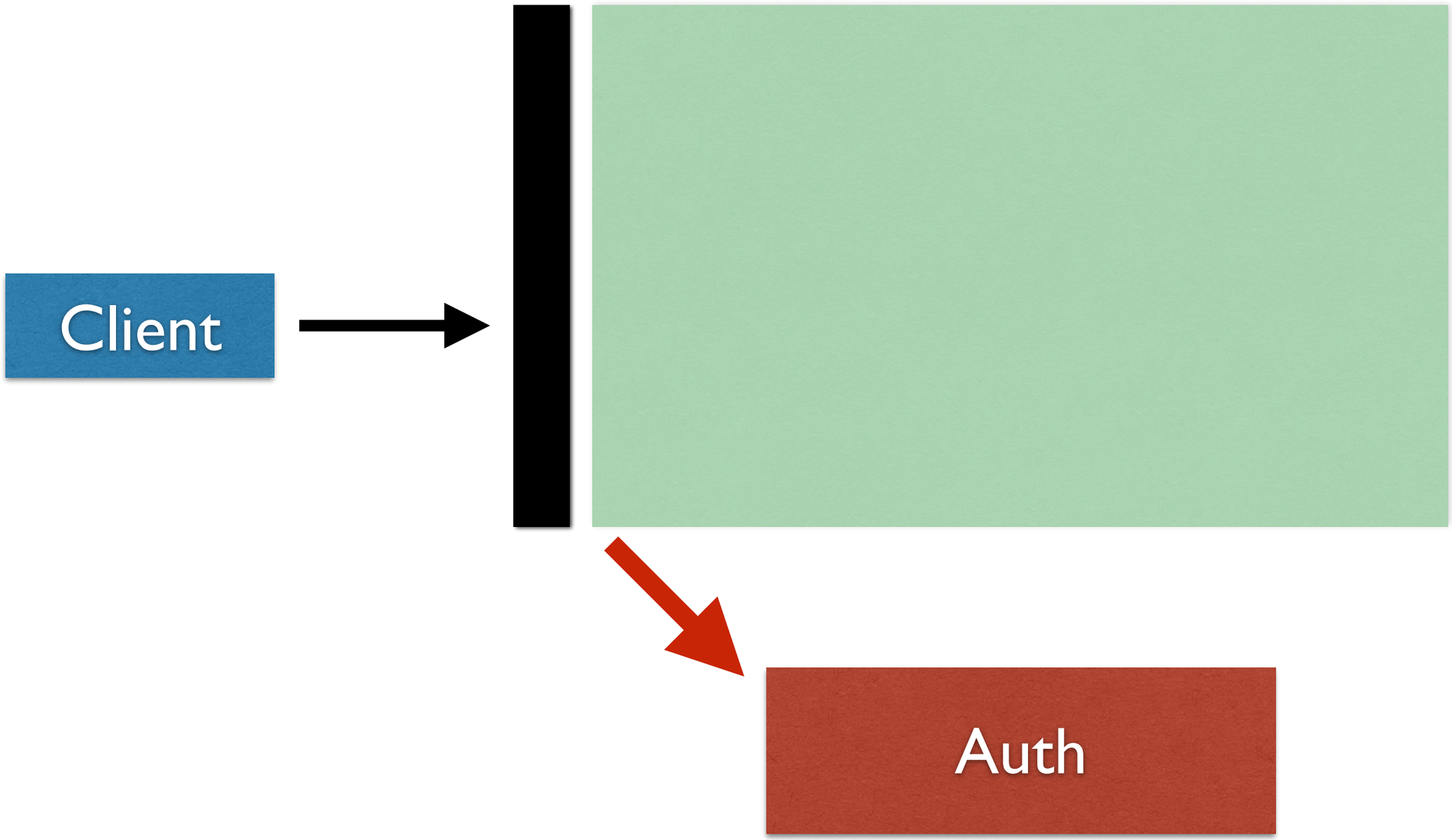
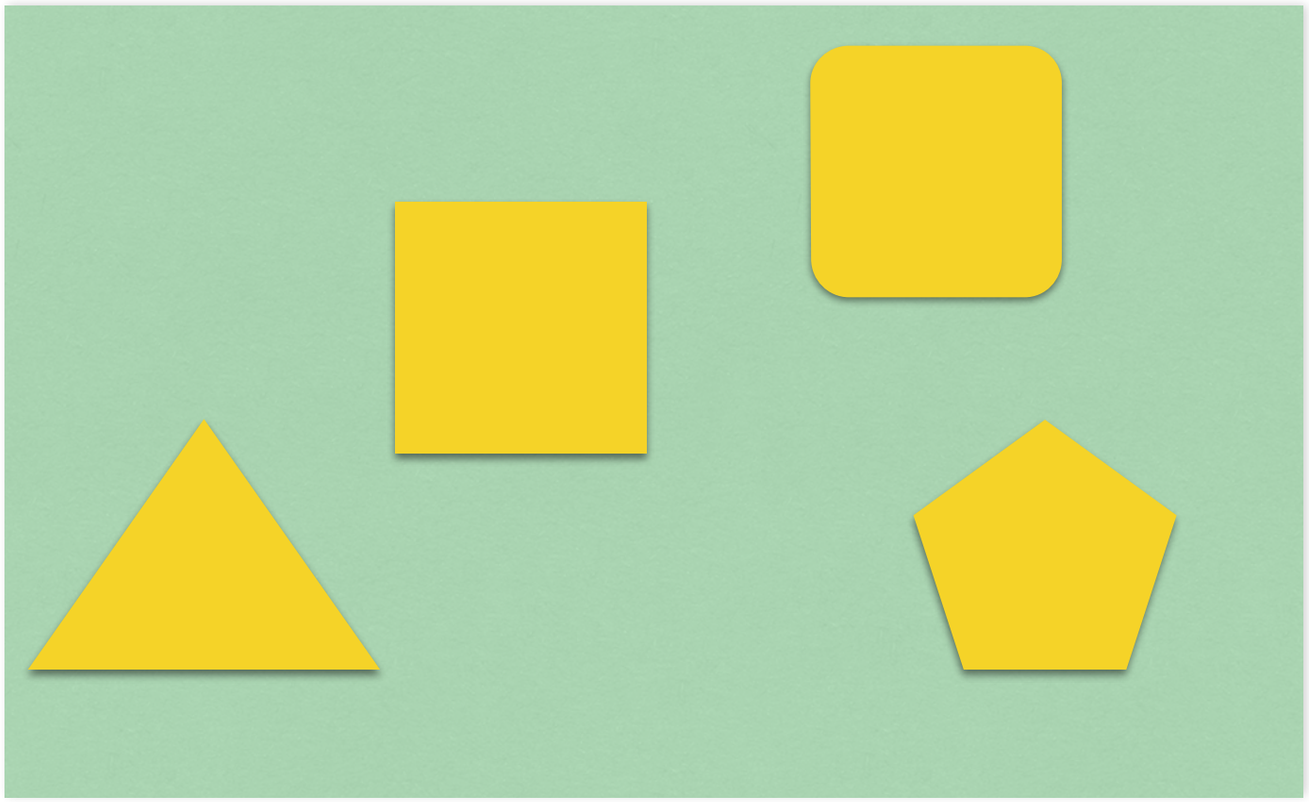


