Comprehensive Overview FAPI 1 and 2

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What is FAPI?

- A security and interoperability profile for OAuth for open banking and other use cases with high security requirements
- Includes new specifications as required

Versions

- FAPI 1
  - Developed from 2016 onwards and used existing OpenID Connect security mechanisms to patch OAuth security issues
  - Final specifications published
  - Adopted by UK OpenBanking, FDX, CDR, and Brasil
- FAPI 2
  - the next evolutionary step, simpler to use and with a broader scope
  - Based on analysis of most PSD 2 and other open banking initiatives as well as requirements from eHealth and eGovernment
  - Adopted in yes open banking scheme (~1000 banks)

Main differences between FAPI 1 and FAPI 2

- Simpler to use
  - through new mechanisms (e.g. Pushed Authorization Requests/PAR, no ID Token as detached signature required)
- Well-understood and better-defined security
  - FAPI 2 Baseline has same protection level as FAPI 1 Advanced
  - FAPI 2 Baseline fully protects against attacker model
- Broader interoperability
  - through coverage of rich authorization / consent management and secure access to APIs
- More versatile
  - through alternative mechanism for token replay protection (DPoP)

FAPI 2 Main Components

Pushed Authorization Requests (PAR)

Pushed Authorization Requests (PAR) replace bespoke solutions like external resources with references in scope/claims, custom authorization request parameters, …

→ Simplified development through vendor support and reliance on TLS (signed requests possible)

→ Minimize data in front-channel to improve security and increase robustness

```
POST /as/par HTTP/1.1
Host: as.example.com
Content-Type: application/x-www-form-urlencoded
Authorization: Basic czZCaGRSa3F0Mzo3Rmp..

response_type=code
&client_id=s6BhdRkqt3&state=af0ifjsldkj
&redirect_uri=https%3A%2F%2Fclient.example.org%2Fcb
<voluminous payload goes here>
```

```
HTTP/1.1 201 Created
Cache-Control: no-cache, no-store
Content-Type: application/json

{
  "request_uri":"urn:example:bwc4JK-ESC0w8acc1...",
  "expires_in": 90
}
```

Rich Authorization Requests (RAR)

Rich Authorization Requests (RAR) enable fine-grained and complex consents.

- Structure of authorization details can be defined as needed (e.g. per application)
- Supports Multi-Consents

```
[
   {
      "type":"payment_initiation",
      "actions":[
         "initiate"
      ],
      "locations":[
         "https://yourbank.com.au/payments"
      ],
      "instructedAmount":{
         "currency":"AUD",
         "amount":"123.50"
      },
      "creditorName":"Merchant123",
      "creditorAccount":{
         "bsb":"123-456",
         "accountNumber":"1234567890"
      },
      "paymentDescription":"INV123456 Description123"
   }
]
```

Grant Management

Grant Management enables support for

- consent state synchronization
- consent revocation
- concurrent consents
- consent update & renewal
- Dashboards

Closely aligned with Australian requirements because it was started during AU CDR consent proposal discussions.

Grant Management (request new grant id)

(Pushed) Authorization Request)

```
POST /as/par HTTP/1.1
Host: as.example.com
Content-Type: application/x-www-form-urlencoded
Authorization: Basic czZCaGRSa3F0Mzo3Rm...

response_type=code&
client_id=s6BhdRkqt3
&grant_management_action=create
&state=af0ifjsldkj
&redirect_uri=https%3A%2F%2Fclient.example.org%2Fcb
&code_challenge_method=S256
&code_challenge=K2-ltc83acc4h...
&authorization_details=%5B%7B%2...
```

Token Response

```
HTTP/1.1 200 OK
  Content-Type: application/json
  Cache-Control: no-cache, no-store

  {
    "access_token": "2YotnFZFEjr1zCsicMWpAA",
    "token_type": "example",
    "expires_in": 3600,
    "refresh_token": "tGzv3JOkF0XG5Qx2TlKWIA",
    "grant_id":"0a15a804-b5b4-4a45-9cd9-18b1a44f3383",
    "authorization_details": [...
    ]
  }
```

Grant Management (API)

Query

GET /grants/**0a15a804-b5b4-4a45-9cd9-18b1a44f3383**
Host: as.example-bank.com
Authorization: Bearer 2YotnFZFEjr1zCsicMWpAA

