AUTH: DATA FLOW

Not web security!

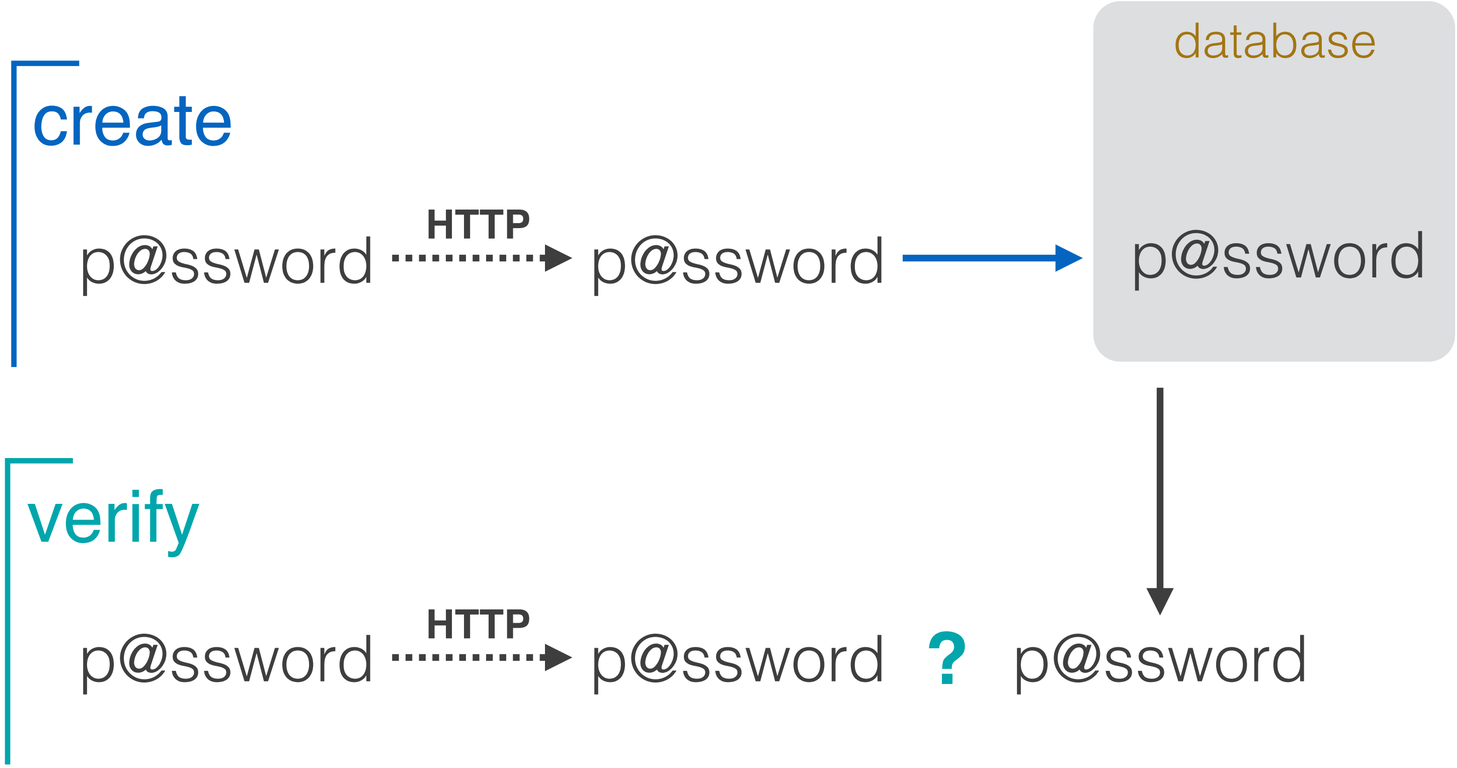
AAA

- **Authentication**
  - “this person is who they say they are”
- **Authorization**
  - “this person is allowed to do X, Y, Z”
- **Accounting**
  - “who the heck is using all our bandwidth?”

AAA

- **Authentication**
  - “this person is who they say they are”
- **Authorization**
  - “this person is allowed to do X, Y, Z”
- **Accounting**
  - “who the heck is using all our bandwidth?”

LOGIN/SIGNUP



STAYING LOGGED IN

THE PROBLEM

What if we want to store some information about each client/server relationship (session)?

IDEAS?

IDEAS?

- script variables

IDEAS?

- script variables
- database documents

SCRIPT VARIABLES?

SCRIPT VARIABLES?

Data will not persist across browser pages

DATABASE DOCUMENTS?

DATABASE DOCUMENTS?

Yes, but login credentials would have to be sent with EVERY request

COOKIE!

= small text file

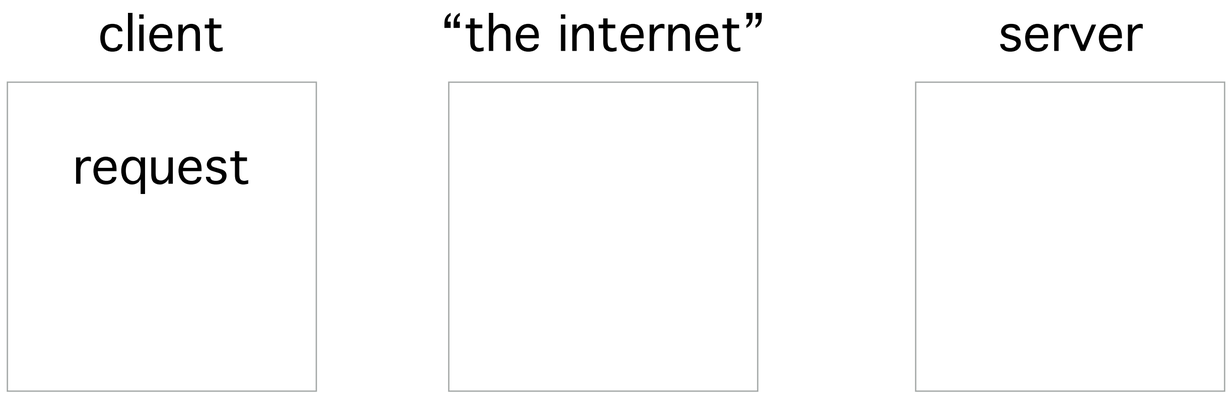
HTTP

client

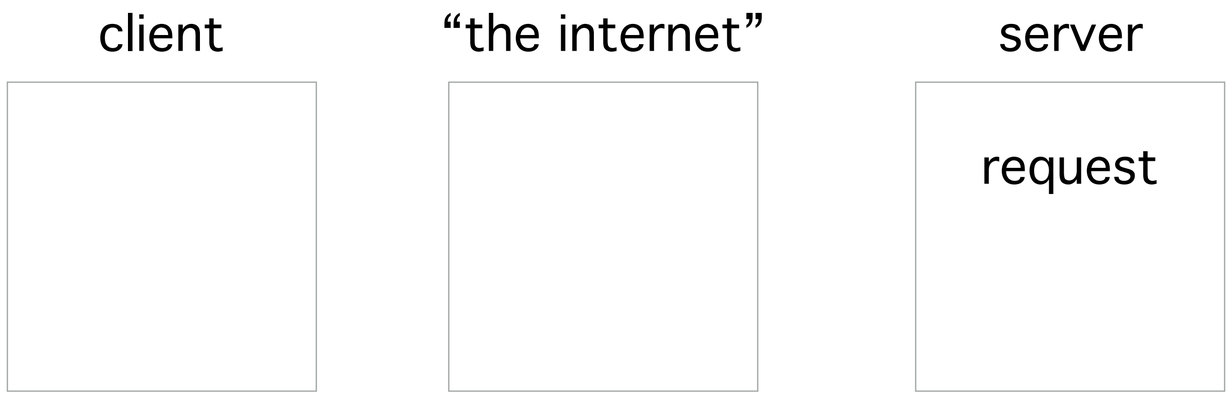
“the internet”

server

HTTP



HTTP



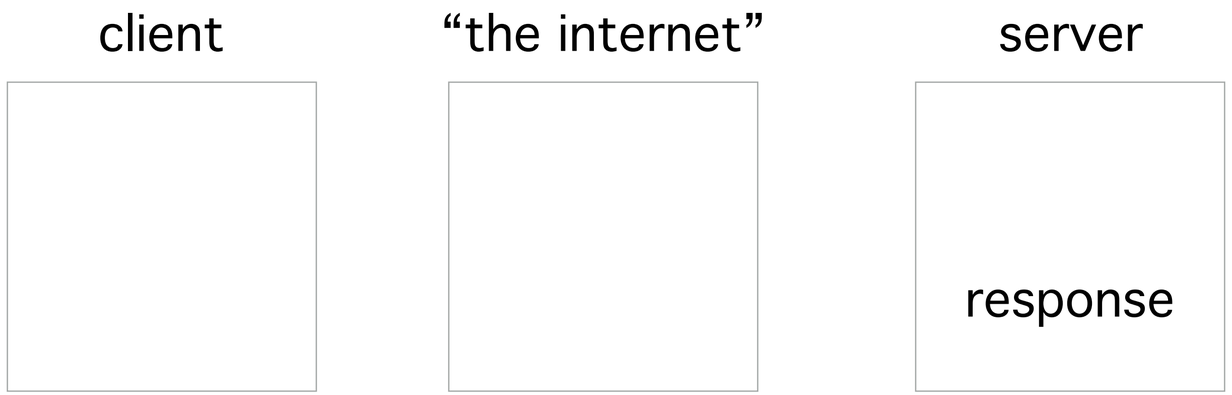
HTTP

client

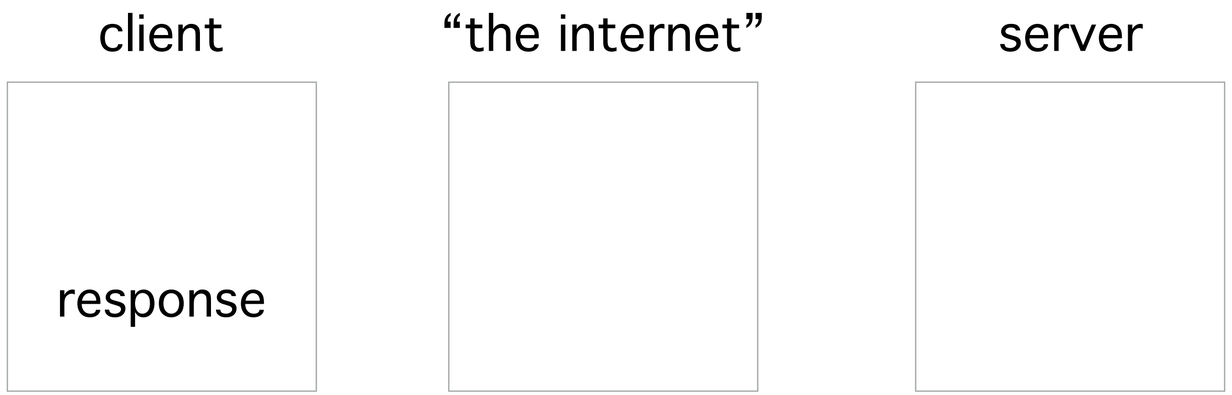
“the internet”

server

HTTP



HTTP



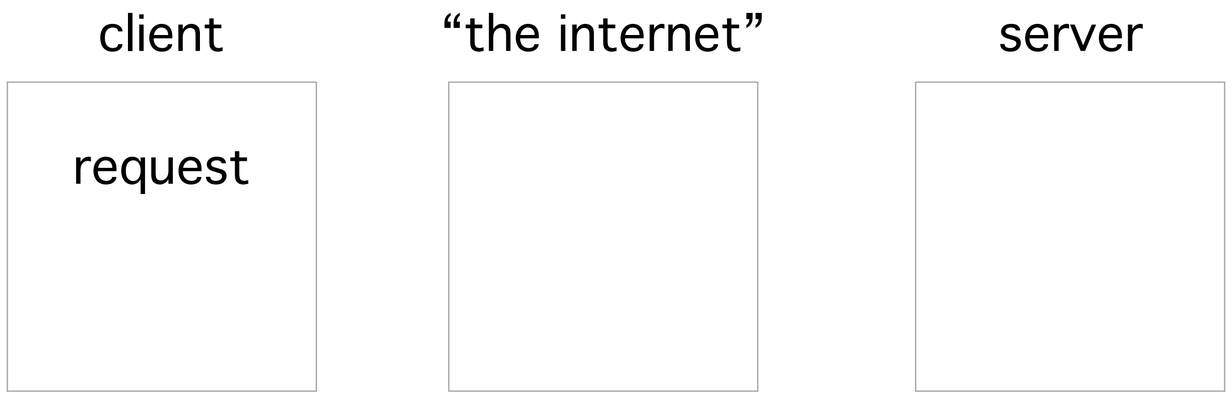
WITH COOKIES

client

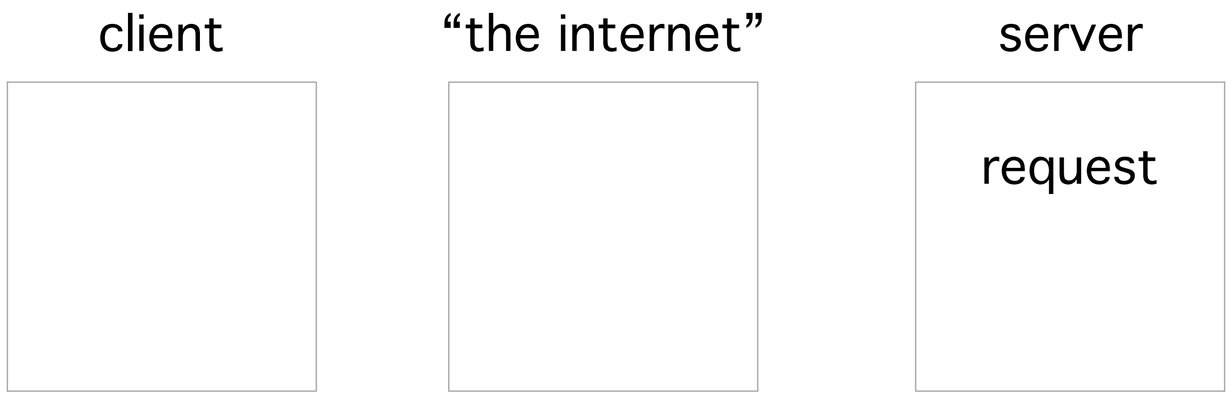
“the internet”