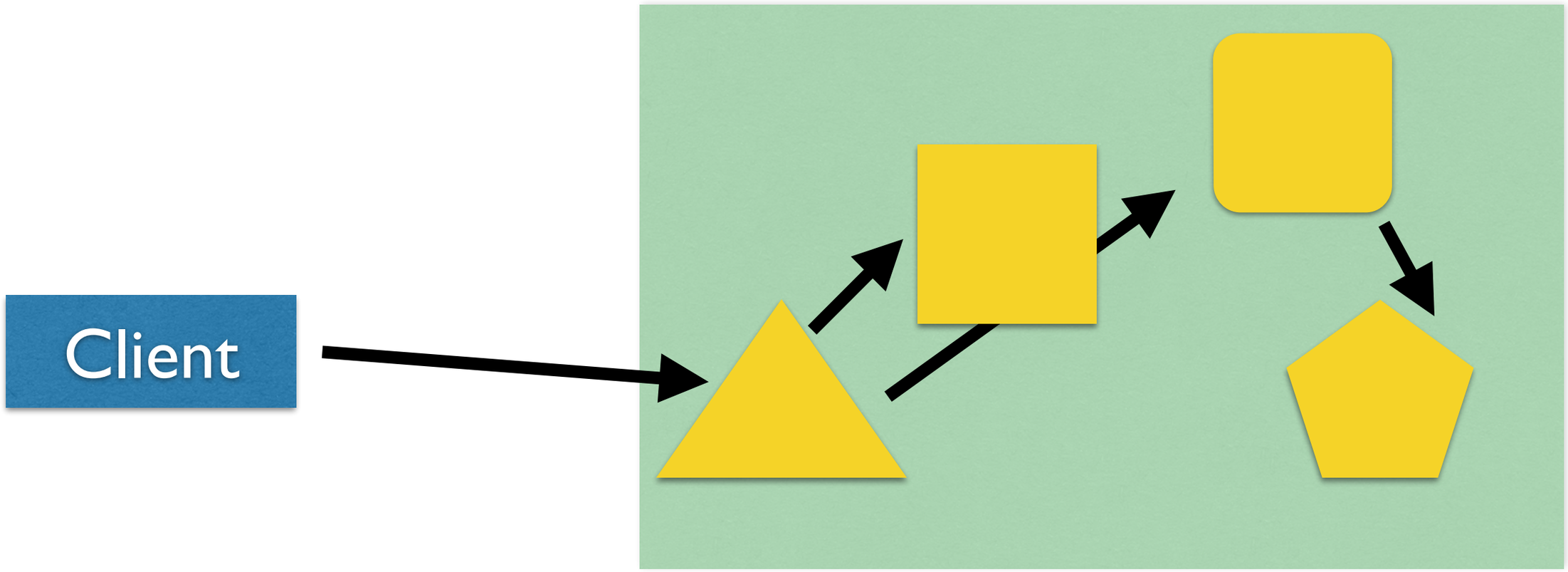
Example: Microservices



Client

Auth

Example: Microservices



Auth

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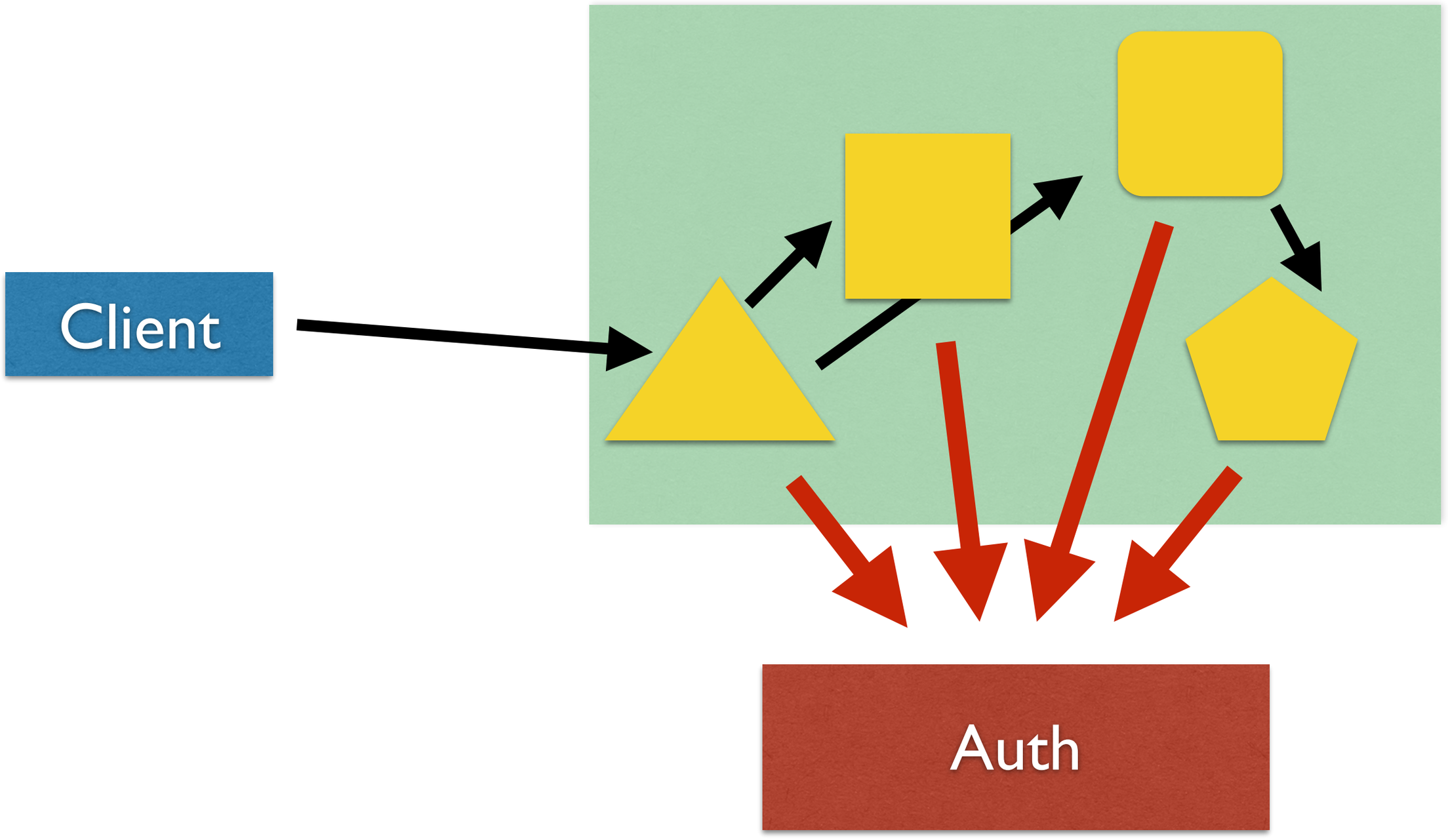

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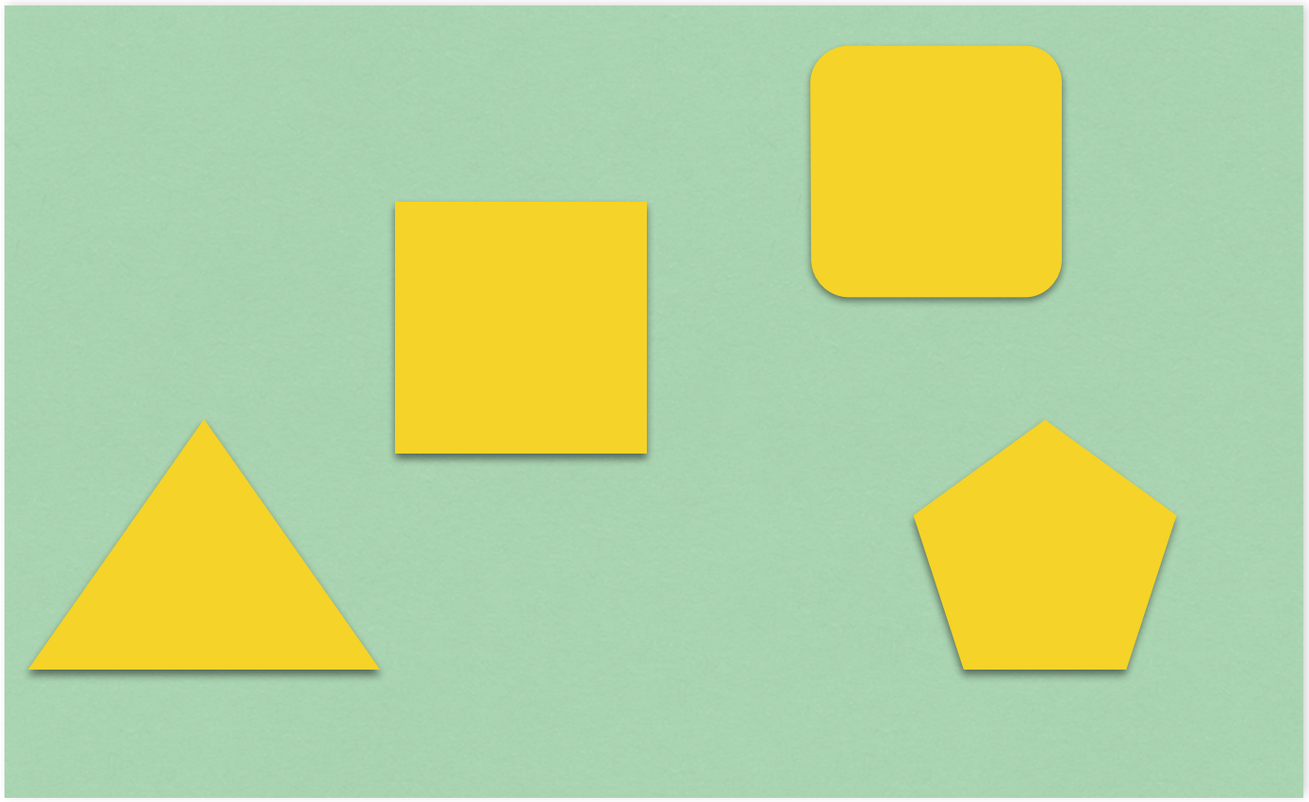

