Advanced API Security

ITANA Group

Nuwan Dias

Architect

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Agenda

- Introduction to API Security
- WSO2 API Security Architecture
- API Authentication
- API Authorization
- Fine Grained Access Control
- Providing Javascript Apps secure access to APIs
- Securing B2B APIs using OAuth2.0
- Data Redaction

HTTP Basic Authentication

- **Creating a GitHub repository**

```
curl -I
    -u $GitHubUserName:$GitHubPassword
    -X POST -H 'Content-Type: application/x-www-form-urlencoded’
    -d '{"name": "my_github_repo"}'
    https://api.github.com/user/repos
```

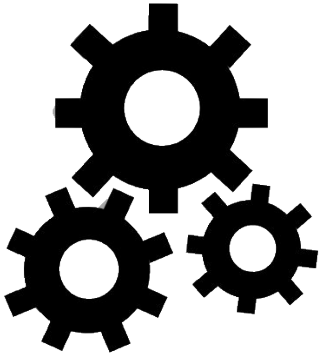
```
Authorization: Basic QWxhZGRpbjpPcGVuU2VzYW1l
```

API Security is about controlling Access Delegation

People

Apps

APIs

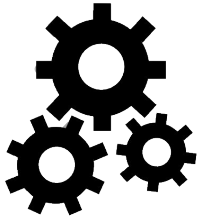


OAuth2.0

- A Framework that has mastered the art of Access Delegation.
- Depends on SSL/TLS.
- Caters a wide variety of use cases via Grant Types.

Resource Owner

Client Application



Resource Server

Authorization Server

OAuth2.0

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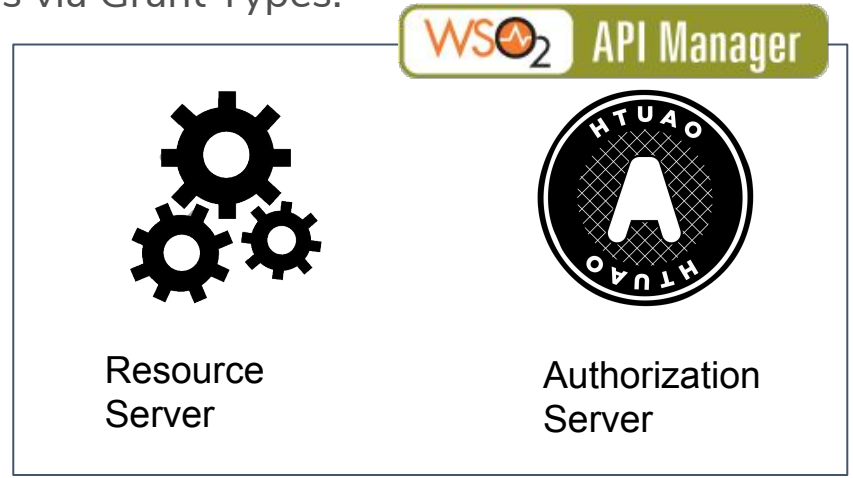

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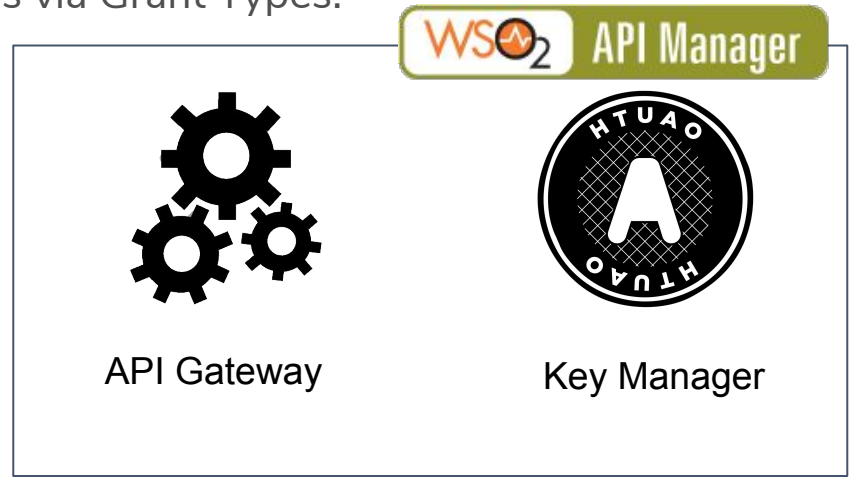
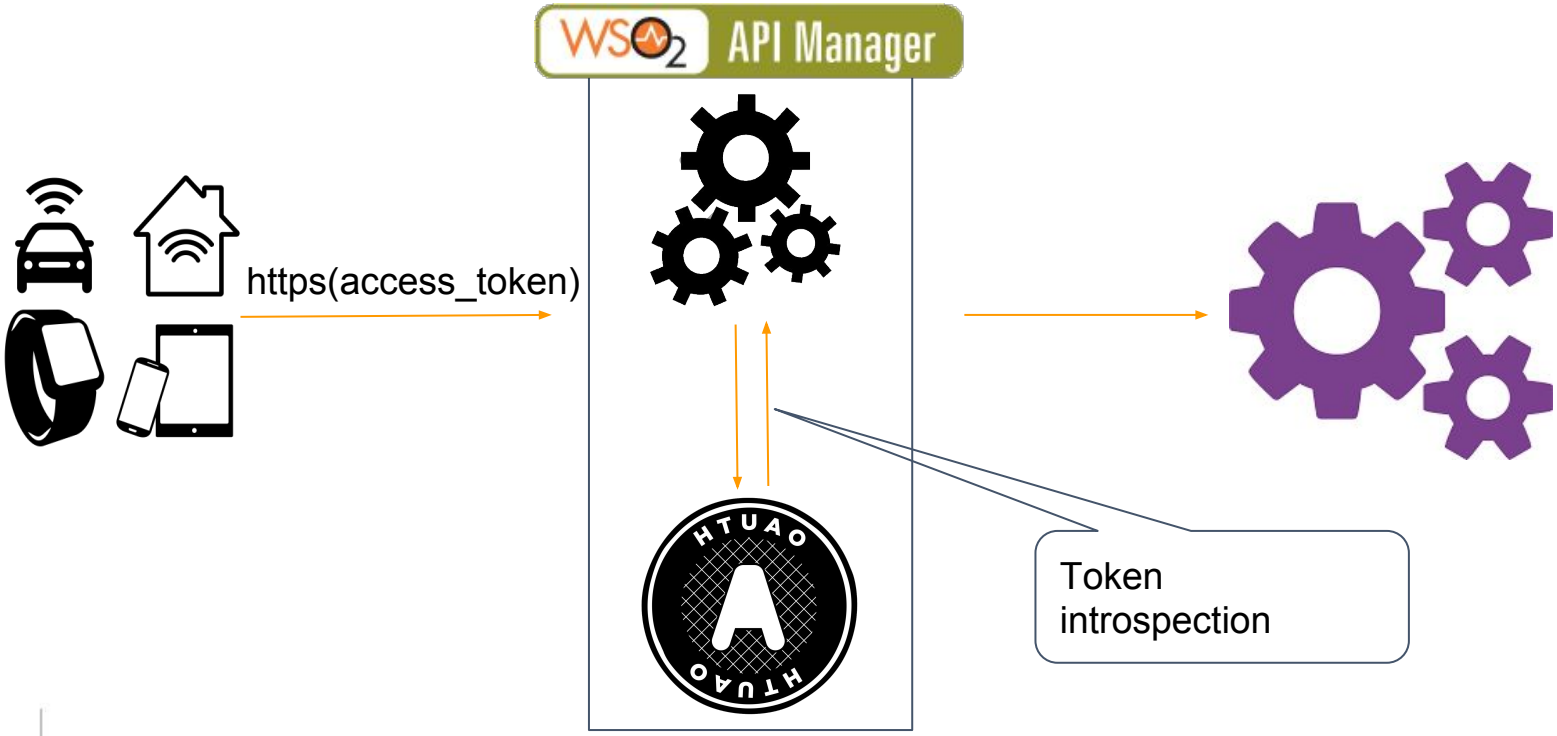