server

WITH COOKIES



WITH COOKIES



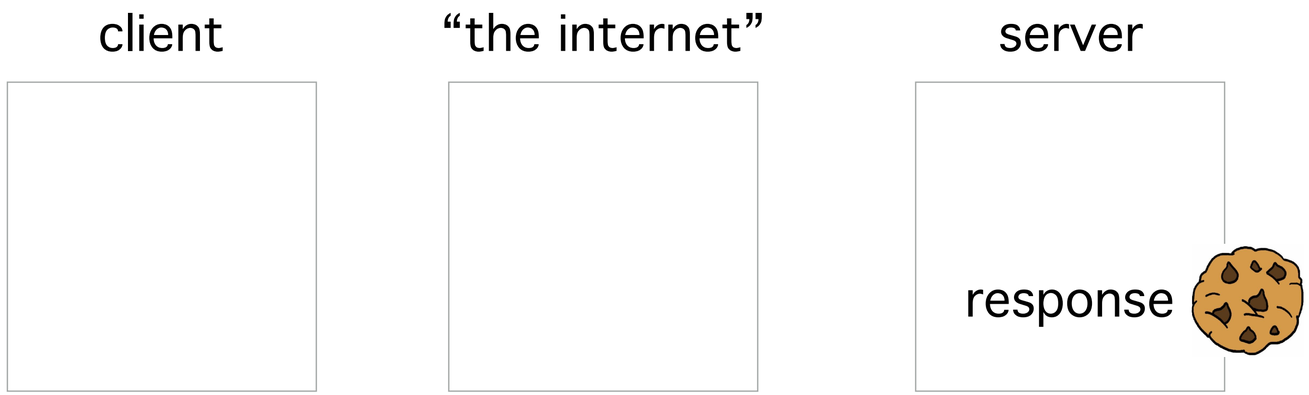
WITH COOKIES

client

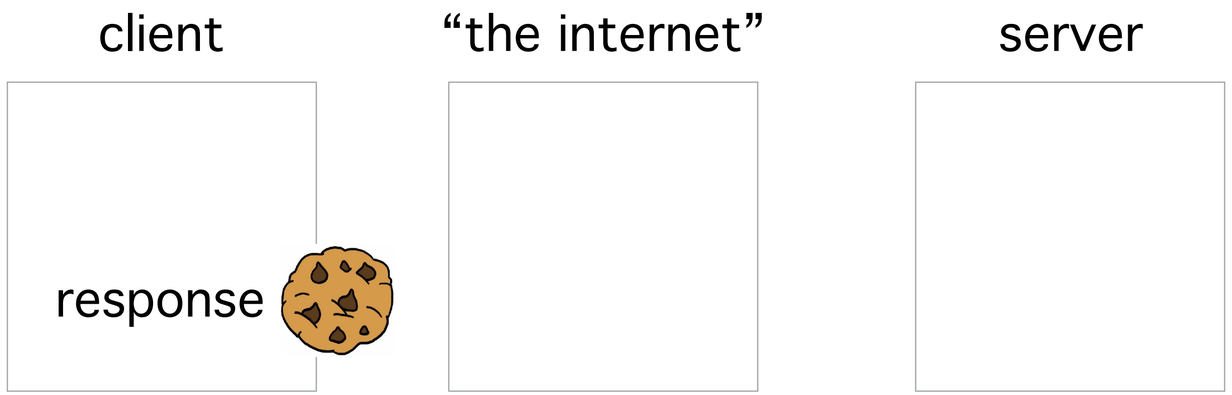
“the internet”

server

WITH COOKIES



WITH COOKIES



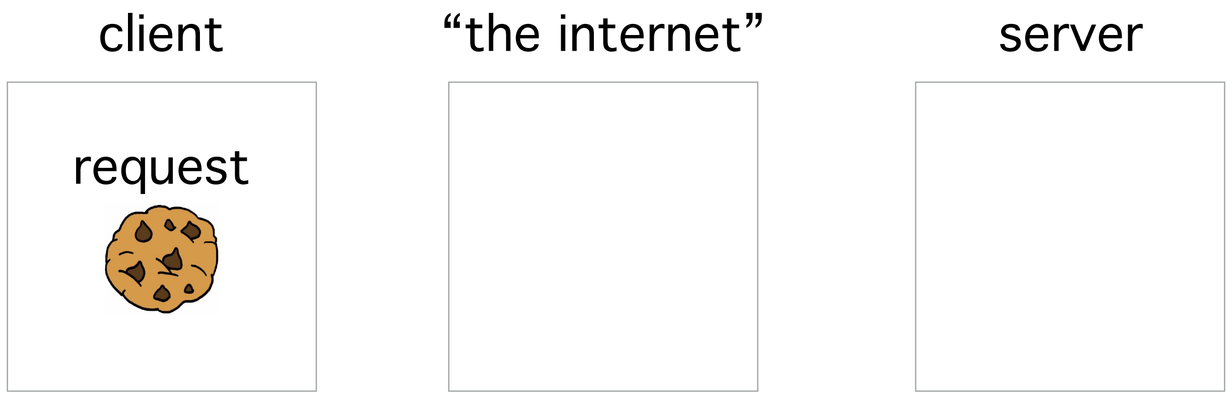
WITH COOKIES

client

“the internet”

server

WITH COOKIES



WITH COOKIES

WITH COOKIES

client

“the internet”

server

request

Do something with cookie

WITH COOKIES

client

“the internet”

server

Do something with cookie

WITH COOKIES

client

“the internet”

server

WITH COOKIES

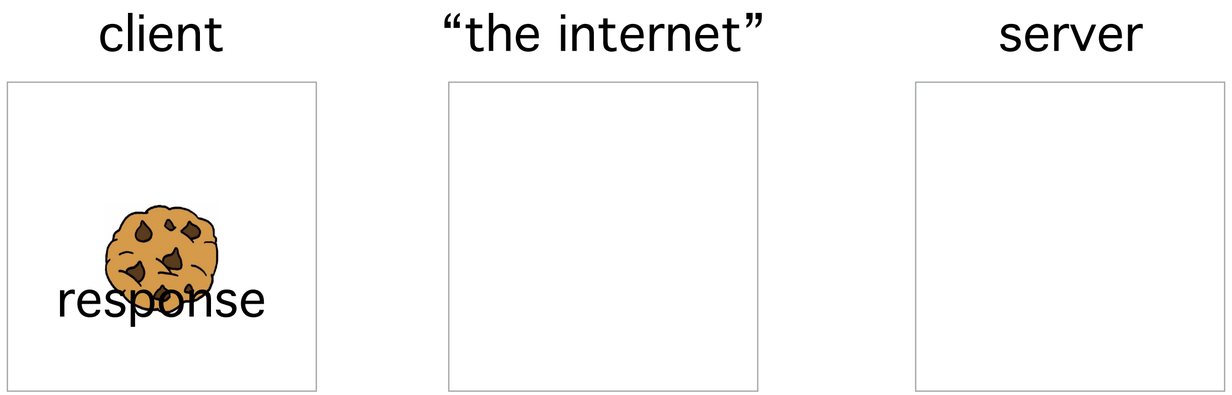
client

“the internet”

server

response

WITH COOKIES



COOKIES & SESSIONS

No need to authenticate for every request

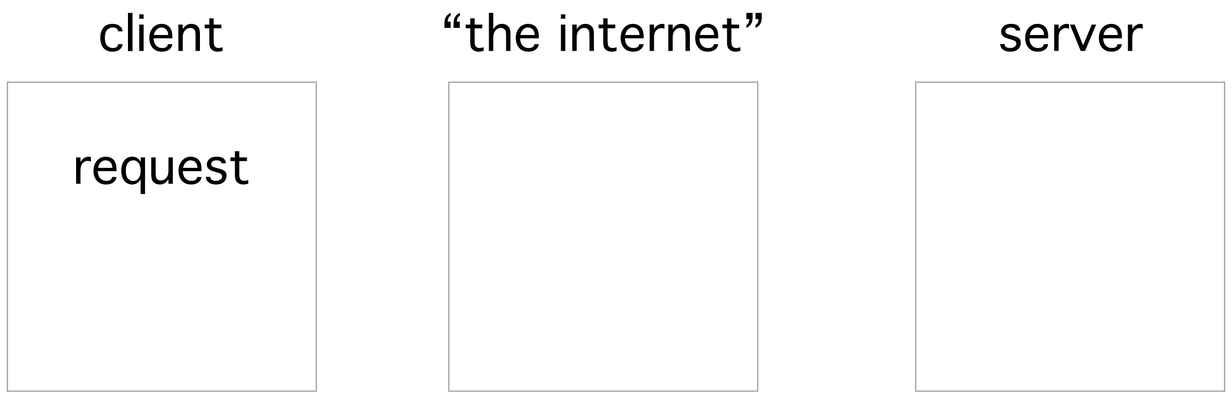
SESSIONS

client

“the internet”

server

SESSIONS



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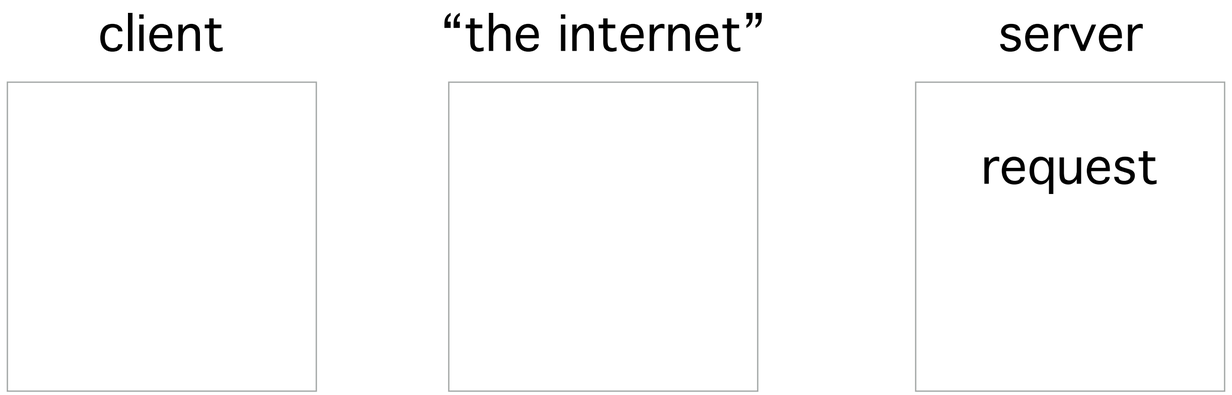


SESSIONS

client

“the internet”

server

SESSIONS

client

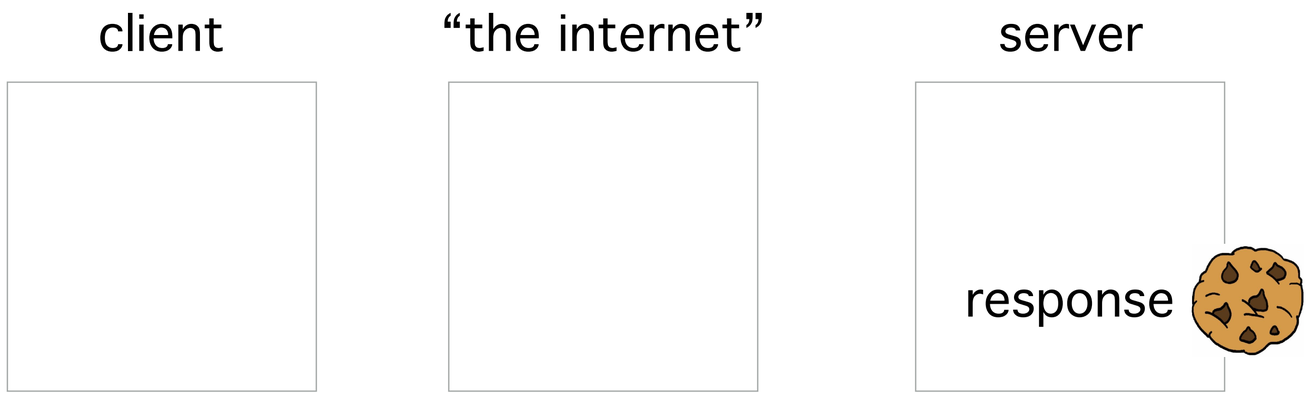
“the internet”

server

Make server session

sessions[id] = {}

SESSIONS



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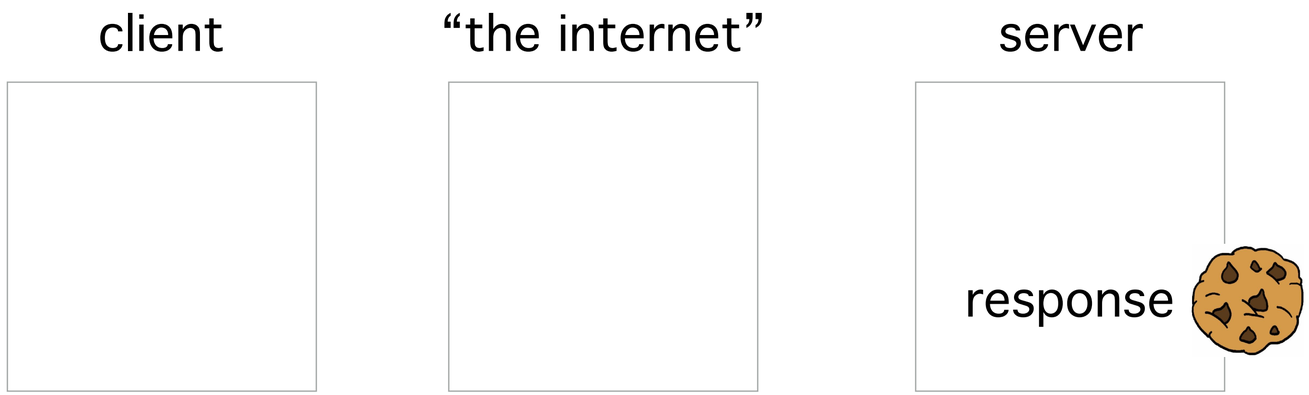