HTTP/1.1 200 OK
Cache-Control: no-cache, no-store
Content-Type: application/json

```
{
  "authorization_details":[...]
}
```

Revoke

DELETE /grants/**0a15a804-b5b4-4a45-9cd9-18b1a44f3383**
Host: as.example-bank.com
Authorization: Bearer 2YotnFZFEjr1zCsicMWpAA

HTTP/1.1 204 No Content

Grant Management (request use of certain grant)

(Pushed) Authorization Request)

```
POST /as/par HTTP/1.1
Host: as.example.com
Content-Type: application/x-www-form-urlencoded
Authorization: Basic czZCaGRSa3F0Mzo3Rm...

response_type=code&
client_id=s6BhdRkqt3
&grant_management_action=update
&grant_id=0a15a804-b5b4-4a45-9cd9-18b1a44f3383
&state=af0ifjsldkj
&redirect_uri=https%3A%2F%2Fclient.example.org%2Fcb
&code_challenge_method=S256
&code_challenge=K2-ltc83acc4h...
&authorization_details=%5B%7B%2...
```

Use cases

- Renew consent (because it is about to be expire)
- Update existing consent
- Ensure authorization process is performed with same user
- Allows identification of user (alternative login hint for CIBA)

PKCE

PKCE (RFC 7636) is used to detect code replay and CSRF

Dynamically generated cryptographically random key used to bind transaction to browser/device

Replaces ID token as detached signature

→ security check moved to AS

→ simple and robust

```
POST /as/par HTTP/1.1
Host: as.example.com
Content-Type: application/x-www-form-urlencoded
Authorization: Basic czZCaGRSa3F0Mzo3Rmp..

response_type=code
&client_id=s6BhdRkqt3&state=af0ifjsldkj
&redirect_uri=https%3A%2F%2Fclient.example.org%2Fcb
&code_challenge_method=S256
&code_challenge=E9Melhoa2OwvFrEMTJguCHaoeK1t8URWbuGJSstw-cM
...
```

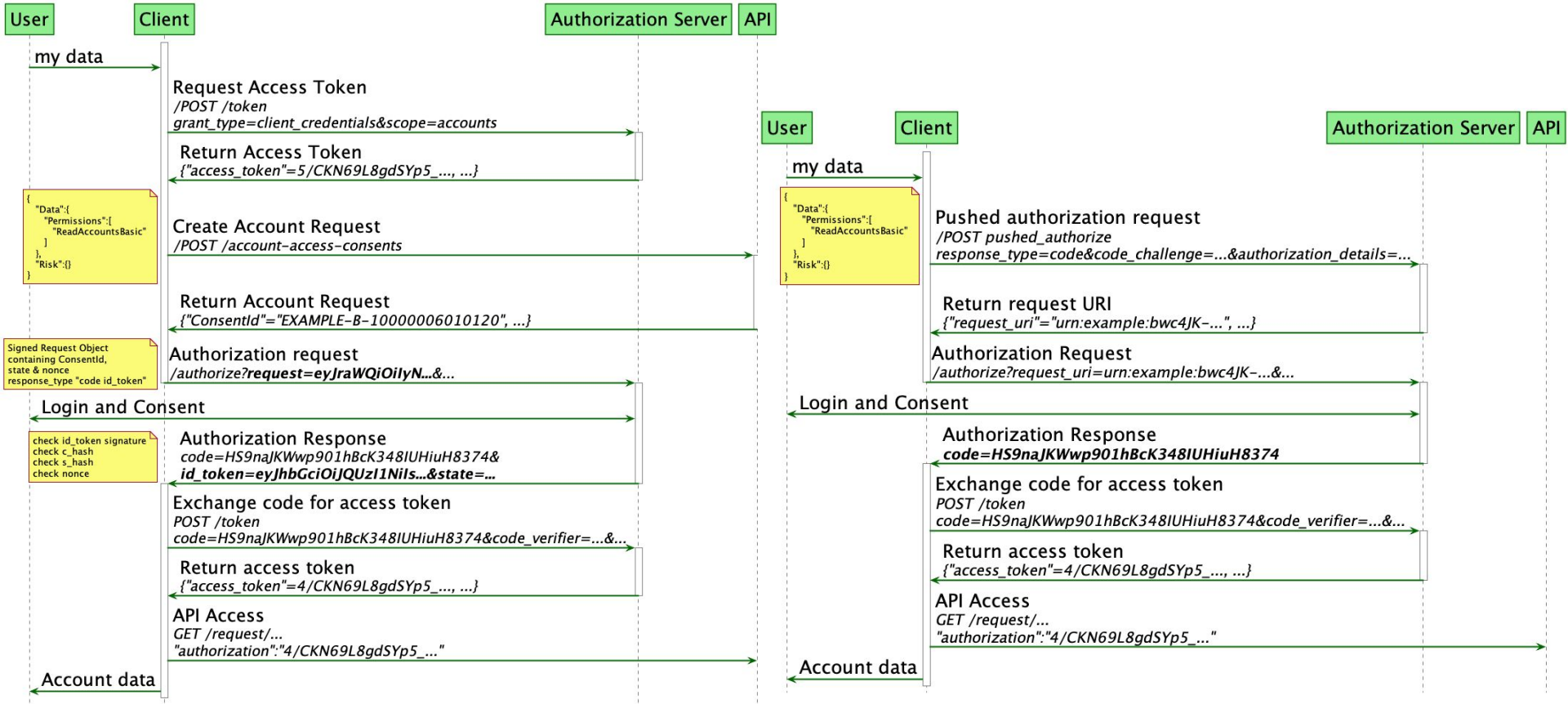
```
POST /as/par HTTP/1.1
Host: as.example.com
Content-Type: application/x-www-form-urlencoded
Authorization: Basic czZCaGRSa3F0Mzo3Rmp..

grant_type=authorization_code
&code=SplxlOBeZQQYbYS6WxSbIA
&redirect_uri=https%3A%2F%2Fclient.example.org%2Fcb
&code_verifier=dBjftJeZ4CVP-mB92K27uhbUJU1p1r_wW1gFWFOEjXk
```