WSO2 API Security Architecture



API Authentication - Getting an Access Token

- Access Token Request

curl -k -d "grant_type=password&username=<username>&password=<password>" -H "Authorization :Basic base64encode(consumer-key:consumer-secret), Content-Type: application/x-www-form-urlencoded" https://localhost:8243/token

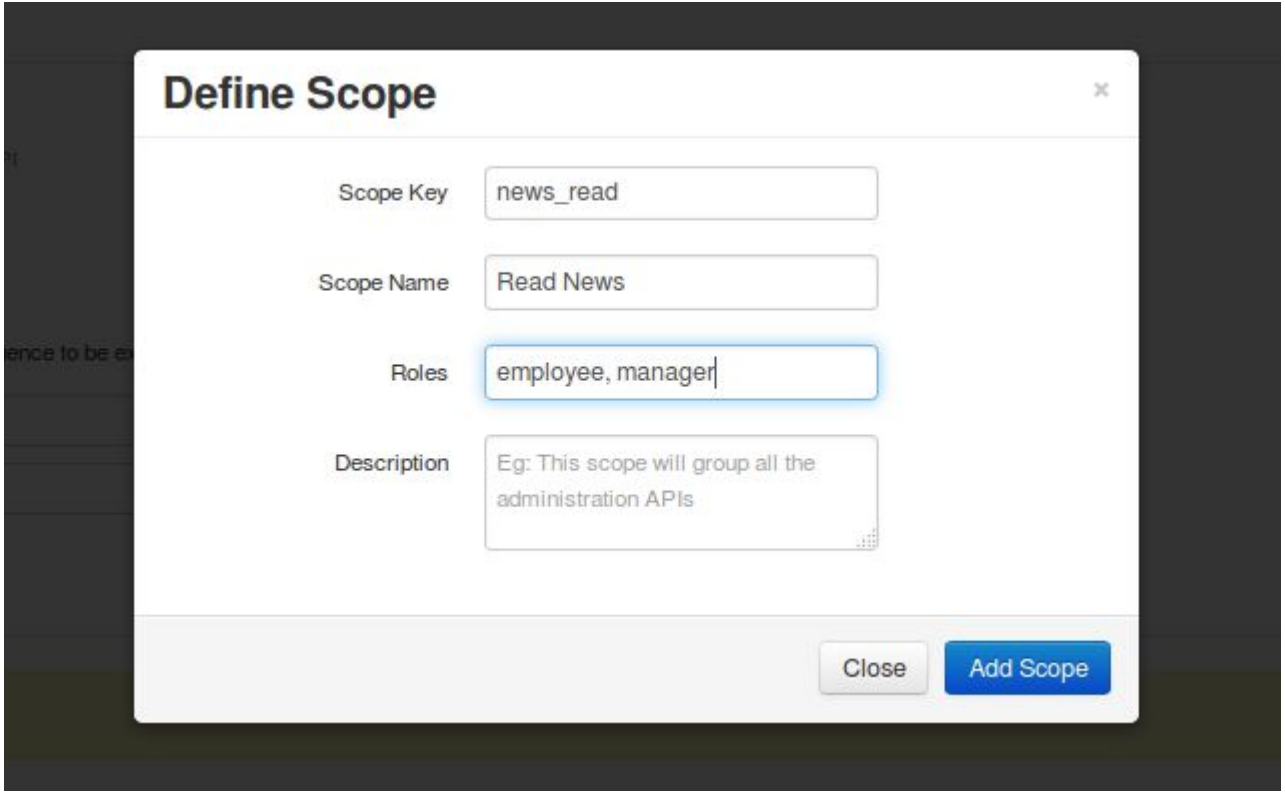
- Access Token Response

{"token_type":"bearer","expires_in":3600,
"refresh_token":"8579facb65d1d3eba74a395a2e78dd6",
"access_token":"**eb51eff0b4d85cda1eb1d312c5b6a3b8**"}

API Authorization - Scopes

- A scope defines an action to be performed.
- A scope can be bound to one or many roles/groups.
- A scope can be attached to one or more API Resources.
- Scopes are granted to an access tokens.
- Scopes have to be requested for when requesting for the access token.