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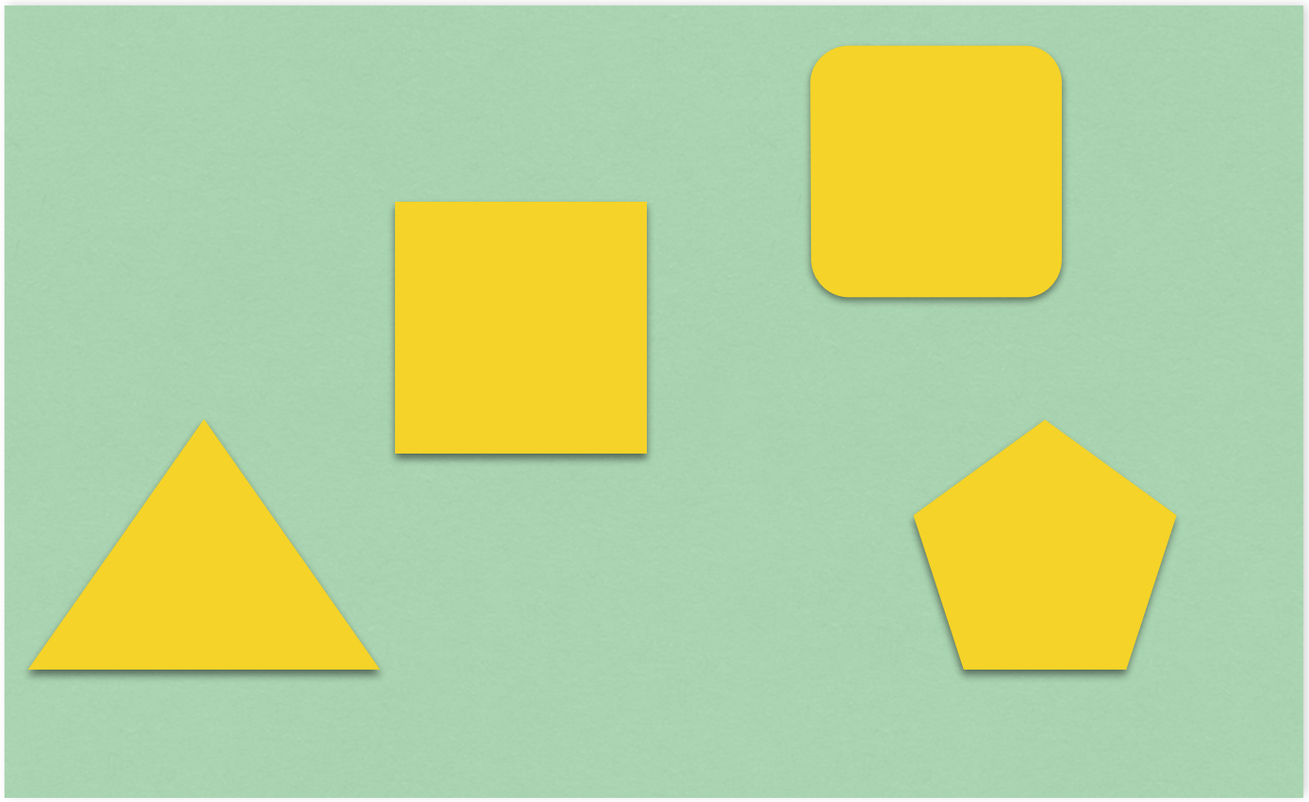

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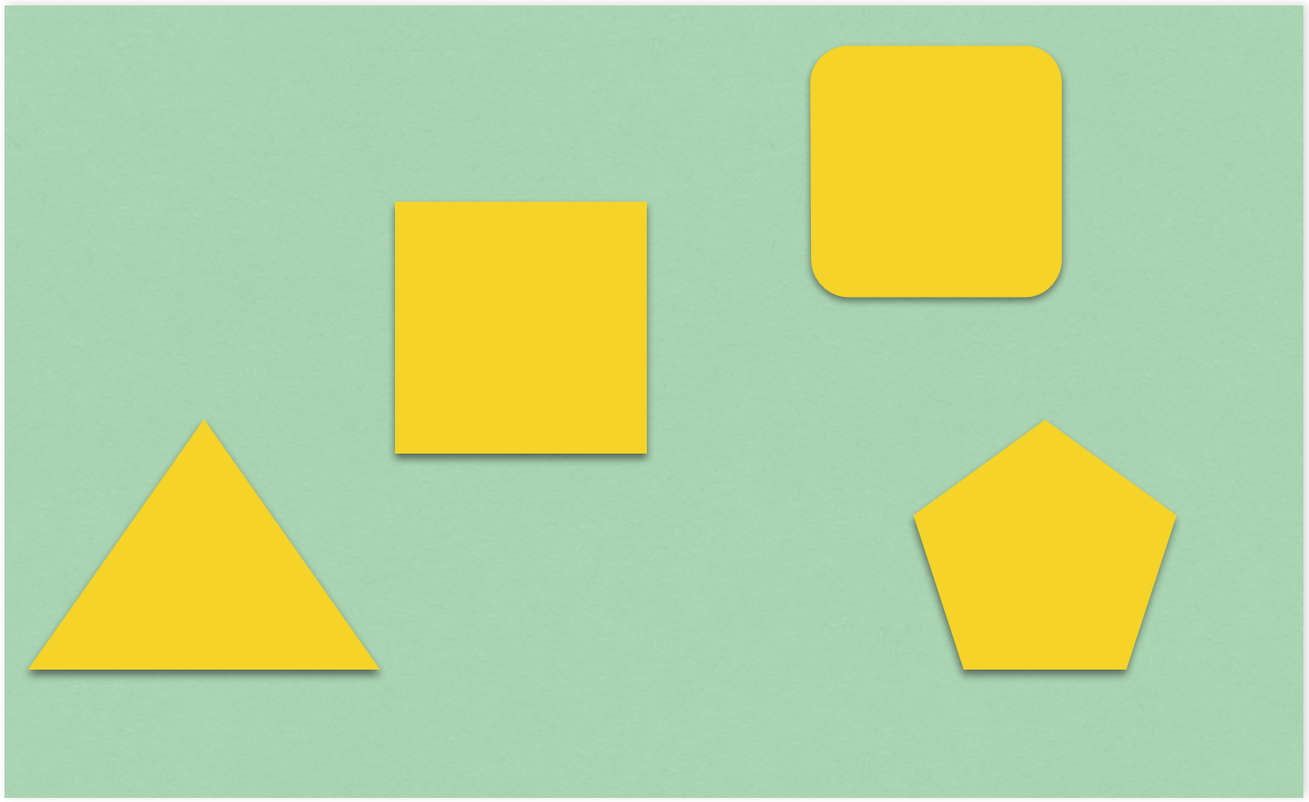