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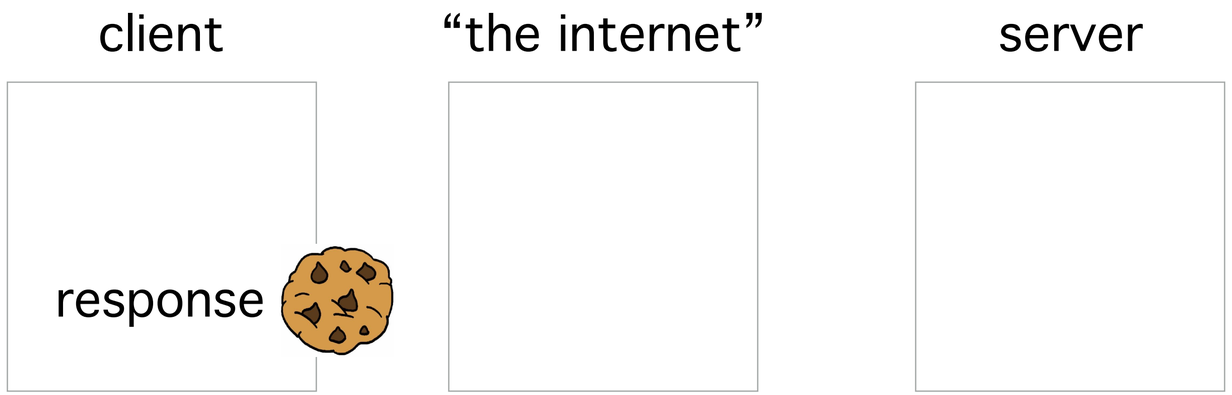


SESSIONS

client

“the internet”

server

SESSIONS

client

request

“the internet”

server

SESSIONS

SESSIONS

client

“the internet”

server

request

Look up session

req.session = sessions[id]

SESSIONS

client

“the internet”

server

Look up session

req.session = sessions[id]

SESSIONS

client

“the internet”

server

SESSIONS

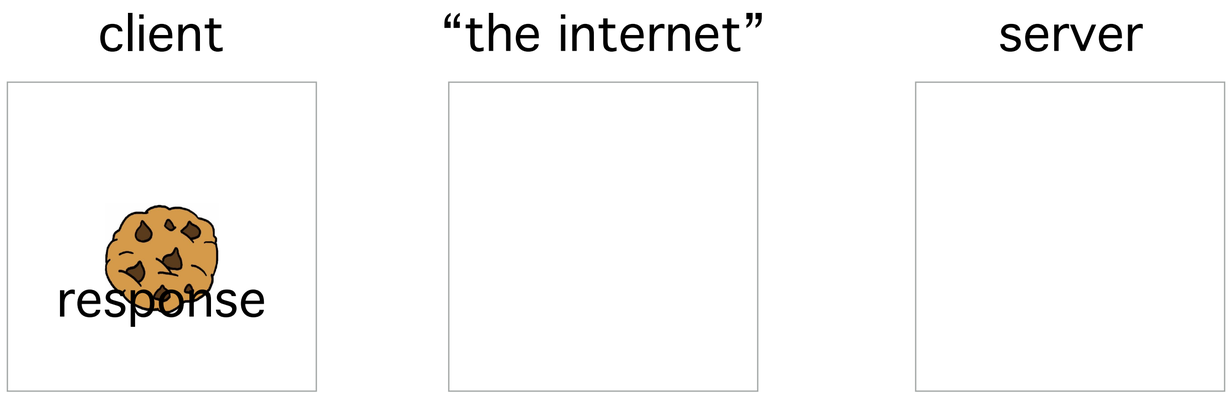
client

“the internet”

server

response

SESSIONS



COOKIES & SESSIONS

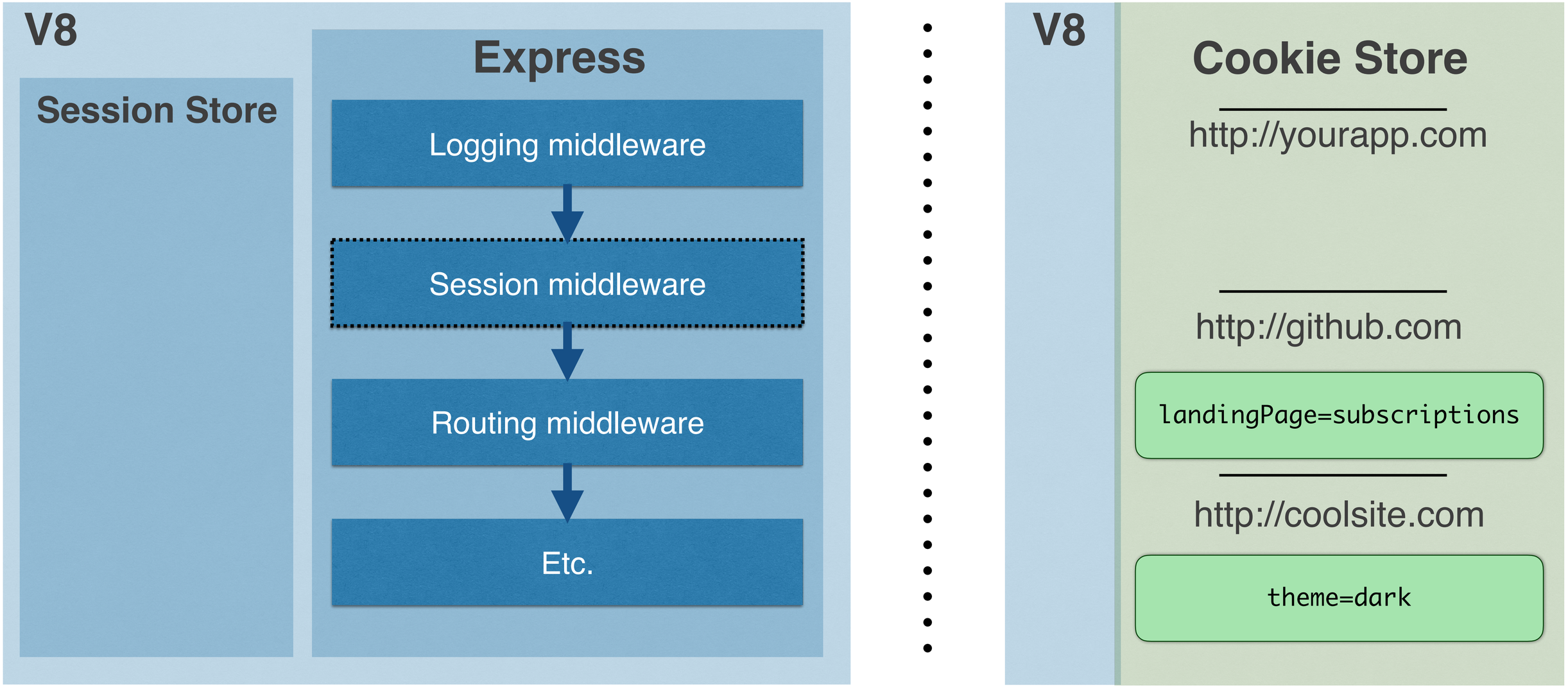
- Server gives client a cookie with ID only
- Client keeps cookie and sends with all requests
- Server loads request-specific session (stored in RAM)