API Authorization - Scopes



API Authorization - Scopes

Resources

Scopes

- **news_read : Read News**
  Roles : employee, manager
- **news_write : Post News**
  Roles : manager

Add Scopes

/read

GET /read + Summary Application & Application User Unlimited **Read News**

/write

POST /write + Summary Application & Application User Unlimited **Post News**

Getting an Access Token with Scope(s)

- Access Token Request

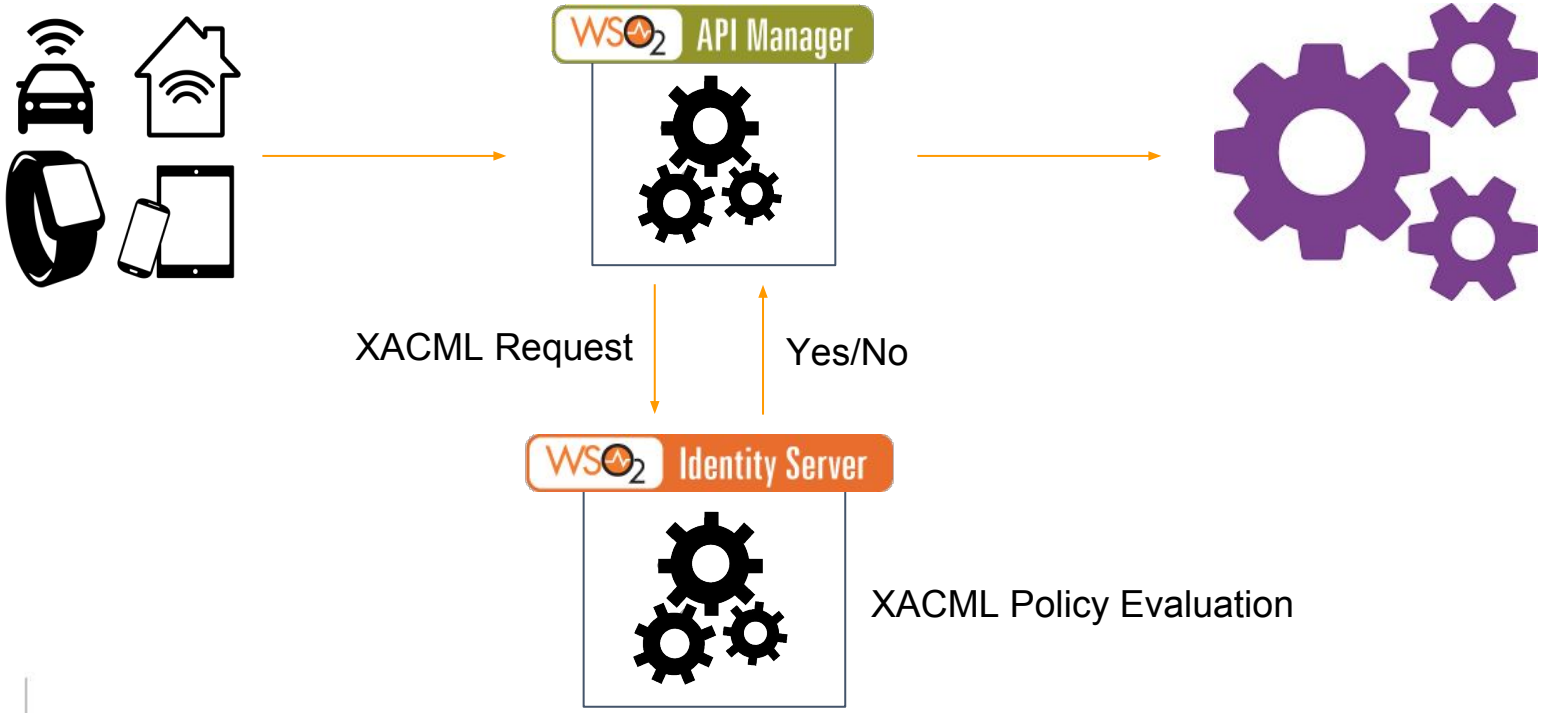
curl -k -d "grant_type=password&username=<username>&password=<password>&**scope=news_read news_write**" -H "Authorization :Basic base64encode(consumer-key:consumer-secret), Content-Type: application/x-www-form-urlencoded" https://localhost:8243/token

- Access Token Response

{**"scope":"news_read"**, "token_type":"bearer","expires_in":3600,
"refresh_token":"8579facb65d1d3eba74a395a2e78dd6",
"access_token":"eb51eff0b4d85cda1eb1d312c5b6a3b8"}