Feature Comparison

Topic	FAPI 1	FAPI 2	
Request Integrity	Signed Request Objects	PAR	Baseline
CSRF	state + s_hash in ID Token	PKCE	
Code Replay	ID Token as detached signature or JARM or PKCE	PKCE	
Mix-Up	iss claim in ID token or JARM	iss response parameter	
Access Token Replay	mTLS	mTLS or DPoP	
Rich authorizations data	**not covered (custom solutions)**	PAR+RAR	
Consent management	**not covered (custom solutions)**	Grant Management	
Non-repudiation	Signed Request Objects, ID Token as detached signature API not covered	JAR, JARM, Signed Introspection Response, Simple HTTP Message Integrity Protocol	Adv

FAPI 1 (lodging intent) vs FAPI 2 (PAR+RAR)



FAPI 2 Security

- FAPI 1 RW Security Level with simpler to implement features and less reliance on client
- Increased interoperability (rich authorization + grant management)

=>

- Facilitates more secure implementations

Roadmap

- FAPI 2 Baseline
  - in first public draft for vote
  - implementers draft approval - June
  - underlying specifications (apart from GM) are stable specs with multiple implementations and vendor support
- Grant management
  - first public draft for vote in May
  - implementers draft approval - July
- FAPI 2 Signing
  - Under development
- FAPI 2 Advanced
  - first implementers draft: dependent on signing

FAPI adoption in new ecosystems

- Reasons to use FAPI 1
  - If vendors in an ecosystem already support FAPI 1
  - FAPI 1 is a mature and widely supported security profile.
- Reasons to use FAPI 2
  - FAPI 2 is easier to implement
  - FAPI 2 covers complex authorization requests and grant lifecycle management aspects
  - FAPI 2 (as profile for API access authorization) better fits with OpenID Connect (for identity claims provisioning) then FAPI 1

Ecosystems already using FAPI 1

- Benefit for adoption:
  - Simpler protocol and improved interoperability
  - Specification aligned with the latest OAuth best practices and security advice
- Incremental adoption of FAPI 2 modules possible:
  - Example: Australia adopted PAR with FAPI 1
  - PAR + RAR + Grant Management as full lifecycle consent management solution for FAPI 1
- Running both profile in parallel is possible
  - Would allow new clients to utilize the simpler protocol (and existing clients to migrate)