SESSIONS

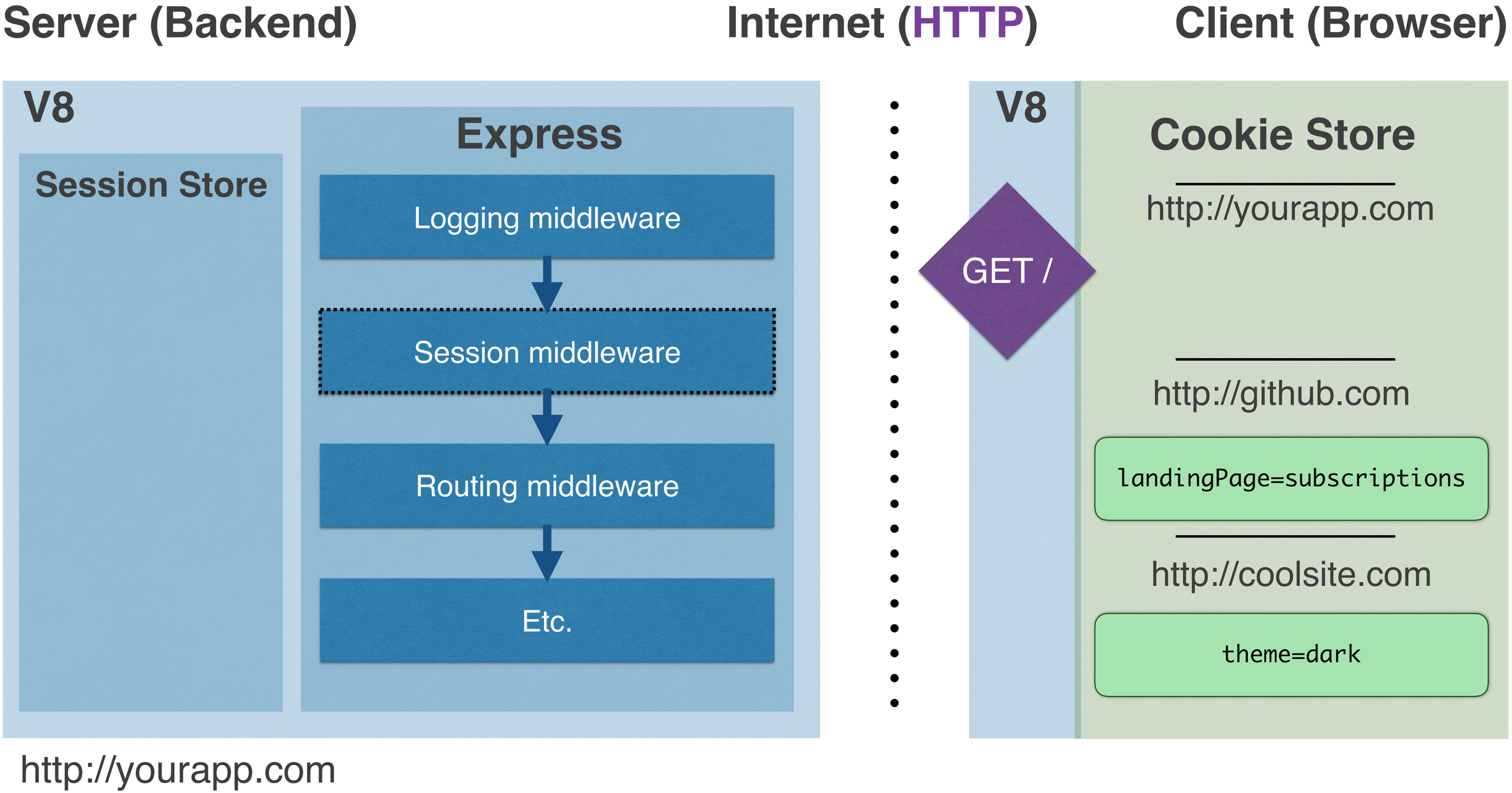
SESSIONS
IN

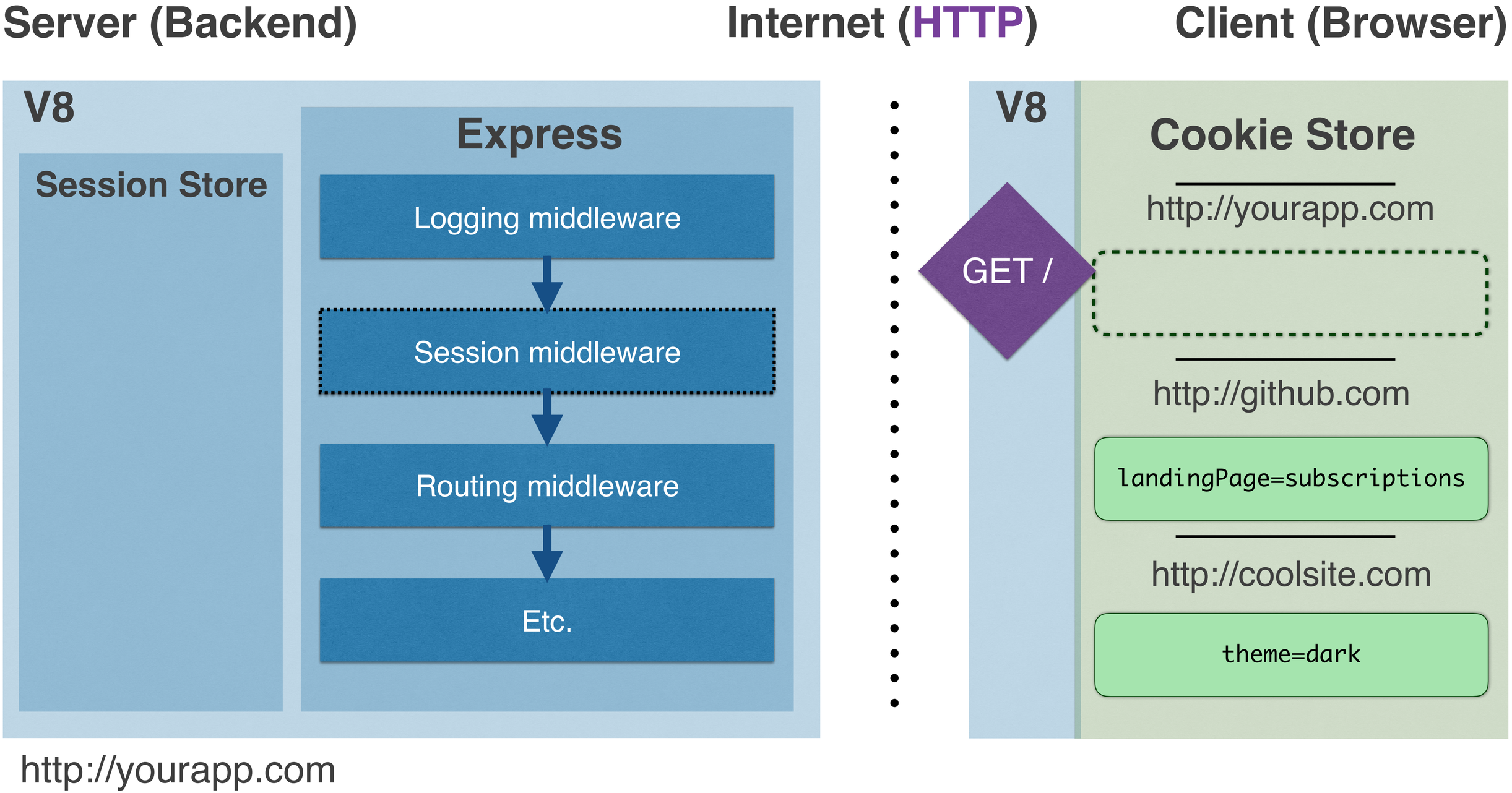
SESSIONS IN DETAIL

Server (Backend) | Internet (HTTP) | Client (Browser)



http://yourapp.com


Server (Backend)
Internet (HTTP)
Client (Browser)
V8
Session Store
Express
Logging middleware
Session middleware
Routing middleware
Etc.
http://yourapp.com
GET /
V8
Cookie Store
http://yourapp.com
http://github.com
landingPage=subscriptions
http://coolsite.com
theme=dark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http://yourapp.com
V8
GET /
Cookie Store
http://yourapp.com
http://github.com
landingPage=subscriptions
http://coolsite.com
theme=dark

HTTP REQUEST

```
GET / HTTP/1.1
Host: yourapp.com
Connection: keep-alive
Accept: text/html
User-Agent: Chrome/
48.0.2564.116
…etc…
```

(headers)

(body)

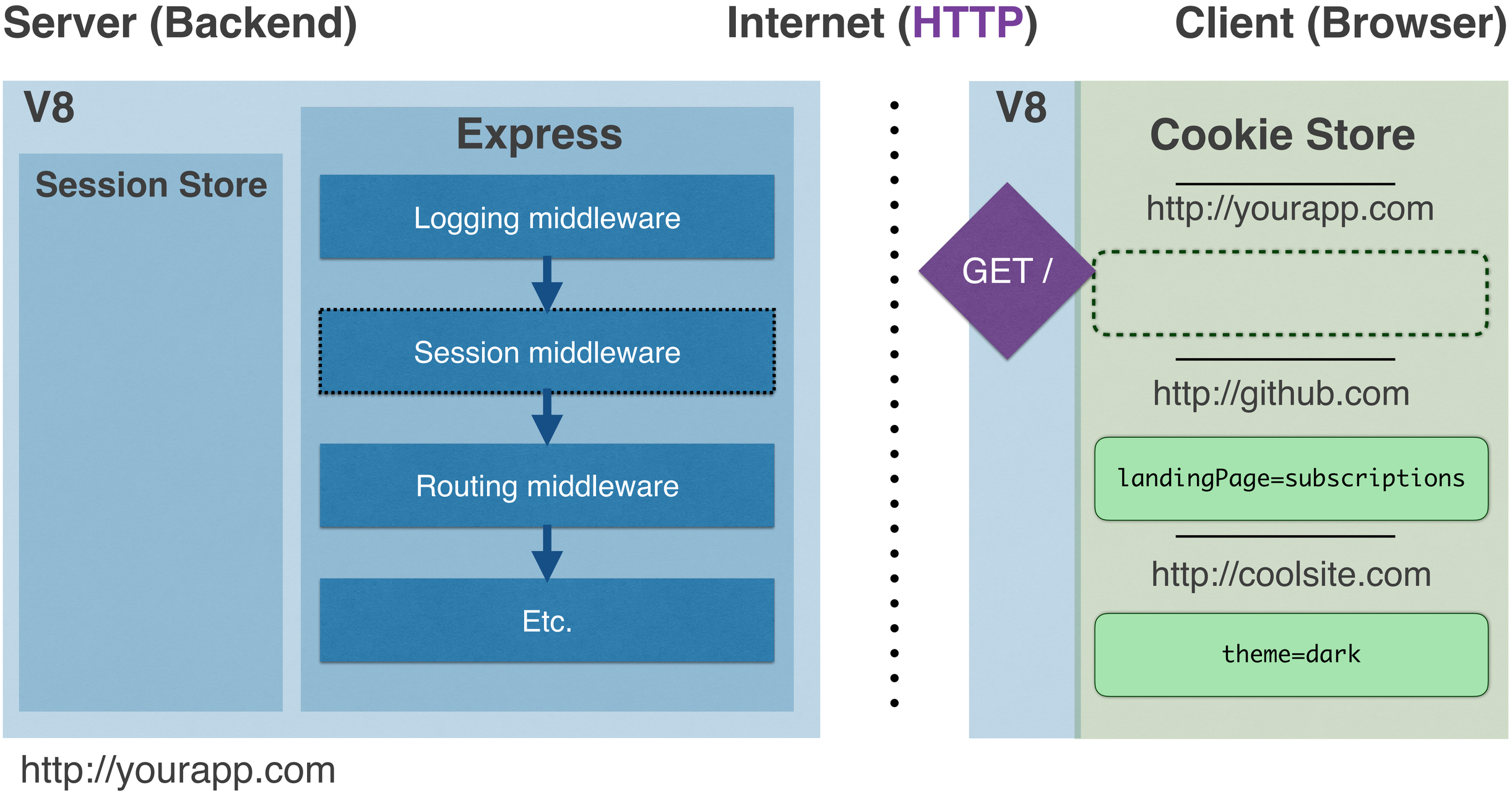
HTTP REQUEST

```
GET / HTTP/1.1
Host: yourapp.com
Connection: keep-alive
Accept: text/html
User-Agent: Chrome/
48.0.2564.116
…etc…
```

(headers)

(body)

…no cookie info (yet)!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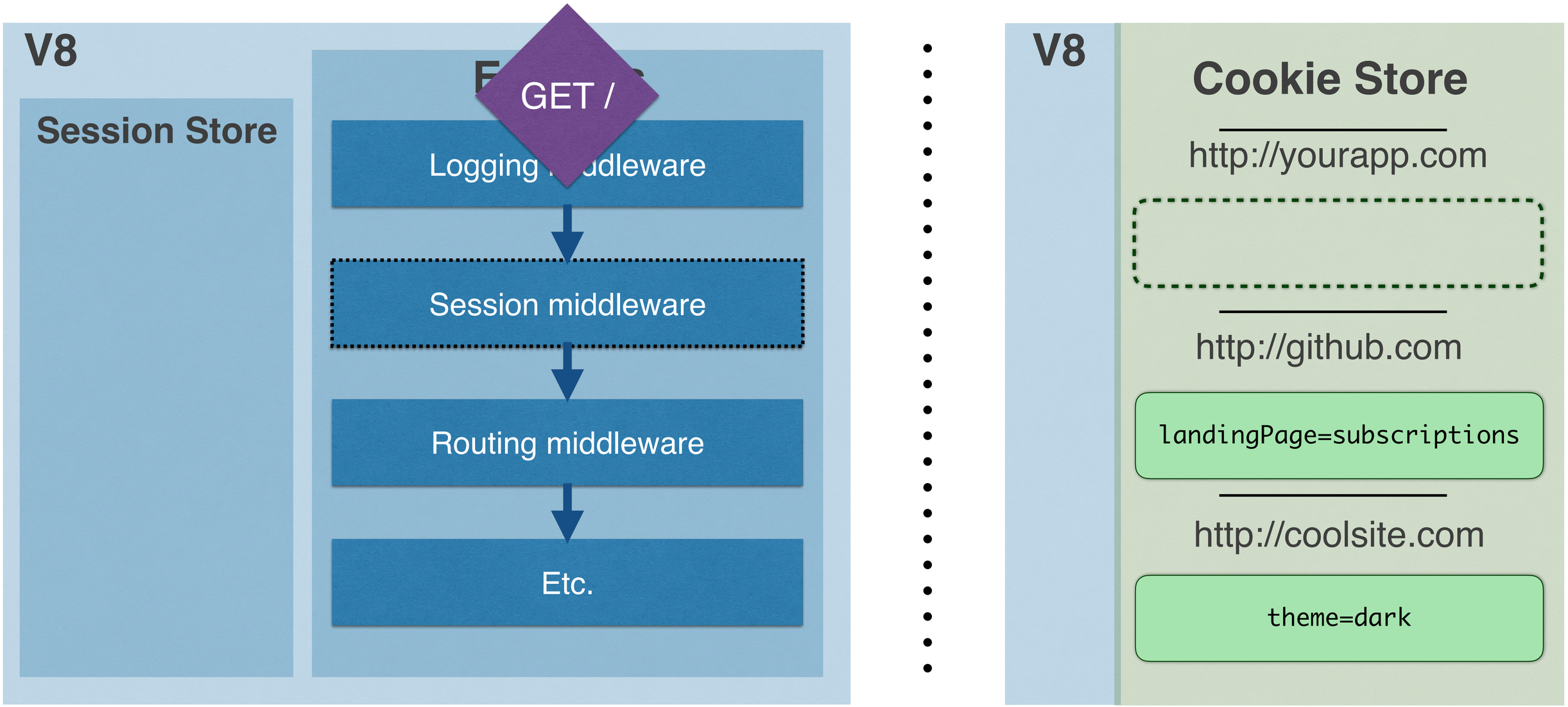
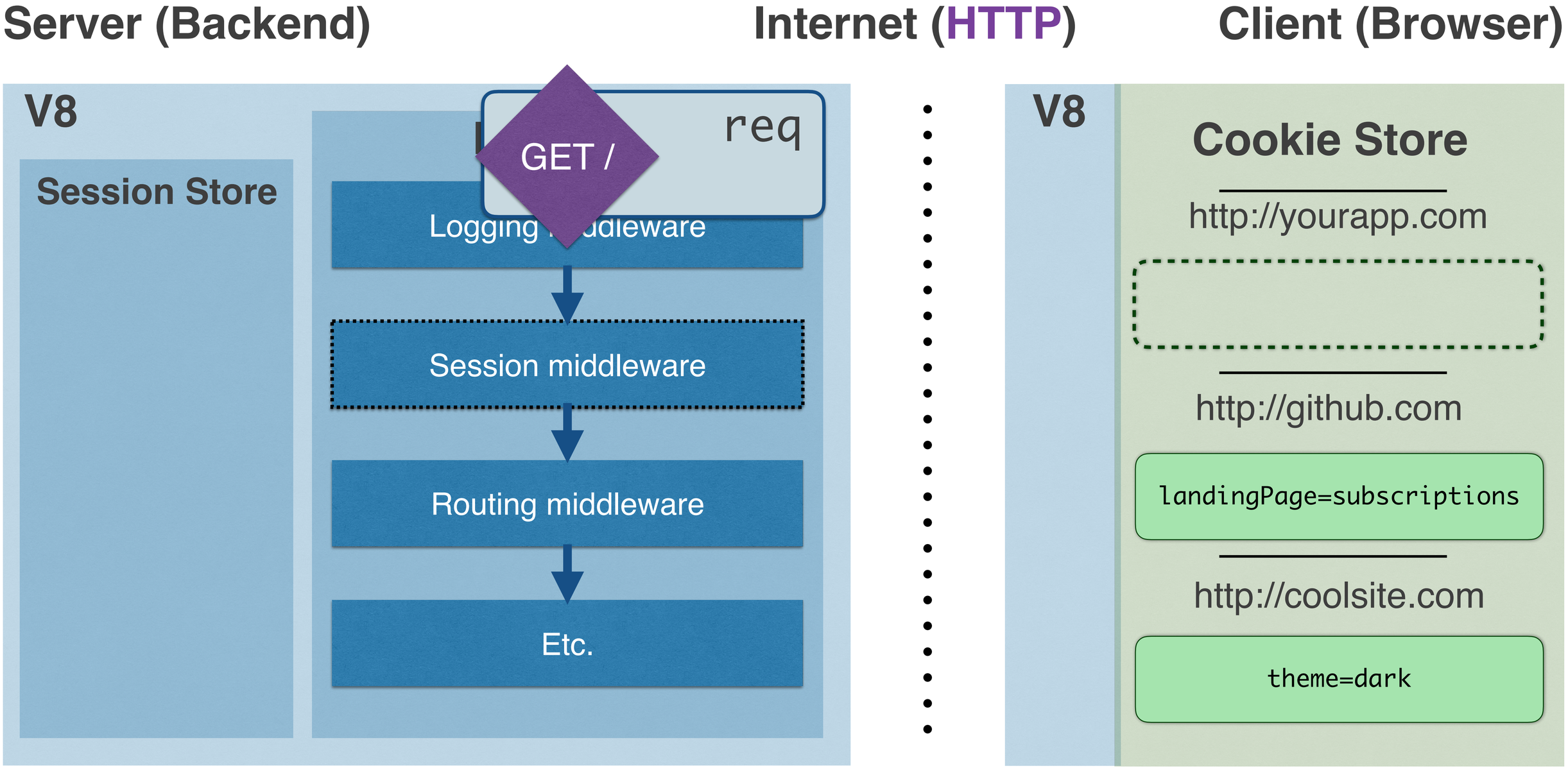