Fine Grained Access Control using Policies

- XACML provides a way to perform policy based fine grained access control



XACML Reference Architecture

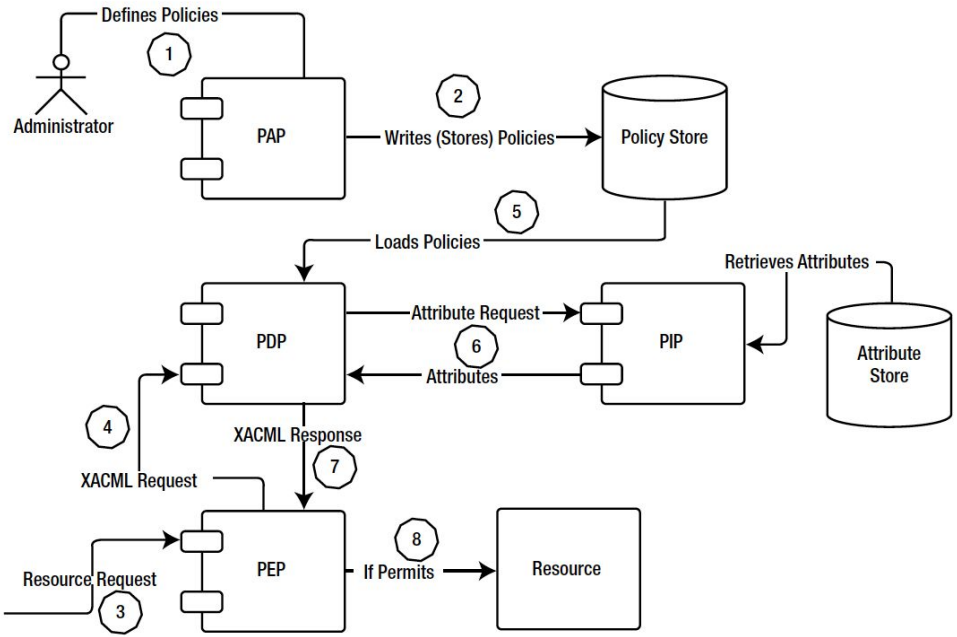


Image Credits: Advanced API Security by Prabath Siriwardena

OAuth2.0 - Implicit Grant

- The problem - Javascript Applications aren't capable of securely storing sensitive information.

- The solution - The implicit Grant protocol doesn't require the client application to store sensitive information nor expects the user to provide credentials to the client application.

- The token is sent in a redirect URL to the browser as a URI fragment. URI Fragments are not submitted to the server and only accessible by Javascript.

*https://myexamplecallback.com/#**access_token=asdfwe-asdab243-asn3sl**&expires_in=3600*

OAuth2.0 - Implicit Grant

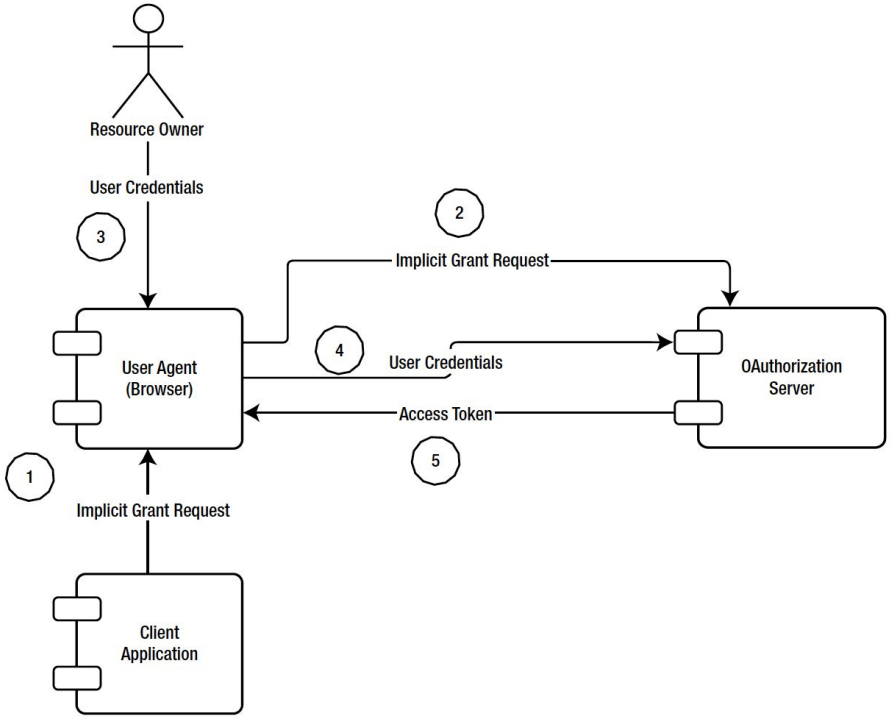
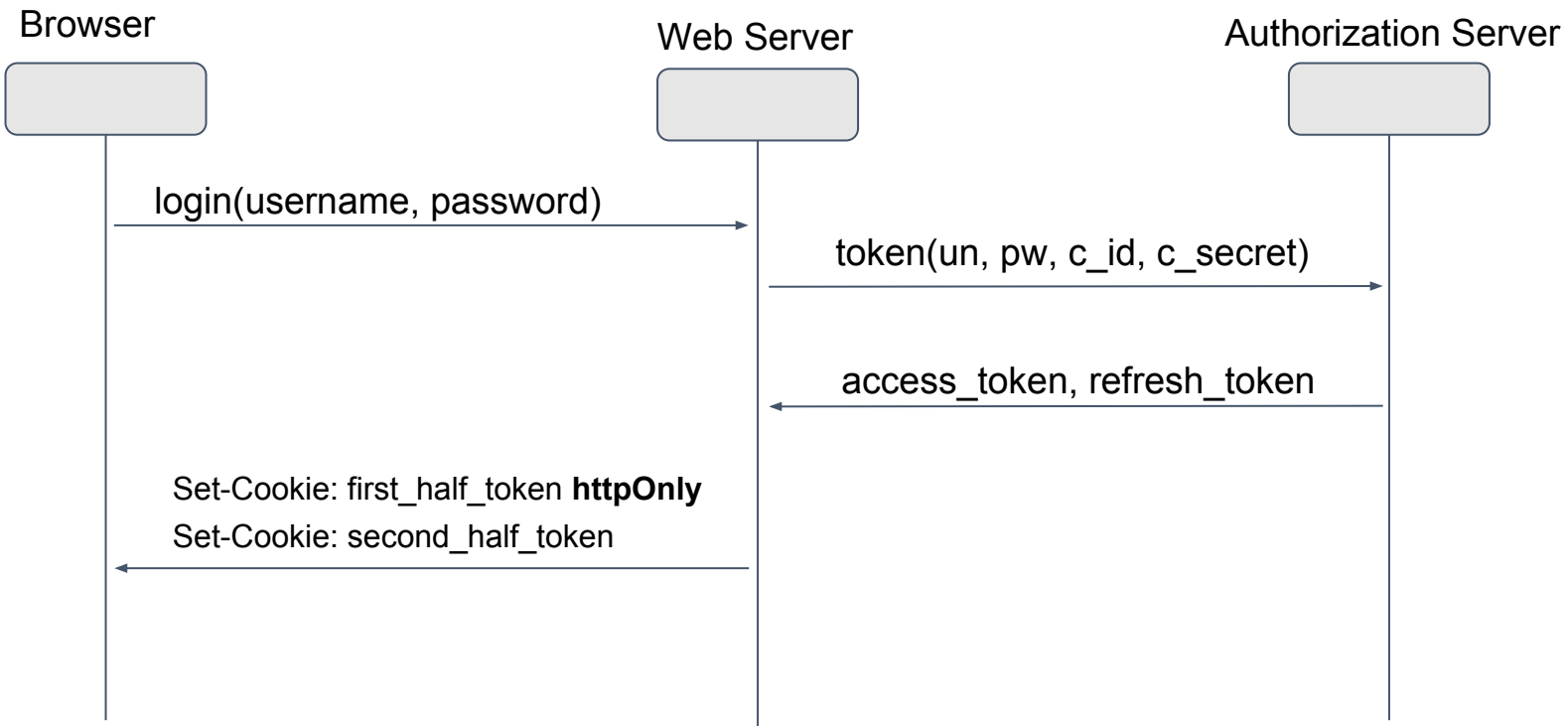