Client

T

Auth

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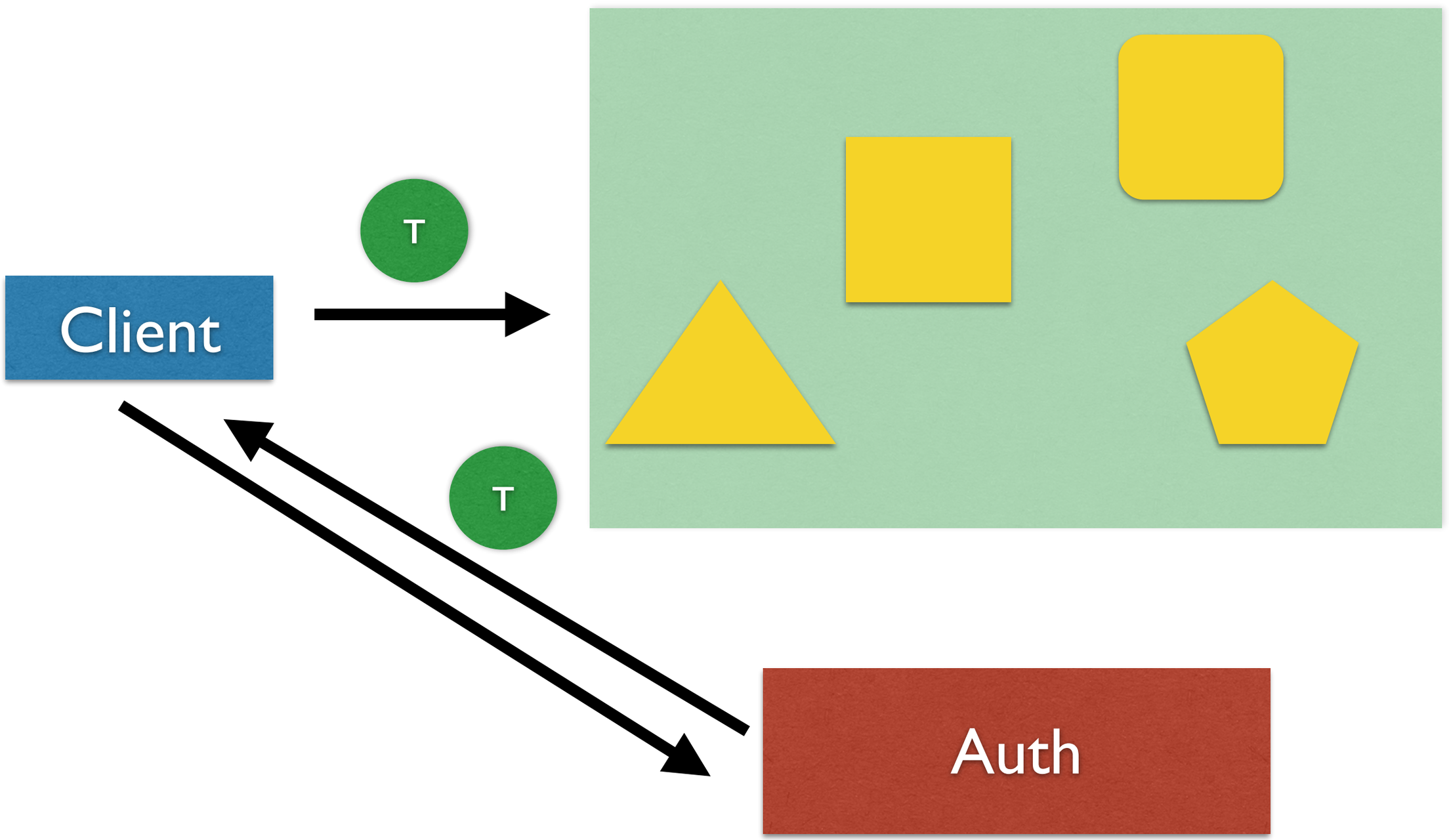

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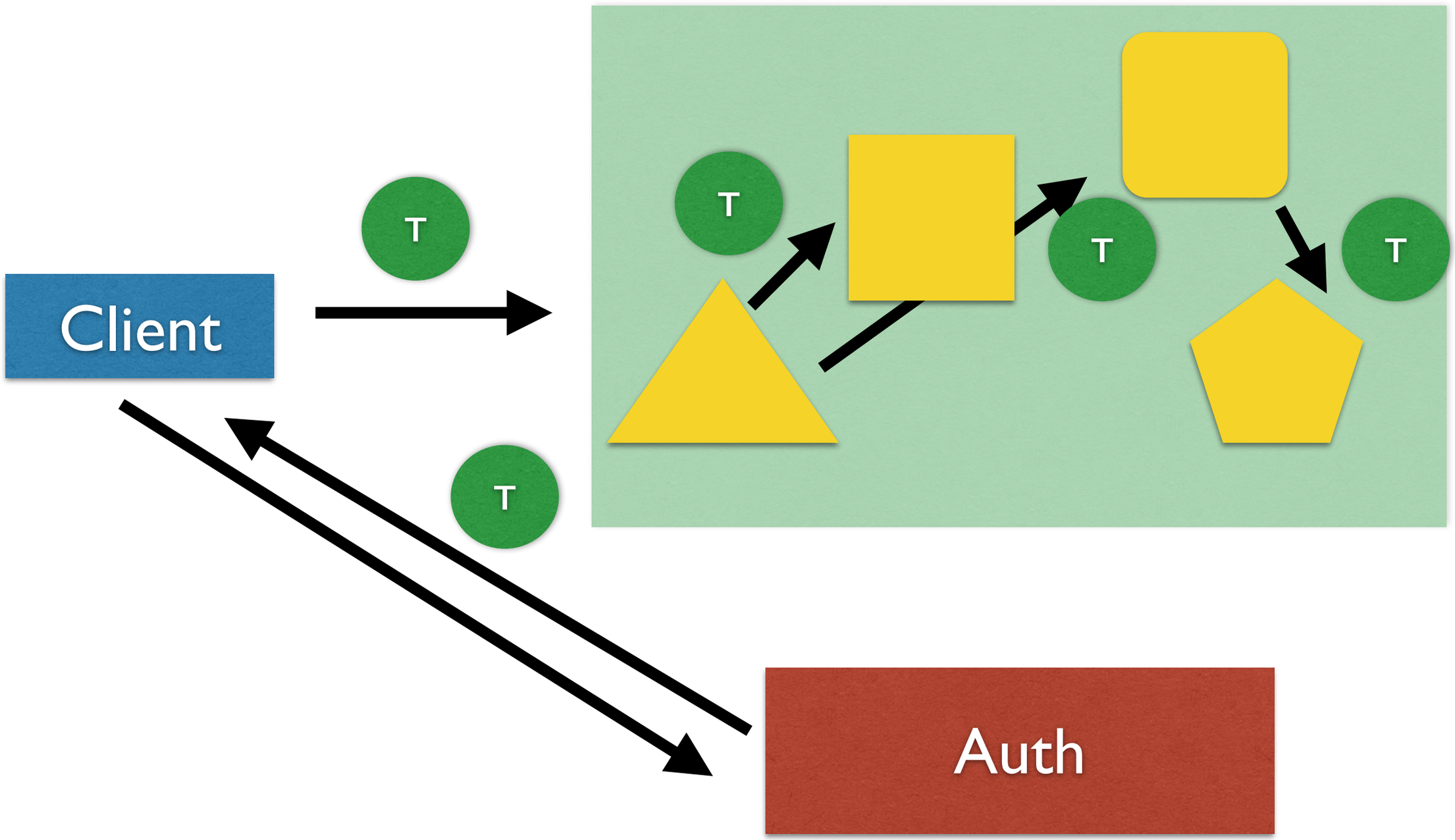

OAuth 2 for Single-Sign-On?