http://yourapp.com



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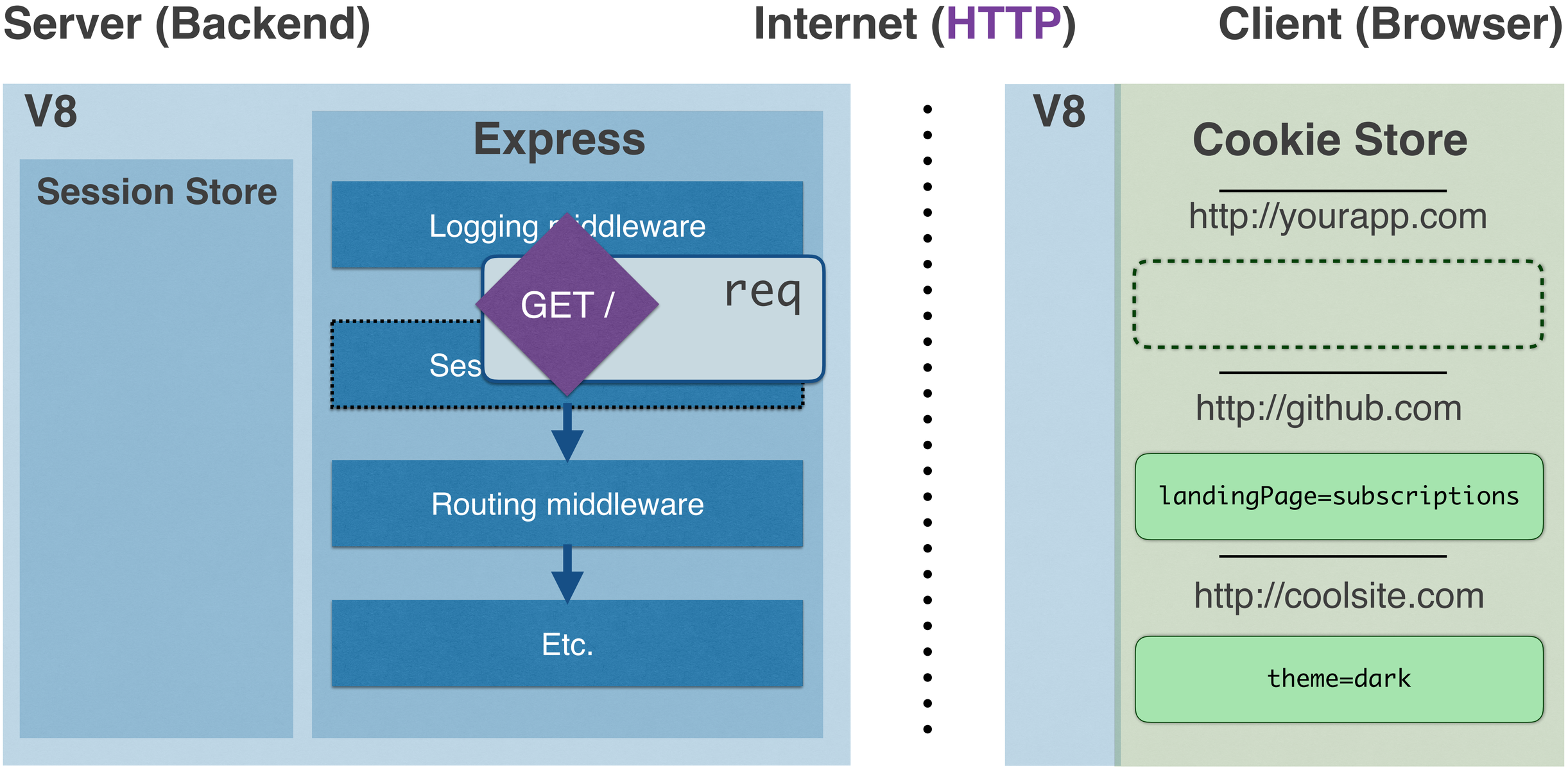

http://yourapp.com

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User-Agent: Chrome/
48.0.2564.116
…etc…
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(headers)

(body)

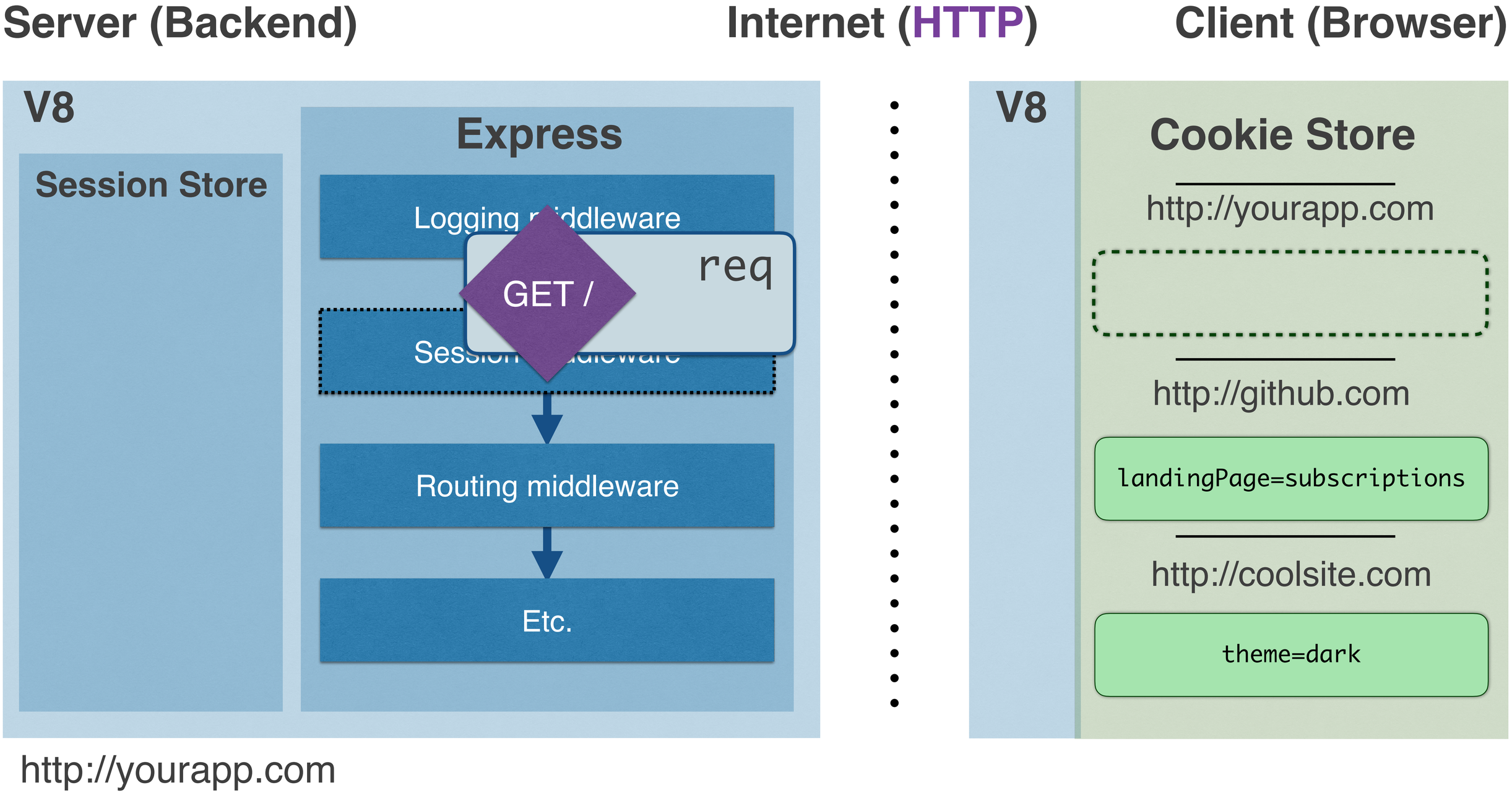
HTTP REQUEST

```
GET / HTTP/1.1
Host: yourapp.com
Connection: keep-alive
Accept: text/html
User-Agent: Chrome/
48.0.2564.116
…etc…
```

(headers)

(body)

still no cookie info…
session middleware:
"let's make a session!"


Server (Backend)
Internet (HTTP)
Client (Browser)
V8
Session Store
Express
Logging middleware
GET /
req
Session middleware
Routing middleware
Etc.
http://yourapp.com
V8
Cookie Store
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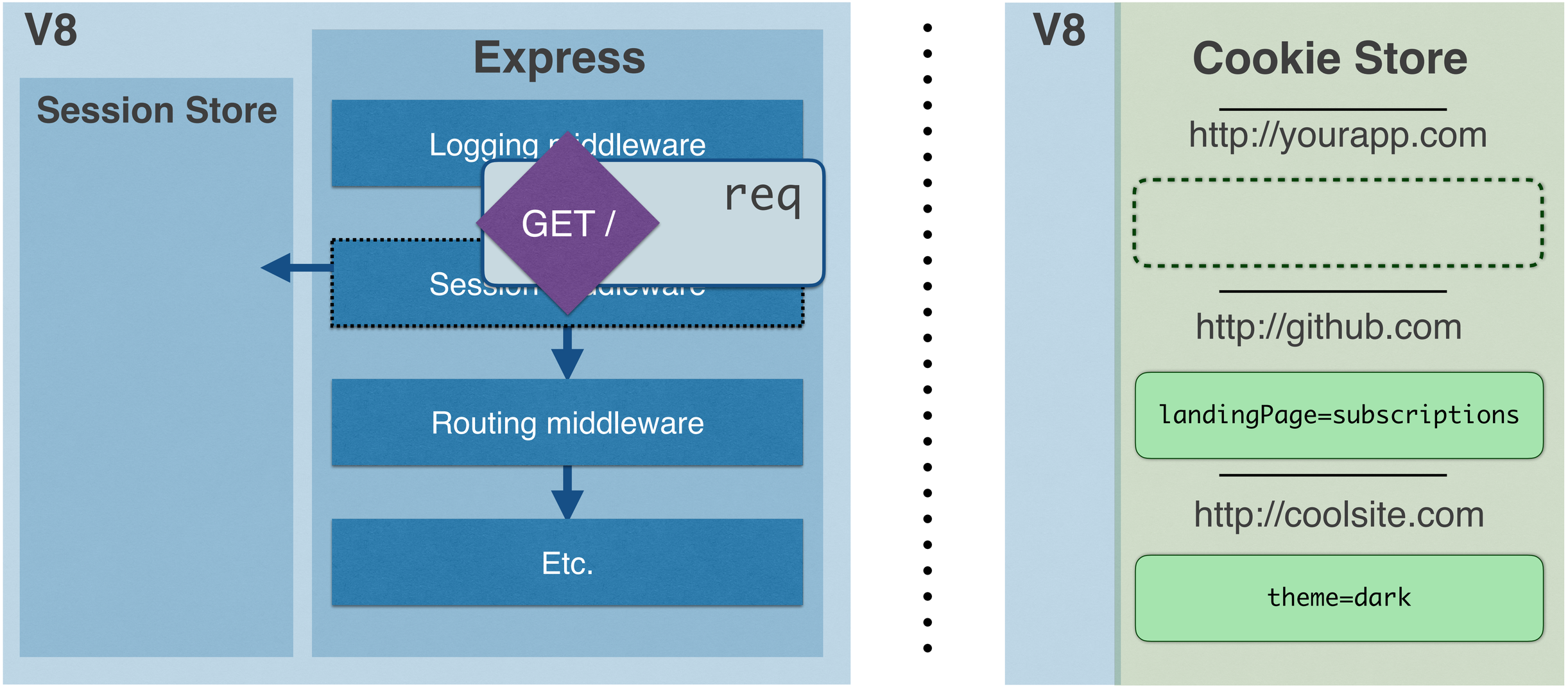
Server (Backend) | Internet (HTTP) | Client (Browser)