Image Credits: Advanced API Security by Prabath Siriwardena

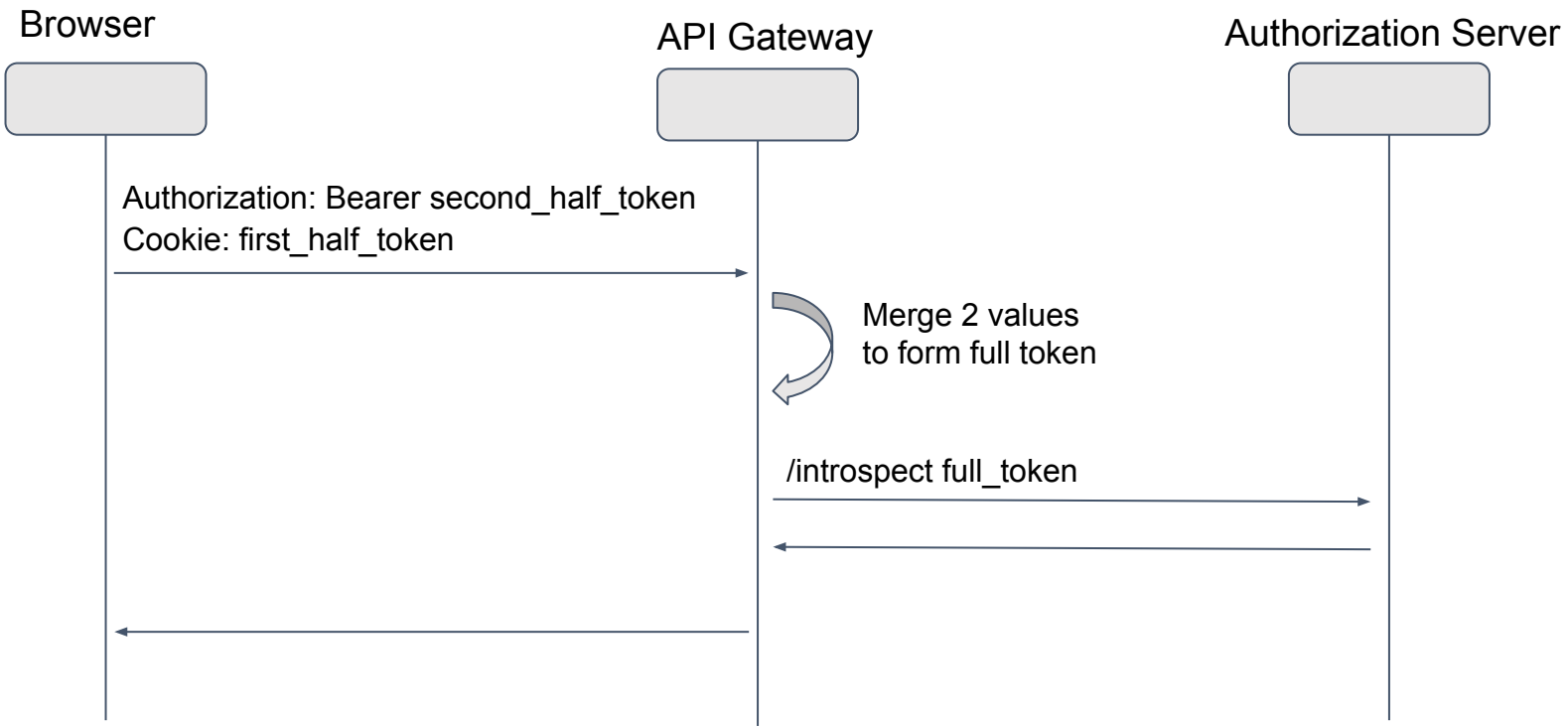
Few drawbacks with the Implicit Grant

- Does not have a refresh token - Forces users to re-login when token expires
- Vulnerable to XSS attacks - If the site is vulnerable to XSS, an attacker can steal the token