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- Token = “Authorization to access Resource”
  Resource could be = Login to Service

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- Missing:

When?

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Who?

When?

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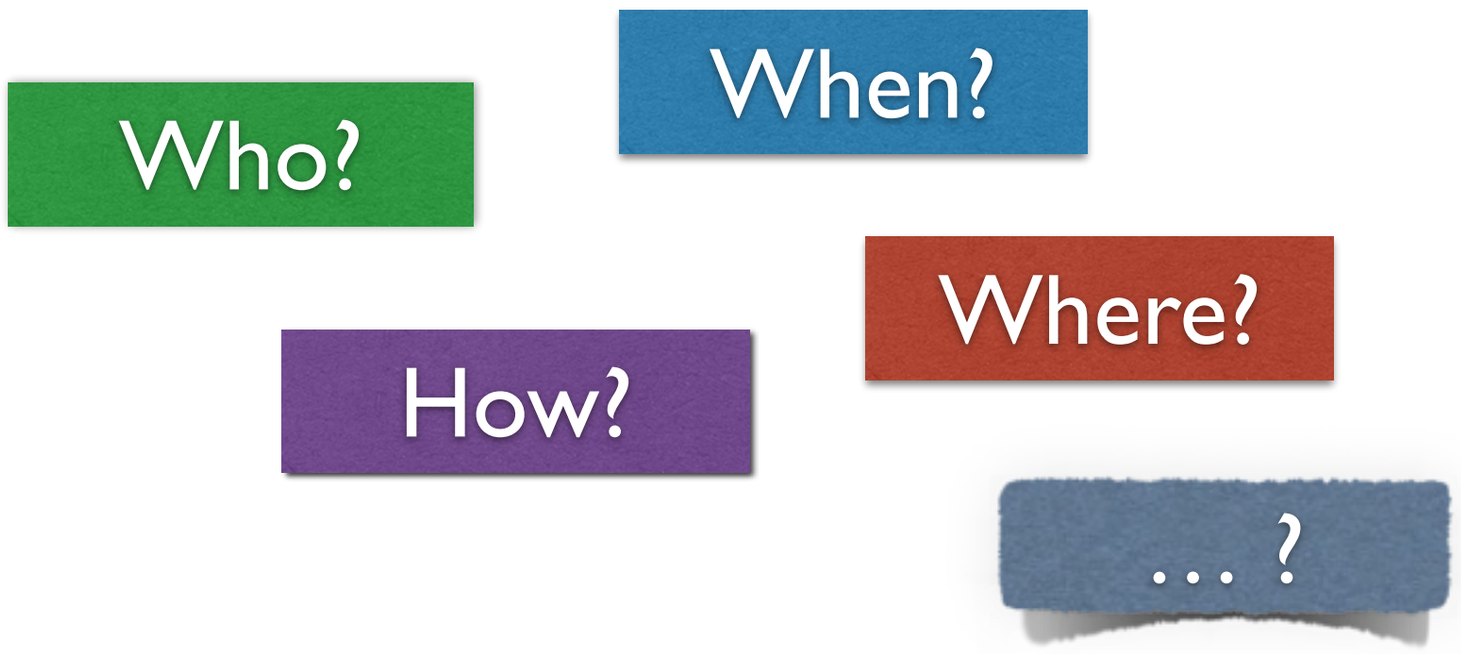
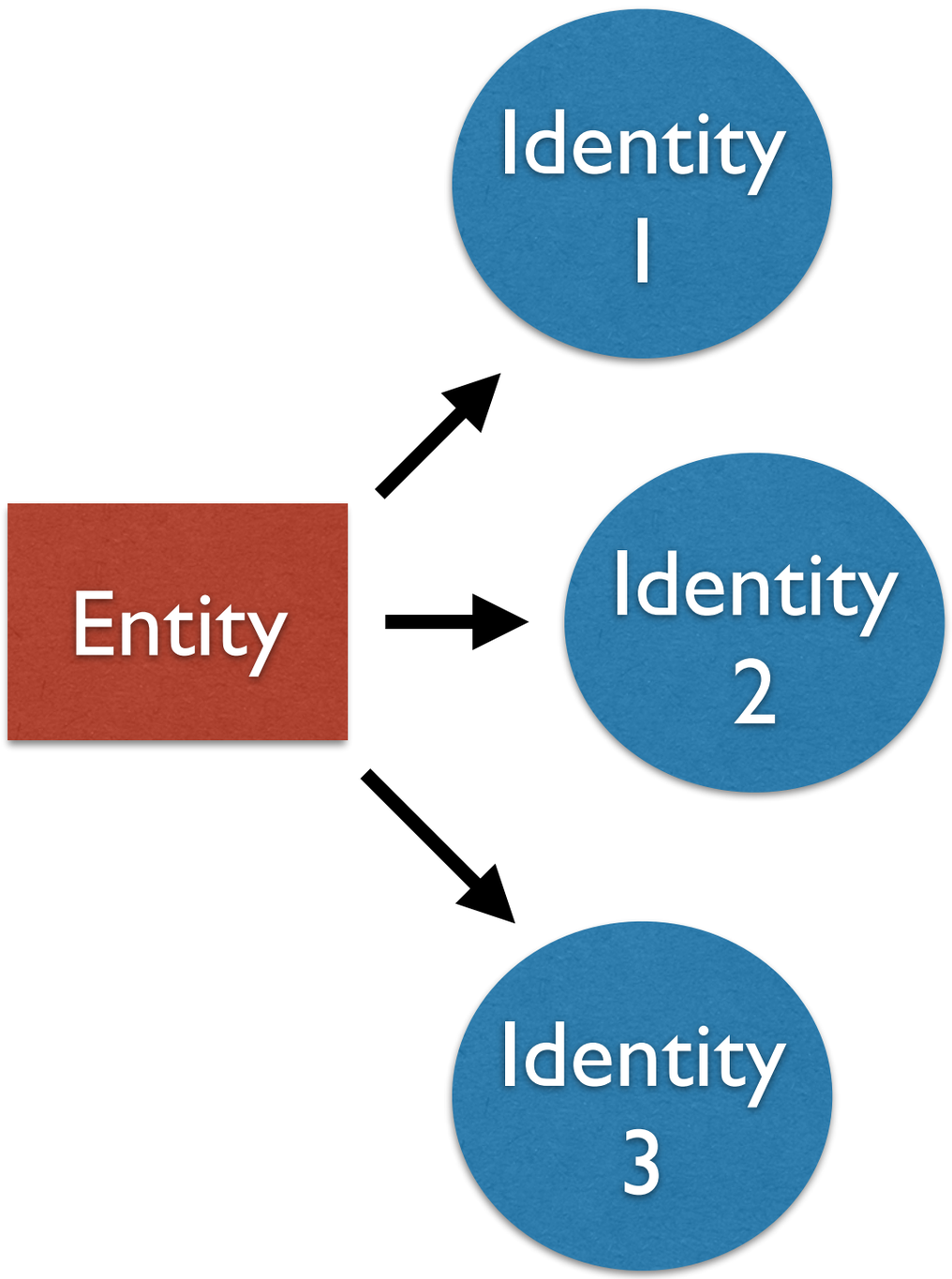