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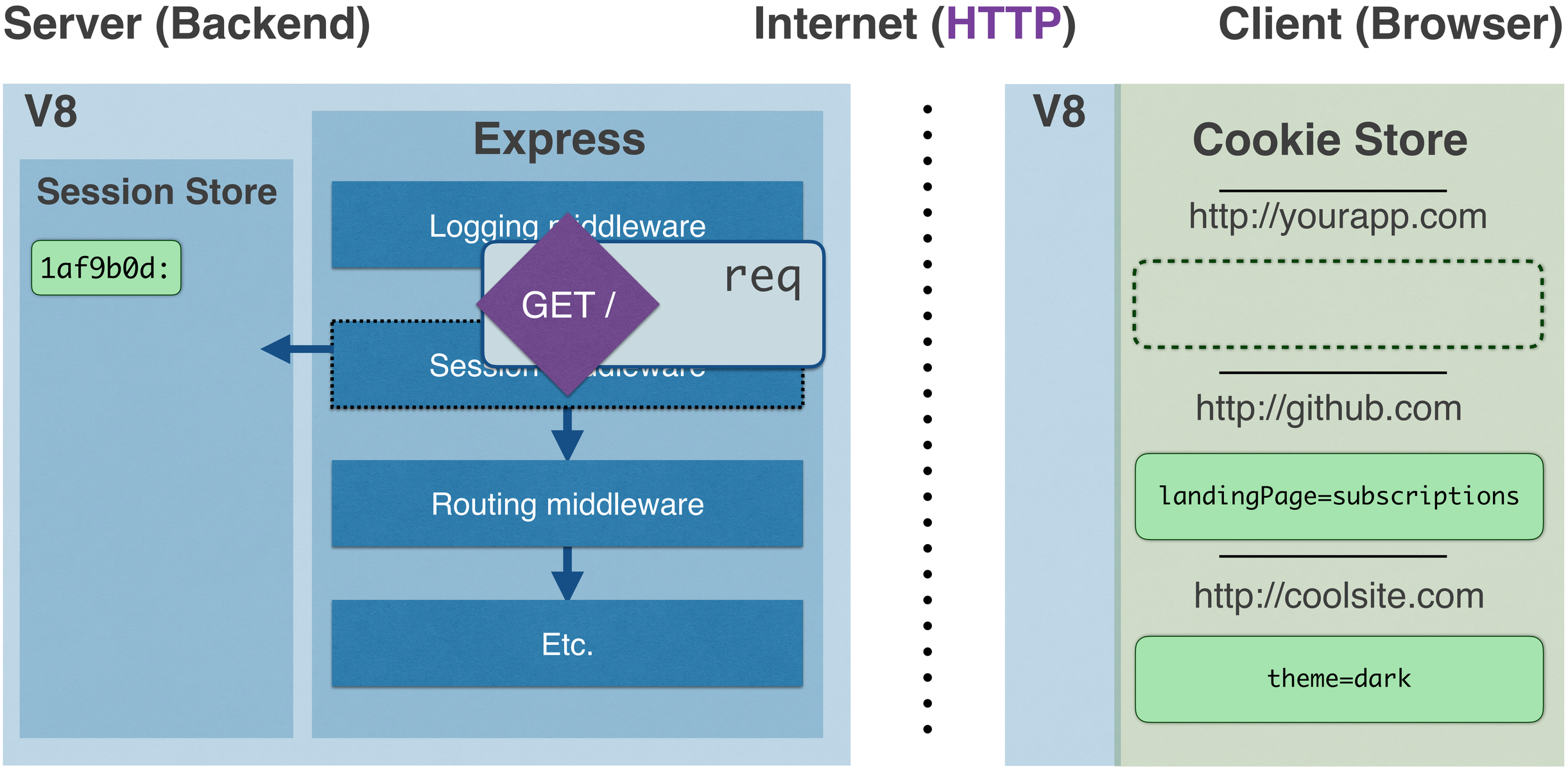

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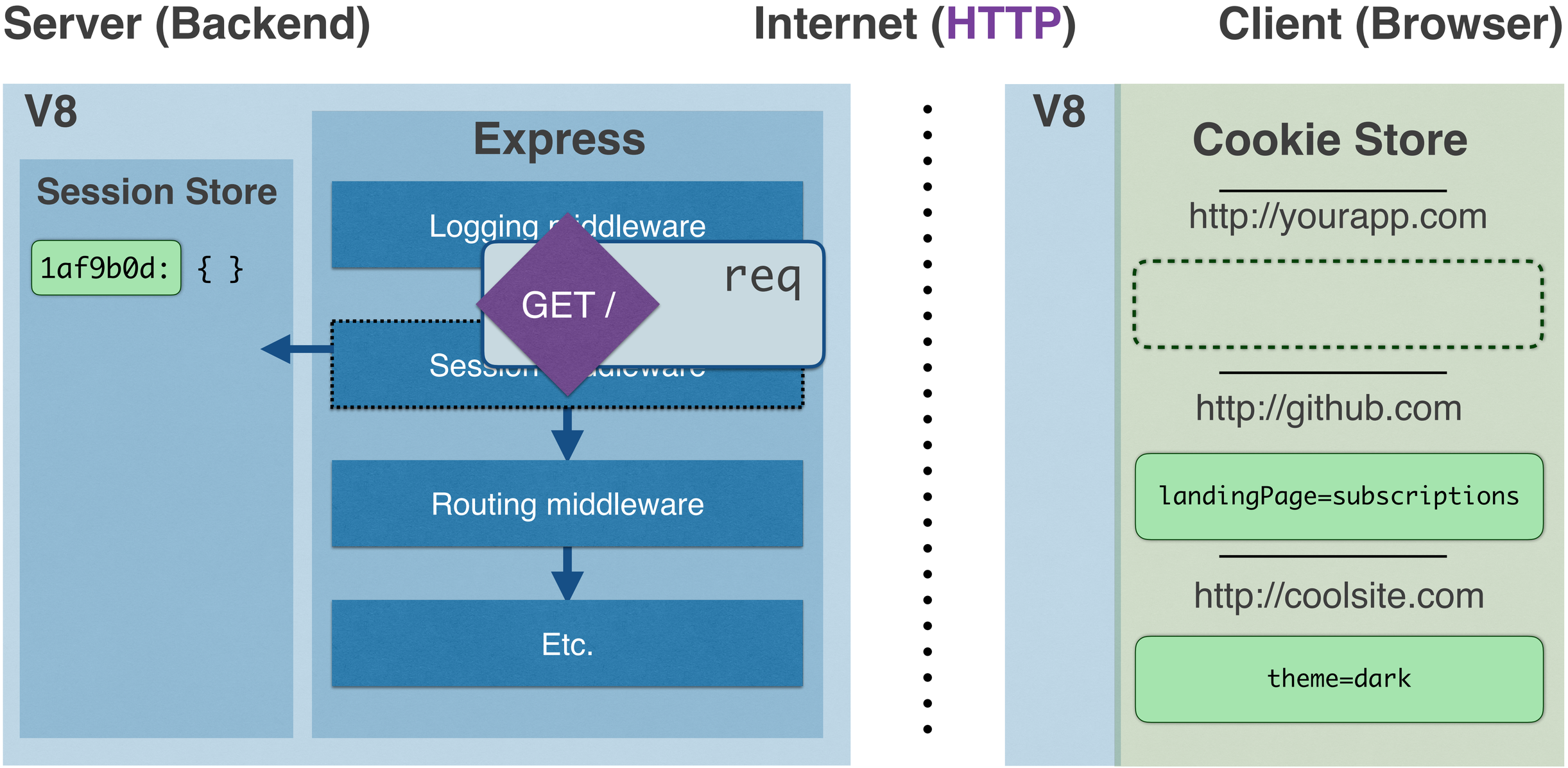

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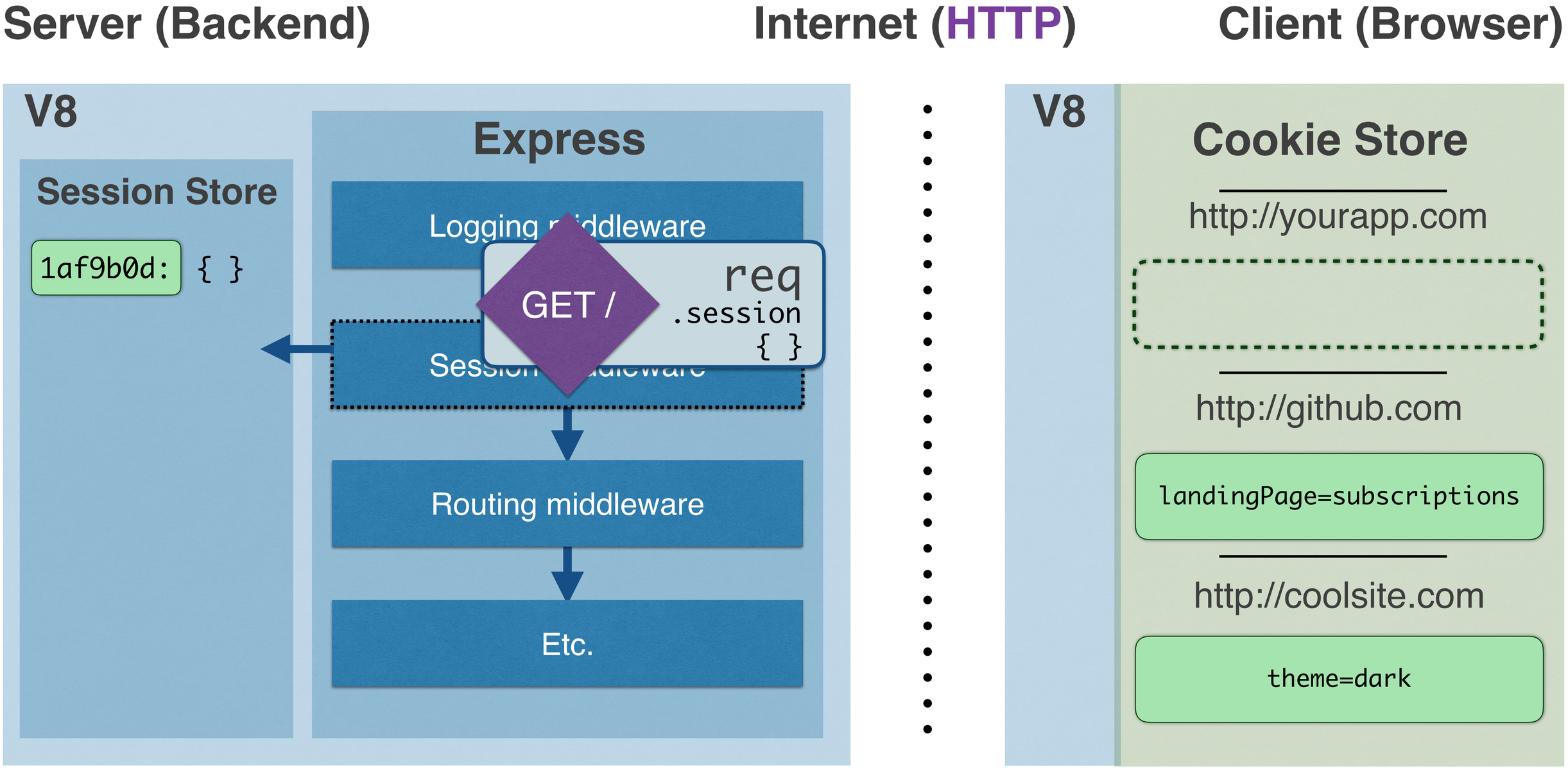

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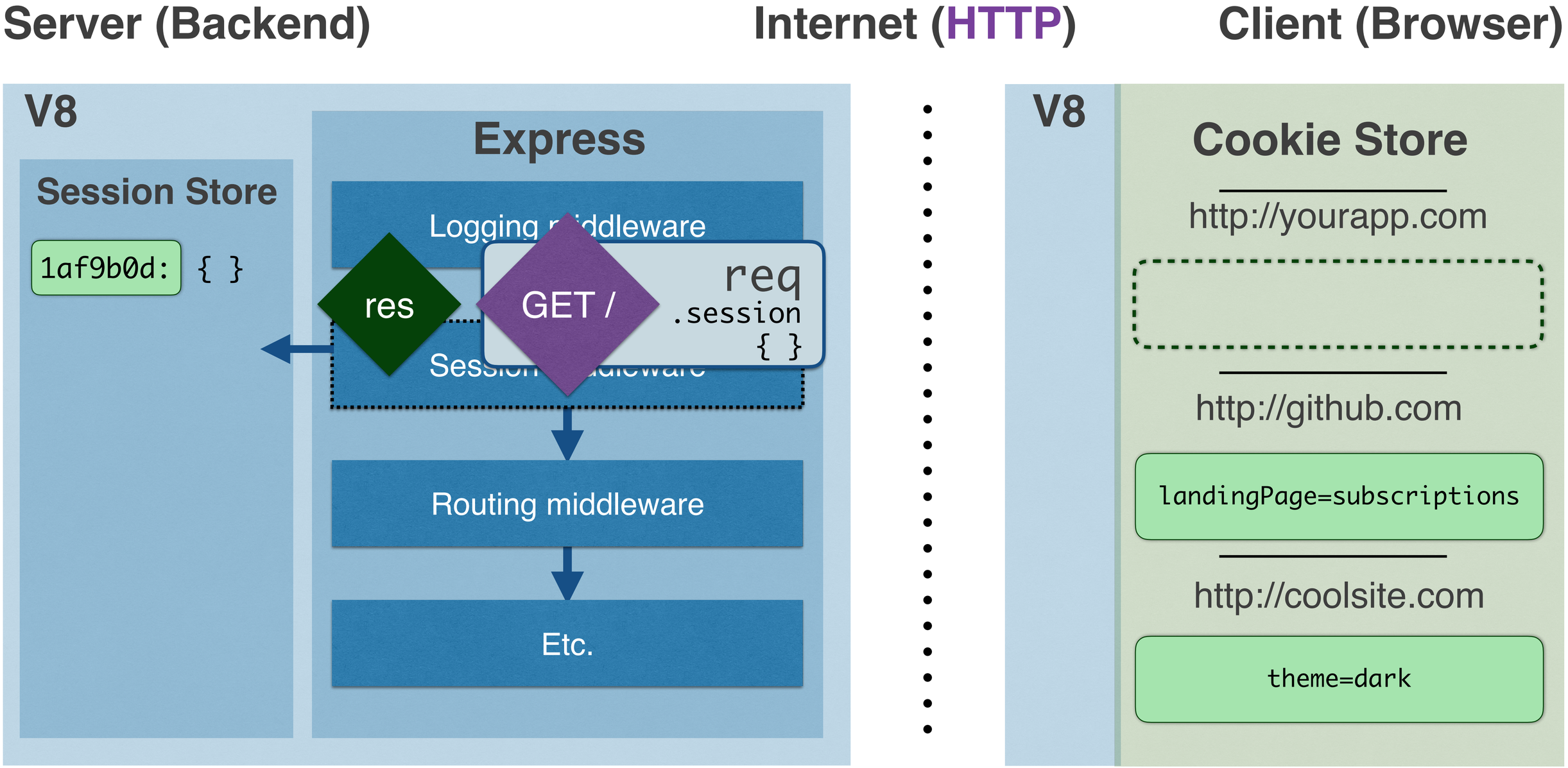

http://yourapp.com

HTTP RESPONSE

```
HTTP/1.x 200 OK
Transfer-Encoding: chunked
Date: Mon, 22 Feb 2016 18:30:00 GMT
Content-Type: text/html
Content-Encoding: gzip
```