A possible alternative - The split token pattern



Split token pattern - Token Validation

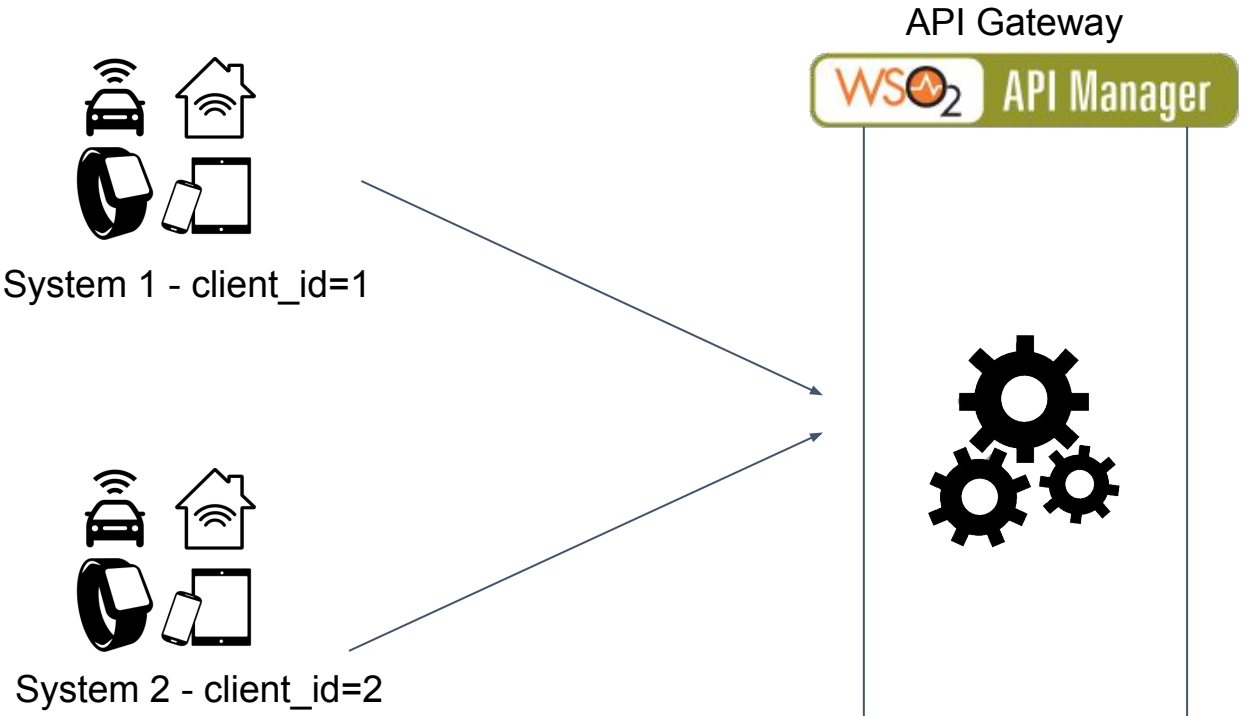


Securing B2B APIs using OAuth

- The problem - B2B do not have a human interaction. This can result in complications when a user is required to authenticate himself to get a token.

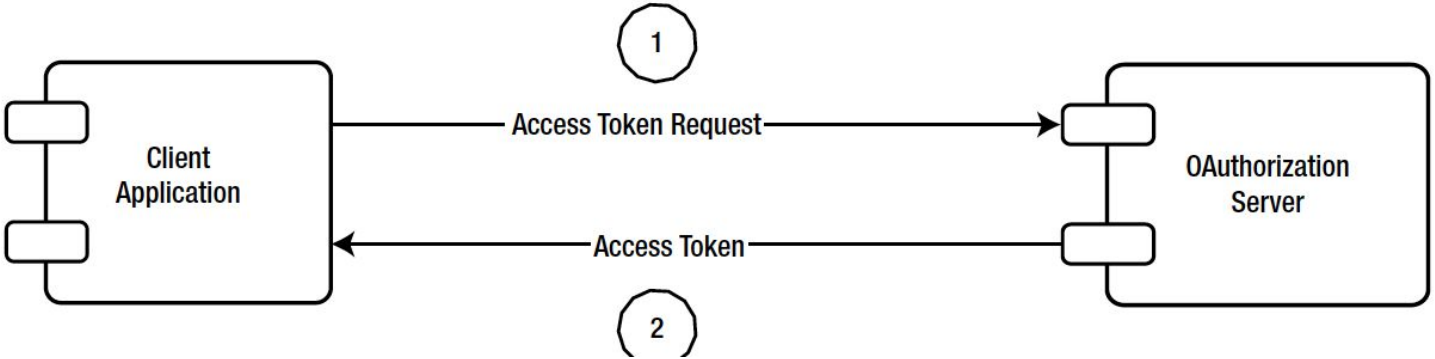
- The solutions -
  - client_credentials grant - For unique client applications (no resource owner)
  - JWT grant - For reusable client applications with a resource owner

client_credentials grant



client_credentials grant

```
curl -v -X POST --basic
        -u OrhQErXIX49svVYoXJGtODWBuFca:eYOFkL756W8usQaVNgCNkz9C2DOa
        -H "Content-Type:application/x-www-form-urlencoded;
                        charset=UTF-8" -k
        -d "grant_type=client_credentials" https://localhost:9443/oauth2/token
```