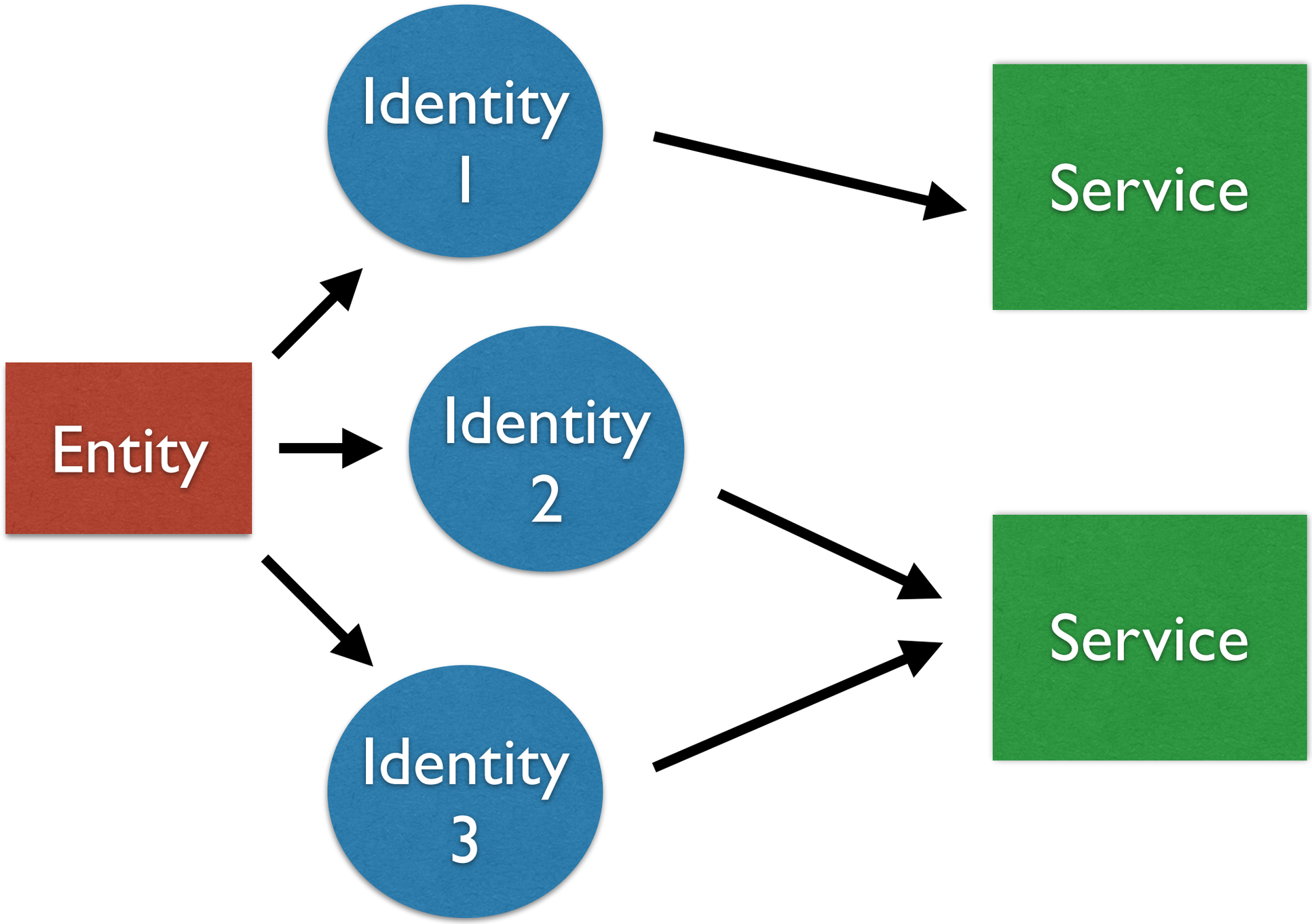
Identities

Entity

Identities



Identities



OpenID Connect

OpenID Connect

OpenID Connect

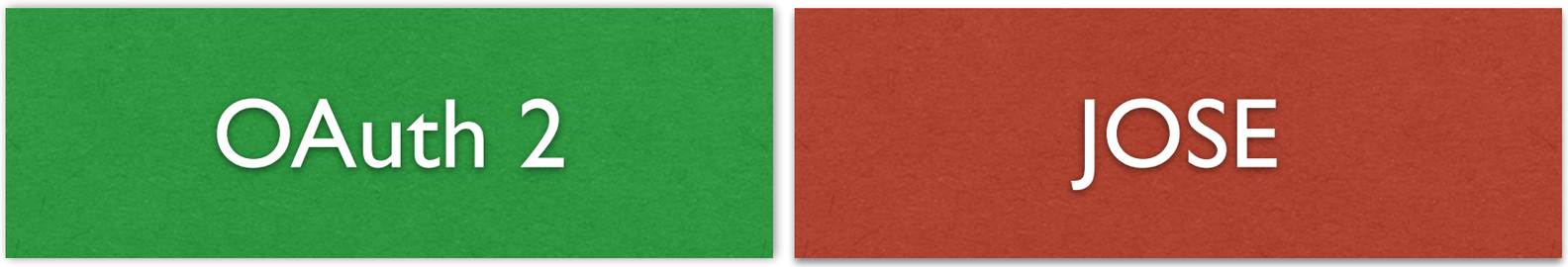
OpenID Connect

OAuth 2

OpenID Connect

OpenID Connect

Identity Layer



JWT Example

```
{
“typ”:”JWT”,
“alg”:”HS256”
}{
   "iss": "http://server.example.com",
   "sub": "248289761001",
   "aud": "s6BhdRkqt3",
   "exp": 1311281970,
   "iat": 1311280970,
   "nonce": "n-0S6_WzA2Mj",
   "name": "Jane Doe",
   "given_name": "Jane",
   "family_name": "Doe",
   "gender": "female",
   "birthdate": "0000-10-31",
   "email": “janedoe@example.com”,
   "email_verified": {"essential": true}
}
```

JWT Example

JWT Header

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{
“typ”:”JWT”,
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   "name": "Jane Doe",
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   "family_name": "Doe",
   "gender": "female",
   "birthdate": "0000-10-31",
   "email": “janedoe@example.com”,
   "email_verified": {"essential": true}
}
```

JWT Payload

JWT Example

Signature

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{
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   "aud": "s6BhdRkqt3",
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   "iat": 1311280970,
   "nonce": "n-0S6_WzA2Mj",
   "name": "Jane Doe",
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   "gender": "female",
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   "email": “janedoe@example.com”,
   "email_verified": {"essential": true}
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```

JWT Example Encoded


```
eyJhbGciOiJSUzI1NiIsInR5cCI6IkpXVCJ9.
eyJpc3MiOiJodHRwczovL2p3dC1pZHAuZXhhbXBsZS5j
b20iLCJzdWIiOiJtYWlsdG86bWlrZUBleGFtcGxlLmNv
bSIsIm5iZiI6MTQyOTY5MzY3MSwiZXhwIjoxNDI5Njk3
MjcxLCJpYXQiOjE0Mjk2OTM2NzEsImp0aSI6ImlkMTIz
NDU2IiwidHlwIjoiaHR0cHM6Ly9leGFtcGxlLmNvbS9y
ZWdpc3RlciJ9.
A3DVPjcIeQPGOkMcABwAe_8lWHvPG9dFhNyskwVfsxIL
t6SKtYGxYz0m7V-
DjzjYLXqzSwycwlRJBuYr_vdLRA9aoGsGQpP5-
SAiA5SdLMMk3MMZTIoSHgZrC8TeZx8bJBlPzkSu91dJI
uzKI8PRPp3DH8Tum-XDsCmqu3_uIl2633Mb1Bg4HKEz-
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m-
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PJ0IxA1awgP74tFS27rt8KLUDnBvWVATNfYDFrqAcFCj
zk49znd4JLvNObbDebka3_g
```

JWT Example Encoded

Header