(headers)

(body, after routing is done)

```
<!DOCTYPE html>
<html>
  <head>
    <title>Your Sweet App</title>
    <script src="/js/main.js"></script>
  </head> …etc.
```

HTTP RESPONSE

```
HTTP/1.x 200 OK
Transfer-Encoding: chunked
Date: Mon, 22 Feb 2016 18:30:00 GMT
Content-Type: text/html
Content-Encoding: gzip
set-cookie: myUid=1af9b0d
```

(headers)

(body, after routing is done)

```
<!DOCTYPE html>
<html>
  <head>
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    <script src="/js/main.js"></script>
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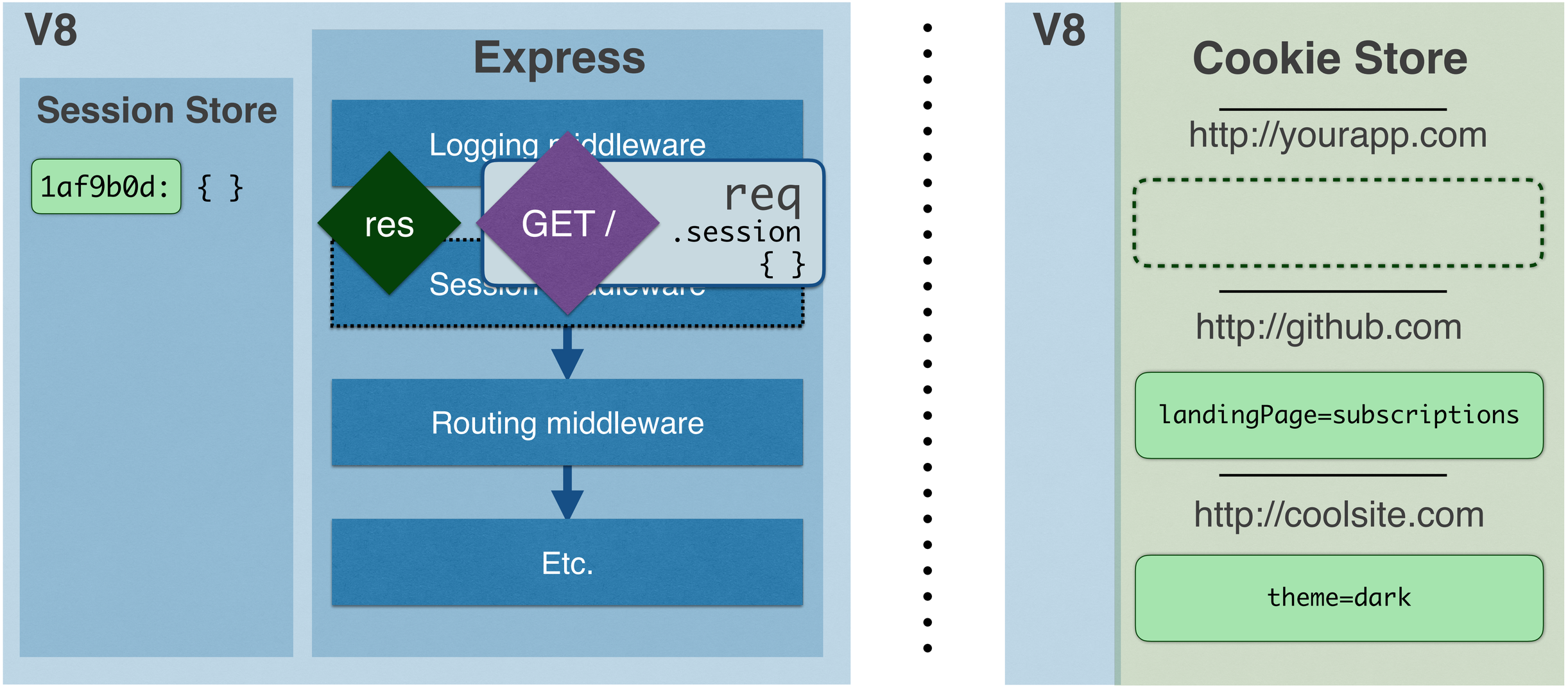
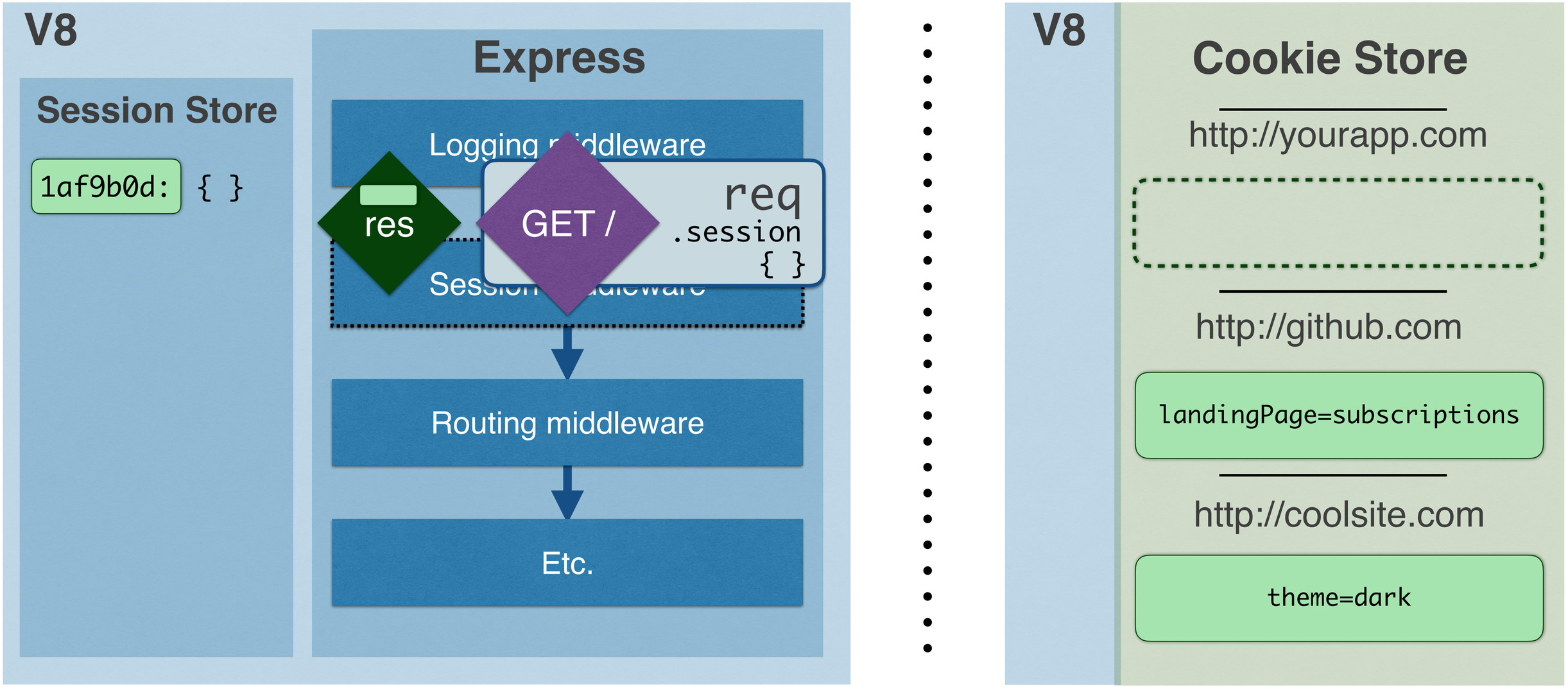
Server (Backend) | Internet (HTTP) | Client (Browser)



http://yourapp.com

Server (Backend) | Internet (HTTP) | Client (Browser)



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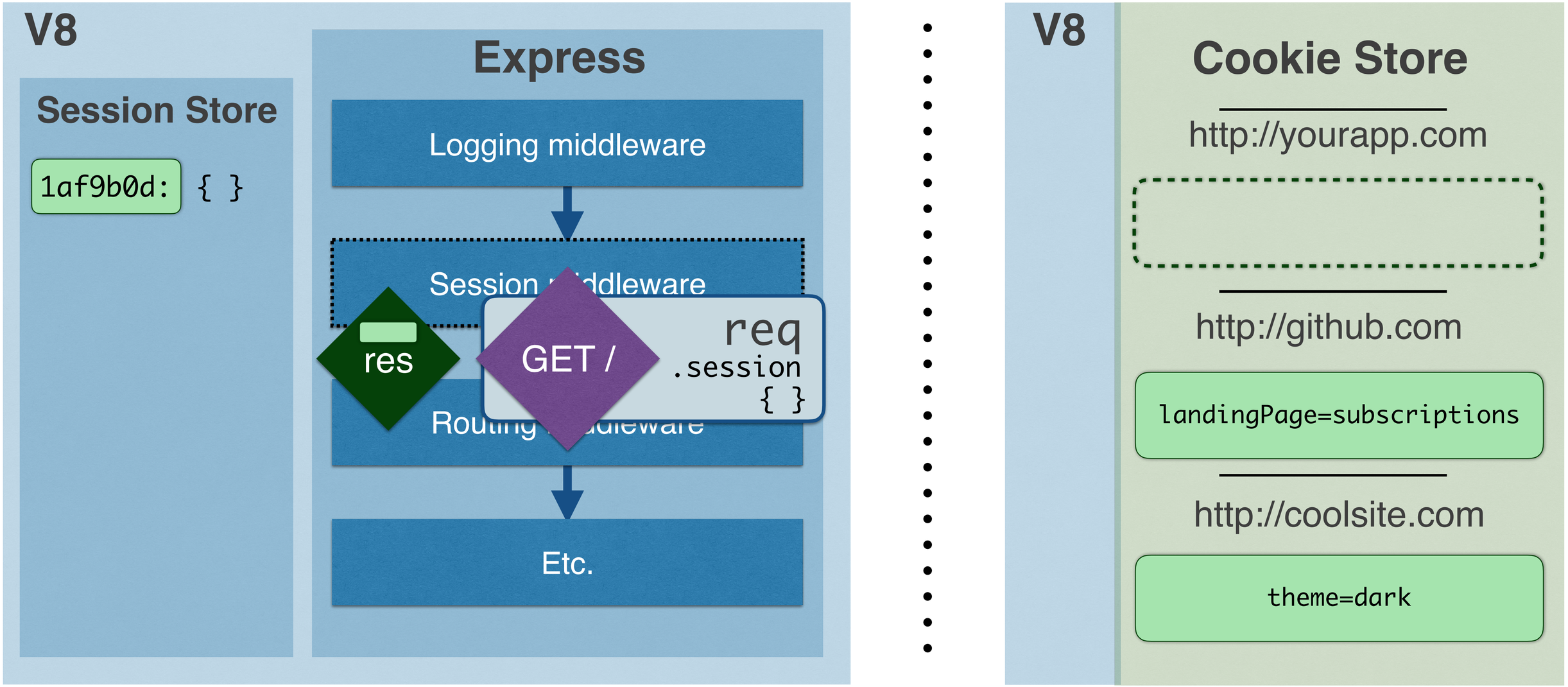
Server (Backend) | Internet (HTTP) | Client (Browser)



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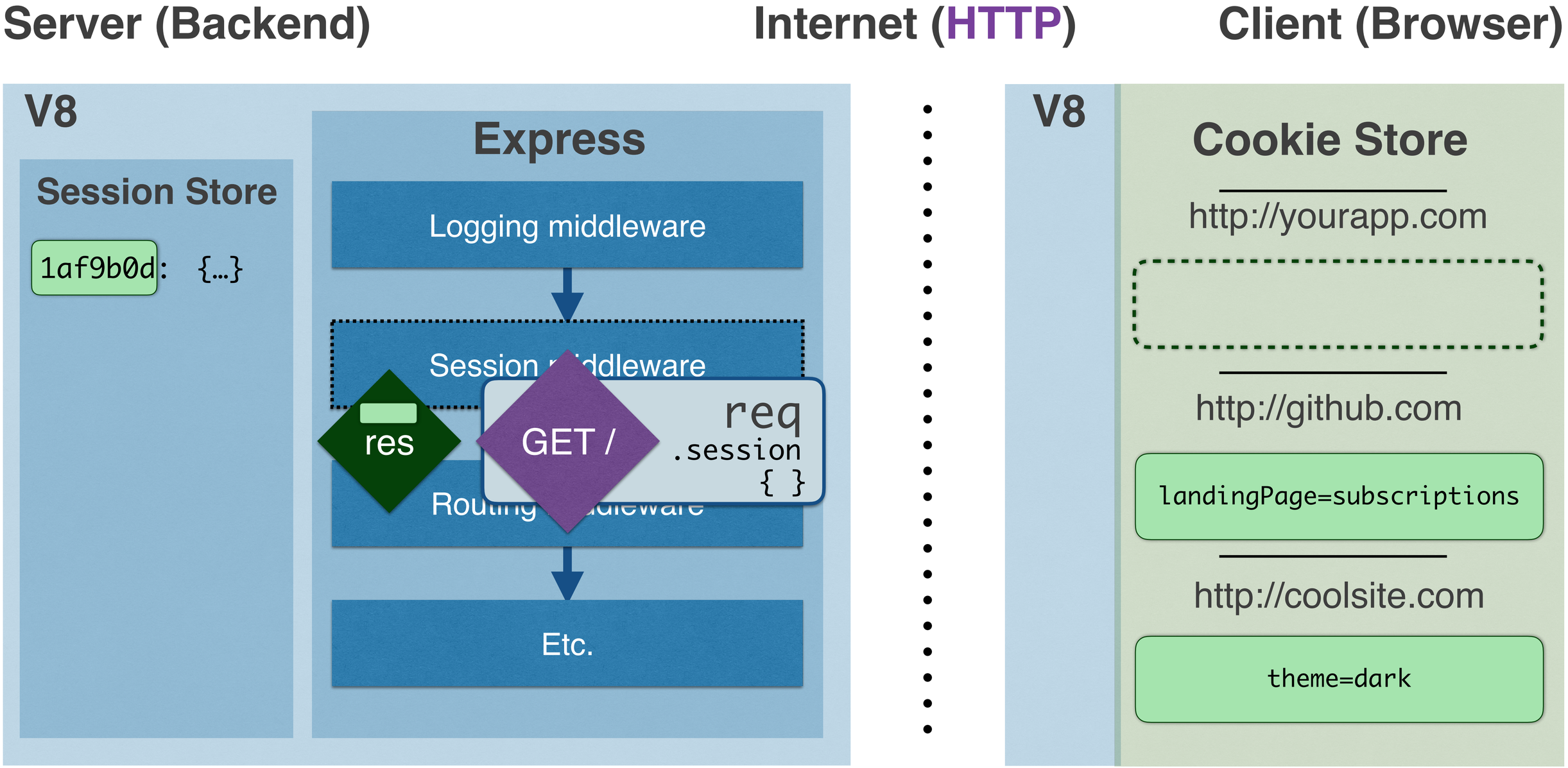

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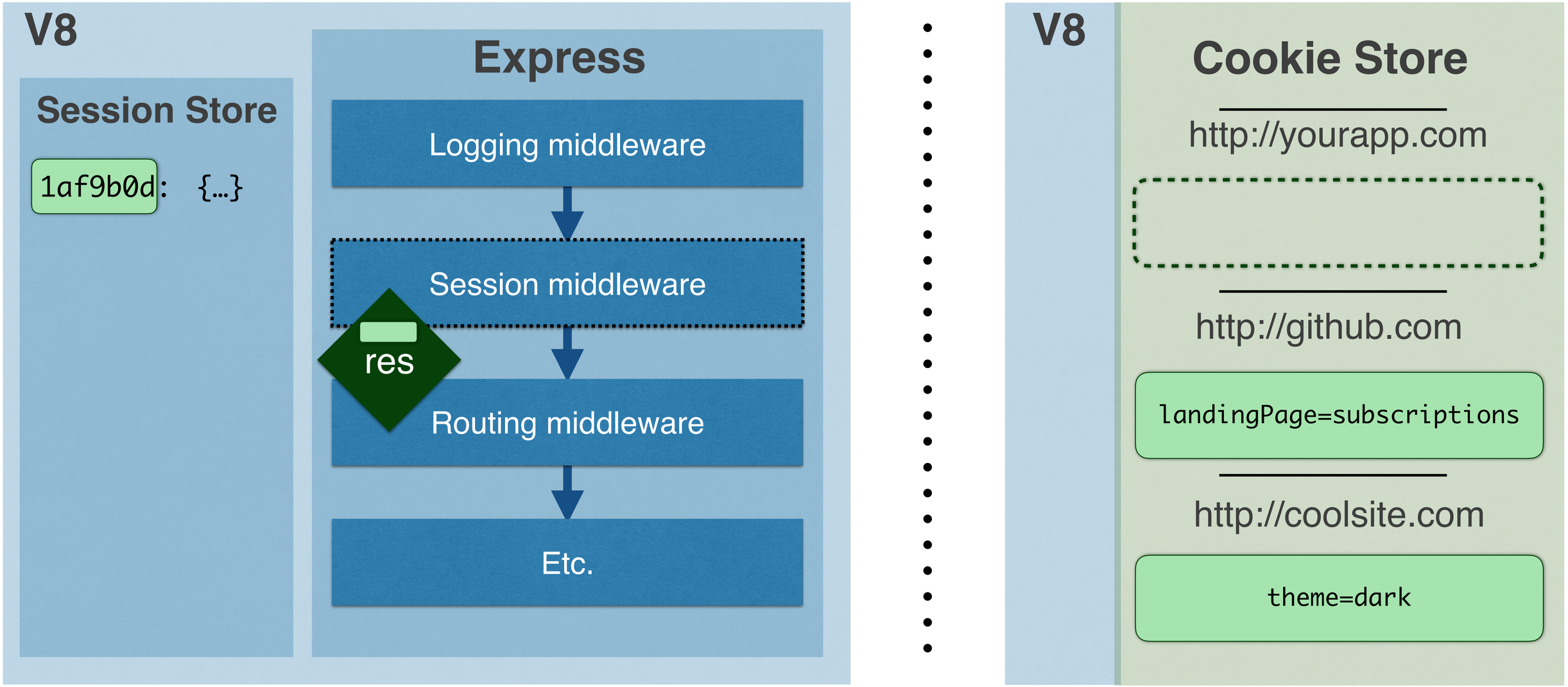

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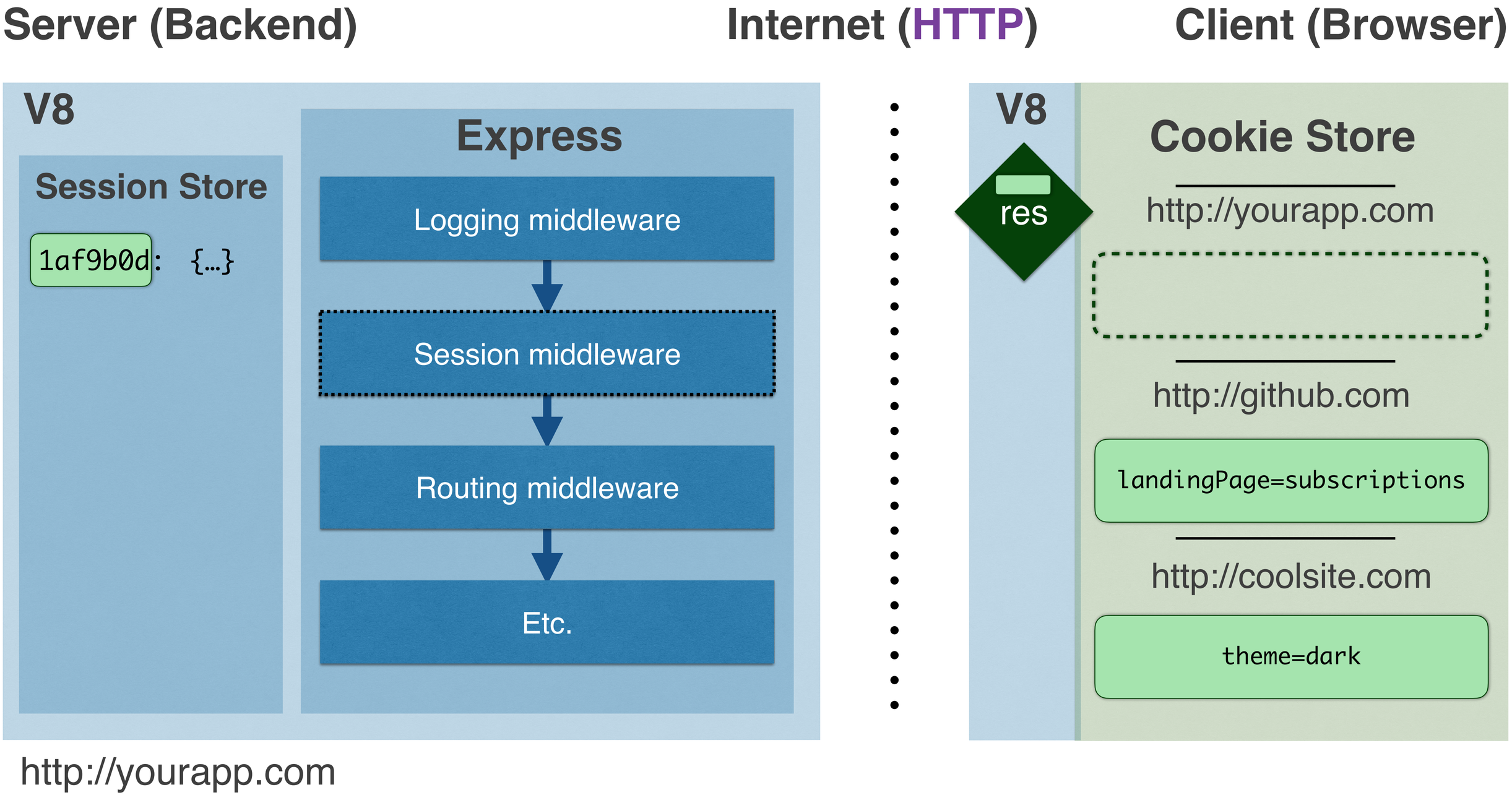
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Session Store
1af9b0d: {…}
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Routing middleware
Etc.
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V8
res
Cookie Store
http://yourapp.com
http://github.com
landingPage=subscriptions
http://coolsite.com
theme=dark

HTTP RESPONSE