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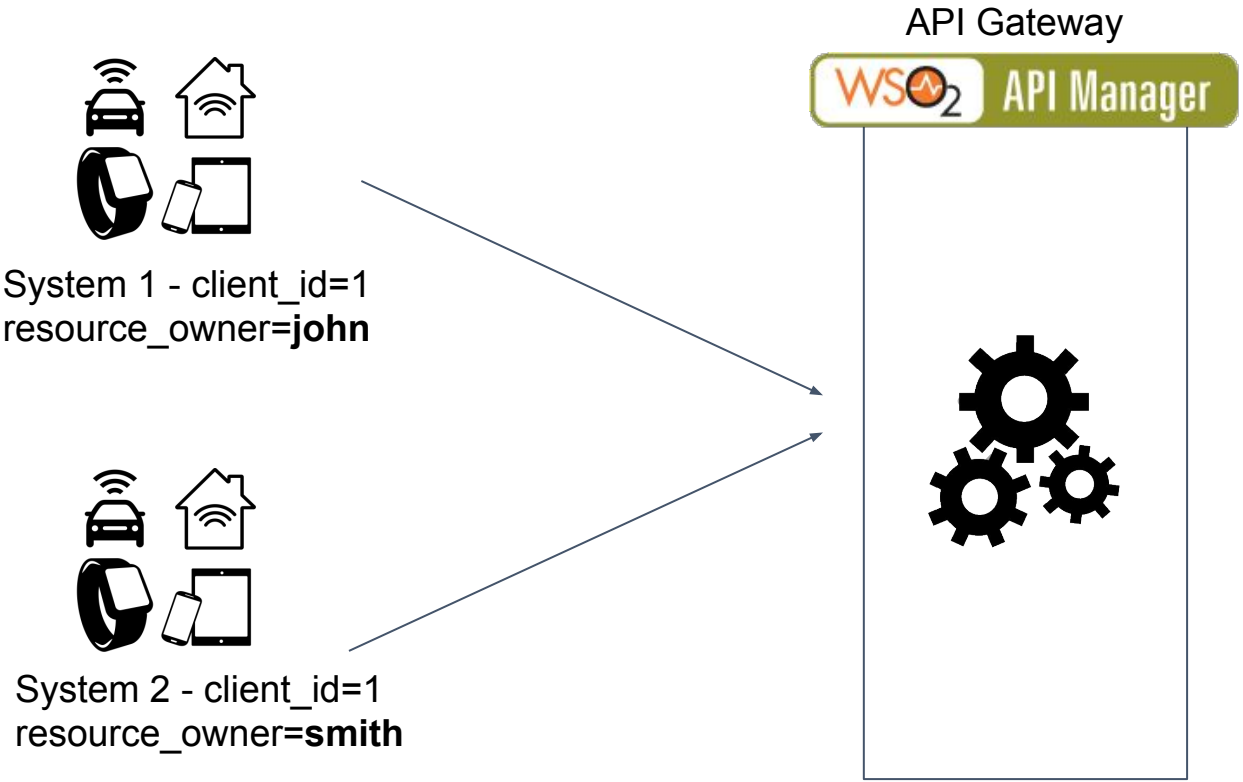
JWT Grant


API Gateway
WSO2 API Manager
System 1 - client_id=1
resource_owner=**john**
System 2 - client_id=1
resource_owner=**smith**

JWT

eyJhbGciOiJSUzI1NiJ9.eyJleHAiOjE0NjEyMzM5ND.OYUJyfR_UhKuPWNJw

JWT Header | JWT Payload | JWT Signature

Sample Header


```
{
  "alg": "RS256"
}
```


Sample Payload


```
{
  "exp": 1458166985,
  "sub": "john",
  "nbf": 1458106985,
  "aud": [
    "https://localhost:9443/oauth2/token",
    "wso2-IS"
  ],
  ……...
}
```

JWT Grant

Client Application

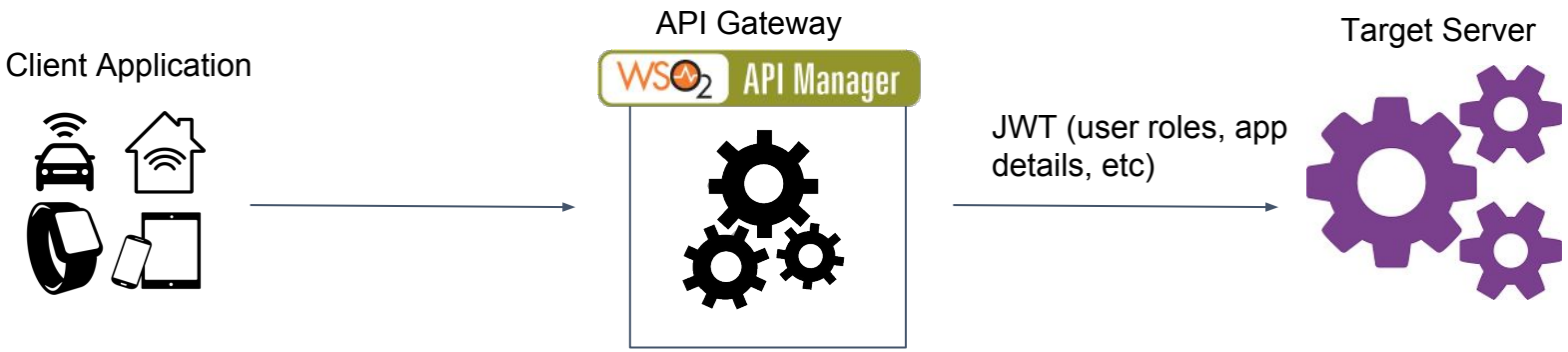
Authorization Server

POST /token HTTP/1.1
Host: auth.bar.com
Content-Type: application/x-www-form-urlencoded
grant_type=urn:ietf:params:oauth:grant-type:jwt-bearer
&assertion=eewewbGciOiJFUzewqew.eewew3Mi[...omitted for brevity...].
ewe-ZhwP[...omitted for brevity...]

1. Decode JWT
2. Validate JWT Signature
3. Extract ‘sub’
4. Validate ‘sub’ against requested scopes
5. Issue access token to client.