```
eyJhbGciOiJSUzI1NiIsInR5cCI6IkpXVCJ9.
eyJpc3MiOiJodHRwczovL2p3dC1pZHAuZXhhbXBsZS5j
b20iLCJzdWIiOiJtYWlsdG86bWlrZUBleGFtcGxlLmNv
bSIsIm5iZiI6MTQyOTY5MzY3MSwiZXhwIjoxNDI5Njk3
MjcxLCJpYXQiOjE0Mjk2OTM2NzEsImp0aSI6ImlkMTIz
NDU2IiwidHlwIjoiaHR0cHM6Ly9leGFtcGxlLmNvbS9y
ZWdpc3RlciJ9.
A3DVPjcIeQPGOkMcABwAe_8lWHvPG9dFhNyskwVfsxIL
t6SKtYGxYz0m7V-
DjzjYLXqzSwycwlRJBuYr_vdLRA9aoGsGQpP5-
SAiA5SdLMMk3MMZTIoSHgZrC8TeZx8bJBlPzkSu91dJI
uzKI8PRPp3DH8Tum-XDsCmqu3_uIl2633Mb1Bg4HKEz-
q2L2Y6k2Z1bqFxRn2GfV3ziQ8uqGOp3V_UlwvPccX8F3
m-
qe3MrF5aPSFGoU9bZDcQcBQ2ypGTluBNYnPzuMx9EdET
PJ0IxA1awgP74tFS27rt8KLUDnBvWVATNfYDFrqAcFCj
zk49znd4JLvNObbDebka3_g
```

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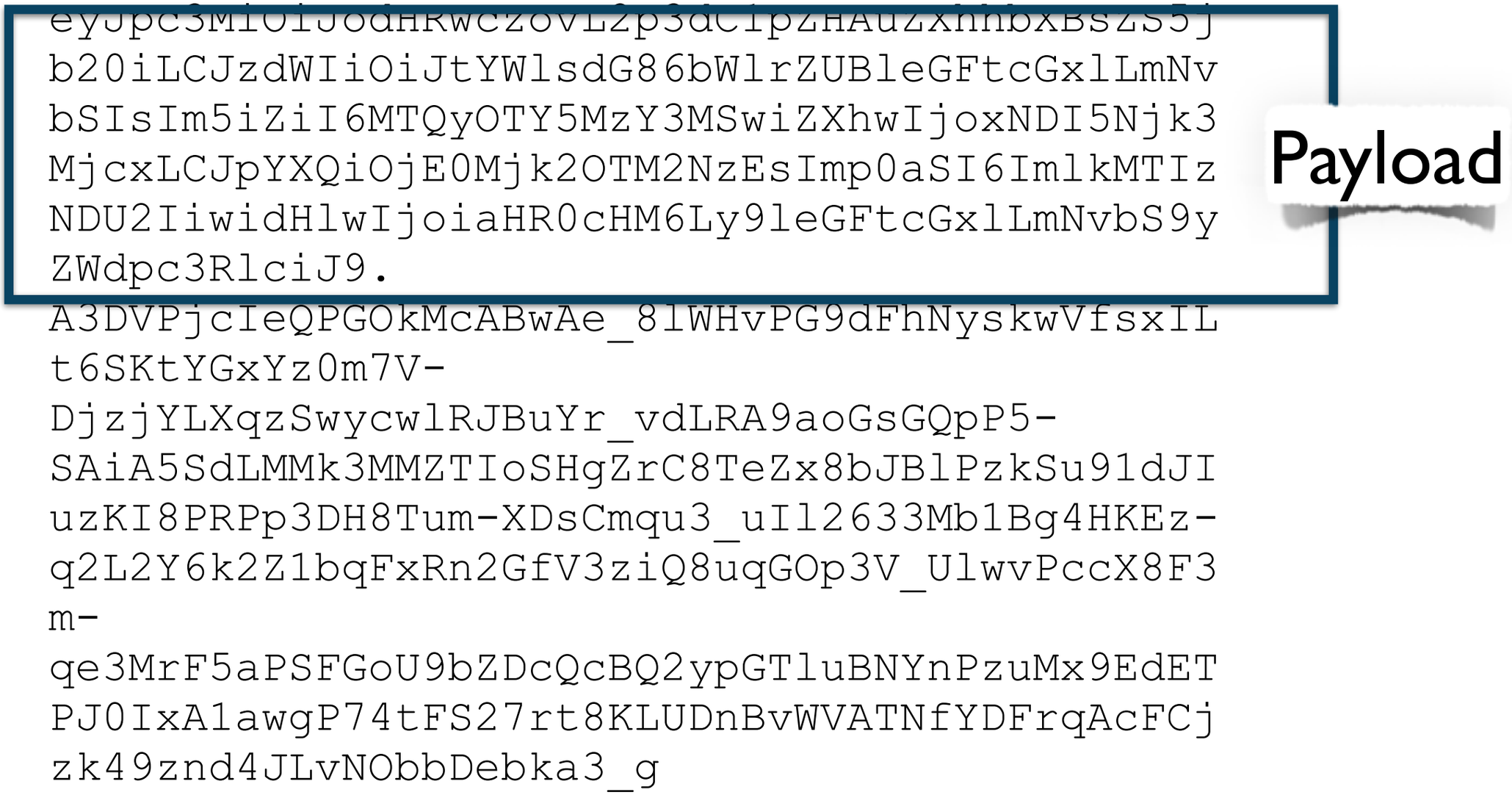

Payload

JWT Example Encoded


```
eyJhbGciOiJSUzI1NiIsInR5cCI6IkpXVCJ9.
eyJpc3MiOiJodHRwczovL2p3dC1pZHAuZXhhbXBsZS5j
b20iLCJzdWIiOiJtYWlsdG86bWlrZUBleGFtcGxlLmNv
bSIsIm5iZiI6MTQyOTY5MzY3MSwiZXhwIjoxNDI5Njk3
MjcxLCJpYXQiOjE0Mjk2OTM2NzEsImp0aSI6ImlkMTIz
NDU2IiwidHlwIjoiaHR0cHM6Ly9leGFtcGxlLmNvbS9y
ZWdpc3RlciJ9.
A3DVPjcIeQPGOkMcABwAe_8lWHvPG9dFhNyskwVfsxIL
t6SKtYGxYz0m7V-
DjzjYLXqzSwycwlRJBuYr_vdLRA9aoGsGQpP5-
SAiA5SdLMMk3MMZTIoSHgZrC8TeZx8bJBlPzkSu91dJI
uzKI8PRPp3DH8Tum-XDsCmqu3_uIl2633Mb1Bg4HKEz-
q2L2Y6k2Z1bqFxRn2GfV3ziQ8uqGOp3V_UlwvPccX8F3
m-
qe3MrF5aPSFGoU9bZDcQcBQ2ypGTluBNYnPzuMx9EdET
PJ0IxA1awgP74tFS27rt8KLUDnBvWVATNfYDFrqAcFCj
zk49znd4JLvNObbDebka3_g
```


Signature

JWT Example Encoded


```
eyJhbGciOiJSUzI1NiIsInR5cCI6IkpXVCJ9.
eyJpc3MiOiJodHRwczovL2p3dC1pZHAuZXhhbXBsZS5j
b20iLCJzdWIiOiJtYWlsdG86bWlrZUBleGFtcGxlLmNv
bSIsIm5iZiI6MTQyOTY5MzY3MSwiZXhwIjoxNDI5Njk3
MjcxLCJpYXQiOjE0Mjk2OTM2NzEsImp0aSI6ImlkMTIz
NDU2IiwidHlwIjoiaHR0cHM6Ly9leGFtcGxlLmNvbS9y
ZWdpc3RlciJ9.
A3DVPjcIeQPGOkMcABwAe_8lWHvPG9dFhNyskwVfsxIL
t6SKtYGxYz0m7V-
DjzjYLXqzSwycwlRJBuYr_vdLRA9aoGsGQpP5-
SAiA5SdLMMk3MMZTIoSHgZrC8TeZx8bJBlPzkSu91dJI
uzKI8PRPp3DH8Tum-XDsCmqu3_uIl2633Mb1Bg4HKEz-
q2L2Y6k2Z1bqFxRn2GfV3ziQ8uqGOp3V_UlwvPccX8F3
m-
qe3MrF5aPSFGoU9bZDcQcBQ2ypGTluBNYnPzuMx9EdET
PJ0IxA1awgP74tFS27rt8KLUDnBvWVATNfYDFrqAcFCj
zk49znd4JLvNObbDebka3_g
```

ID Token Example