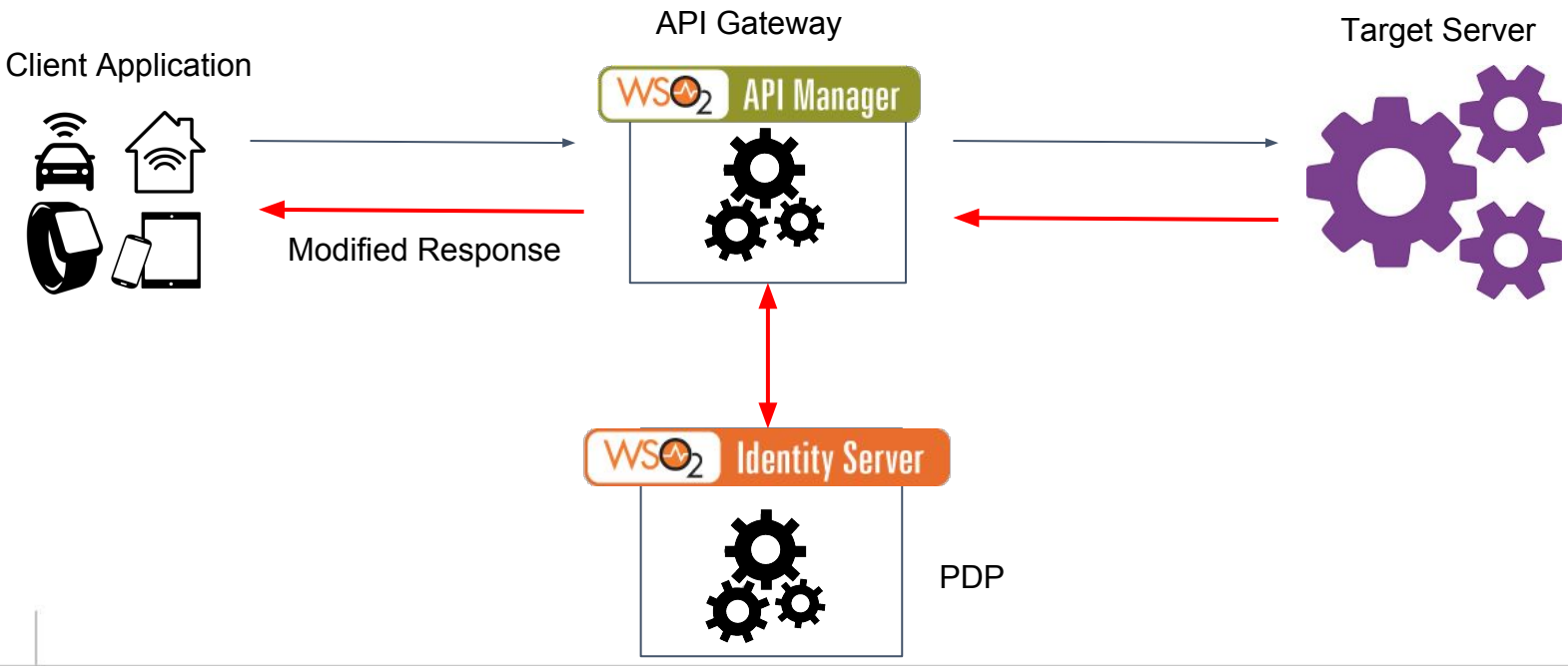
Data Redaction - Method 1 (Through the Target Server)

- The API Gateway generates a JWT that contains the user claims and other attributes and passes this information to the Target Server (back-end) in a special http header.
- The Target Server can use this information to decide which data to be provided in the response.

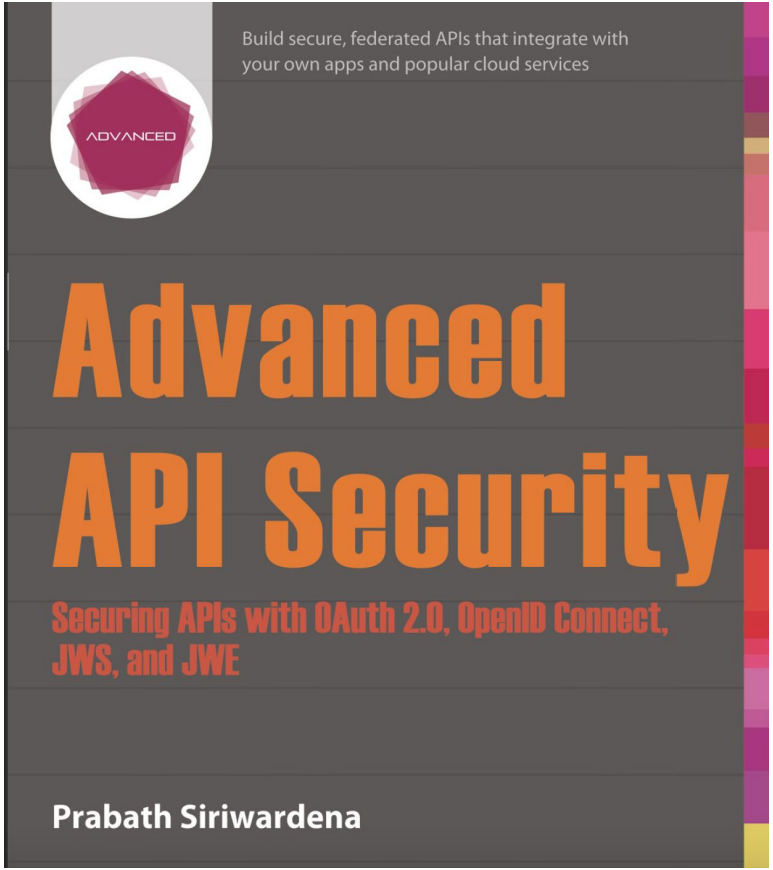


Data Redaction - Method 2 (Using Policies)

- The API Gateway contacts a PDP to check if the user bears a necessary permission and determine the final API response based on those facts



Recommended Reading



THANK YOU

wso2.com