```
{
“typ”:”JWT”,
“alg”:”HS256”
}{
   "iss": "http://server.example.com",
   "sub": "248289761001",
   "aud": "s6BhdRkqt3",
   "exp": 1311281970,
   "iat": 1311280970,
   "nonce": "n-0S6_WzA2Mj",
   "name": "Jane Doe",
   "given_name": "Jane",
   "family_name": "Doe",
   "gender": "female",
   "birthdate": "0000-10-31",
   "email": “janedoe@example.com”,
   "email_verified": {"essential": true}
}
```

ID Token Example

```
{
“typ”:”JWT”,
“alg”:”HS256”
}{
   "iss": "http://server.example.com",
   "sub": "248289761001",
   "aud": "s6BhdRkqt3",
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   "name": "Jane Doe",
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   "family_name": "Doe",
   "gender": "female",
   "birthdate": "0000-10-31",
   "email": “janedoe@example.com”,
   "email_verified": {"essential": true}
}
```

Claim

ID Token Example

```
{
“typ”:”JWT”,
“alg”:”HS256”
}{
   "iss": "http://server.example.com",
   "sub": "248289761001",
   "aud": "s6BhdRkqt3",
   "exp": 1311281970,
   "iat": 1311280970,
   "nonce": "n-0S6_WzA2Mj",
   "name": "Jane Doe",
   "given_name": "Jane",
   "family_name": "Doe",
   "gender": "female",
   "birthdate": "0000-10-31",
   "email": “janedoe@example.com”,
   "email_verified": {"essential": true}
}
```

mandatory Claims

ID Token Example

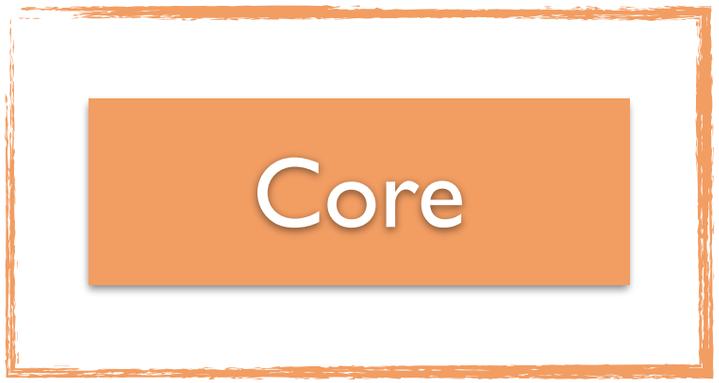
```
{
“typ”:”JWT”,
“alg”:”HS256”
}{
   "iss": "http://server.example.com",
   "sub": "248289761001",
   "aud": "s6BhdRkqt3",
   "exp": 1311281970,
   "iat": 1311280970,
   "nonce": "n-0S6_WzA2Mj",
   "name": "Jane Doe",
   "given_name": "Jane",
   "family_name": "Doe",
   "gender": "female",
   "birthdate": "0000-10-31",
   "email": “janedoe@example.com”,
   "email_verified": {"essential": true}
}
```

scope E-Mail

ID Token Example

```
{
“typ”:”JWT”,
“alg”:”HS256”
}{
   "iss": "http://server.example.com",
   "sub": "248289761001",
   "aud": "s6BhdRkqt3",
   "exp": 1311281970,
   "iat": 1311280970,
   "nonce": "n-0S6_WzA2Mj",
   "name": "Jane Doe",
   "given_name": "Jane",
   "family_name": "Doe",
   "gender": "female",
   "birthdate": "0000-10-31",
   "email": “janedoe@example.com”,
   "email_verified": {"essential": true}
}
```

OpenID Connect Modules



OpenID Connect Modules

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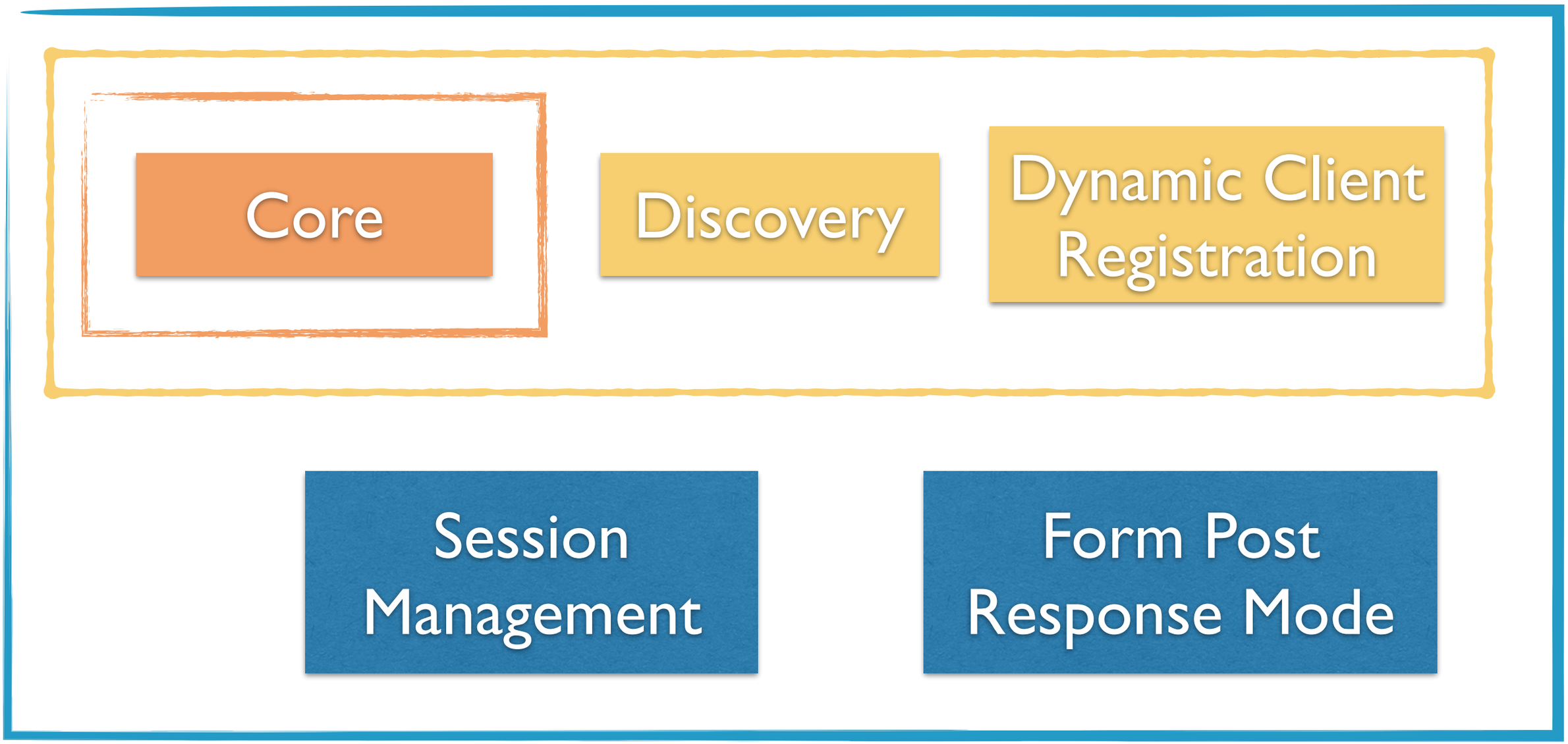

Enterprise Use Cases

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- Securing internal APIs

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- Active Directory

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- Securing internal APIs
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Enterprise Use Cases

- Securing internal APIs
- Single-Sign-On
- Active Directory
- Mobile Clients
- White Label Software

Should I use it?

- OpenID Connect Extensions still partly Working Drafts

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- JOSE still Working Draft
- OAuth Extensions: PoP, etc.

Should I use it?

- OpenID Connect Extensions still partly Working Drafts
- JOSE still Working Draft
- OAuth Extensions: PoP, etc.
- Implementation Complexity

Thank you!

Questions?

Comments?

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