```
HTTP/1.x 200 OK
Transfer-Encoding: chunked
Date: Mon, 22 Feb 2016 18:30:00 GMT
Content-Type: text/html
Content-Encoding: gzip
set-cookie: myUid=1af9b0d
```

(headers)

(body, after routing is done)

```
<!DOCTYPE html>
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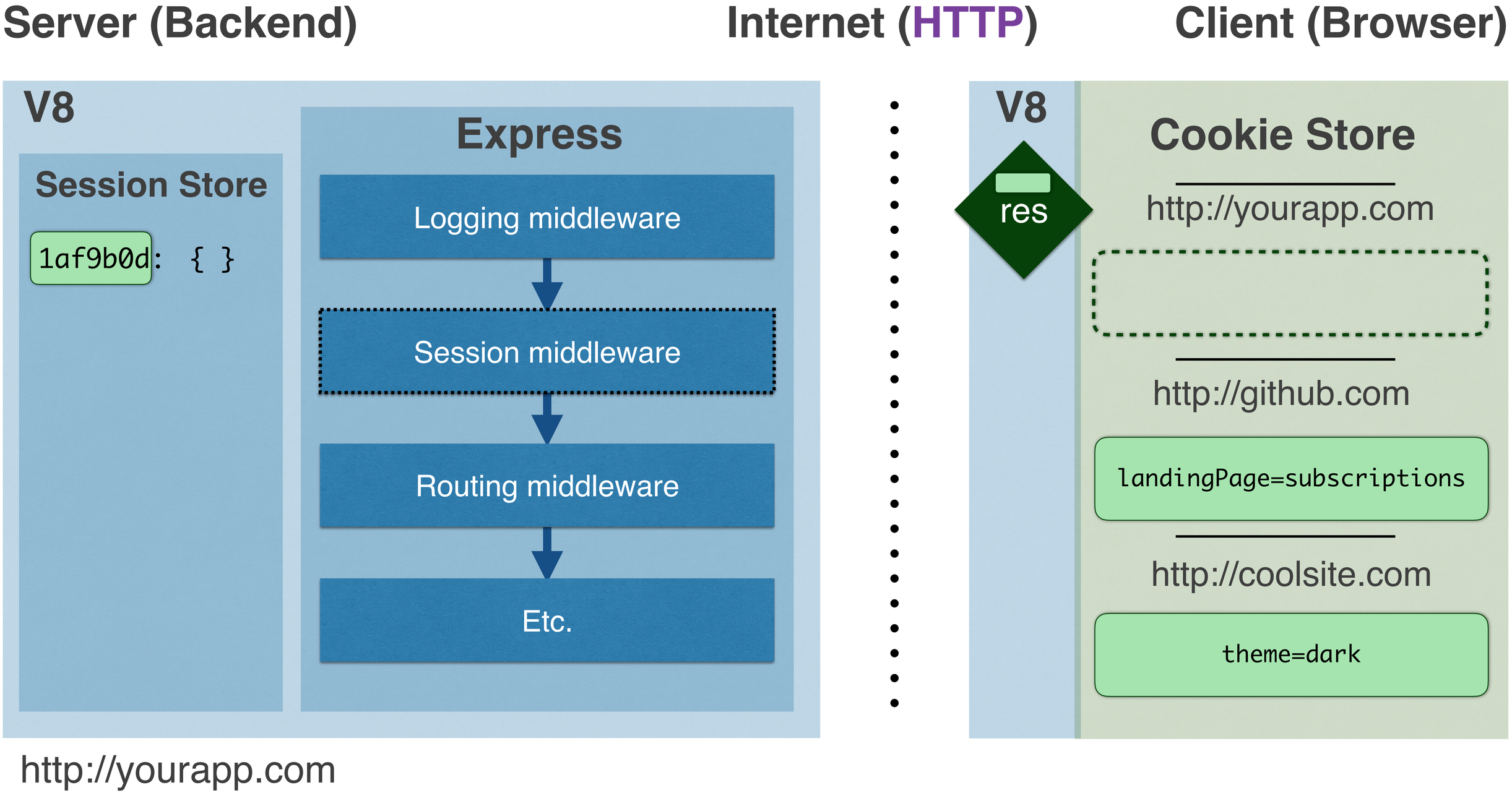
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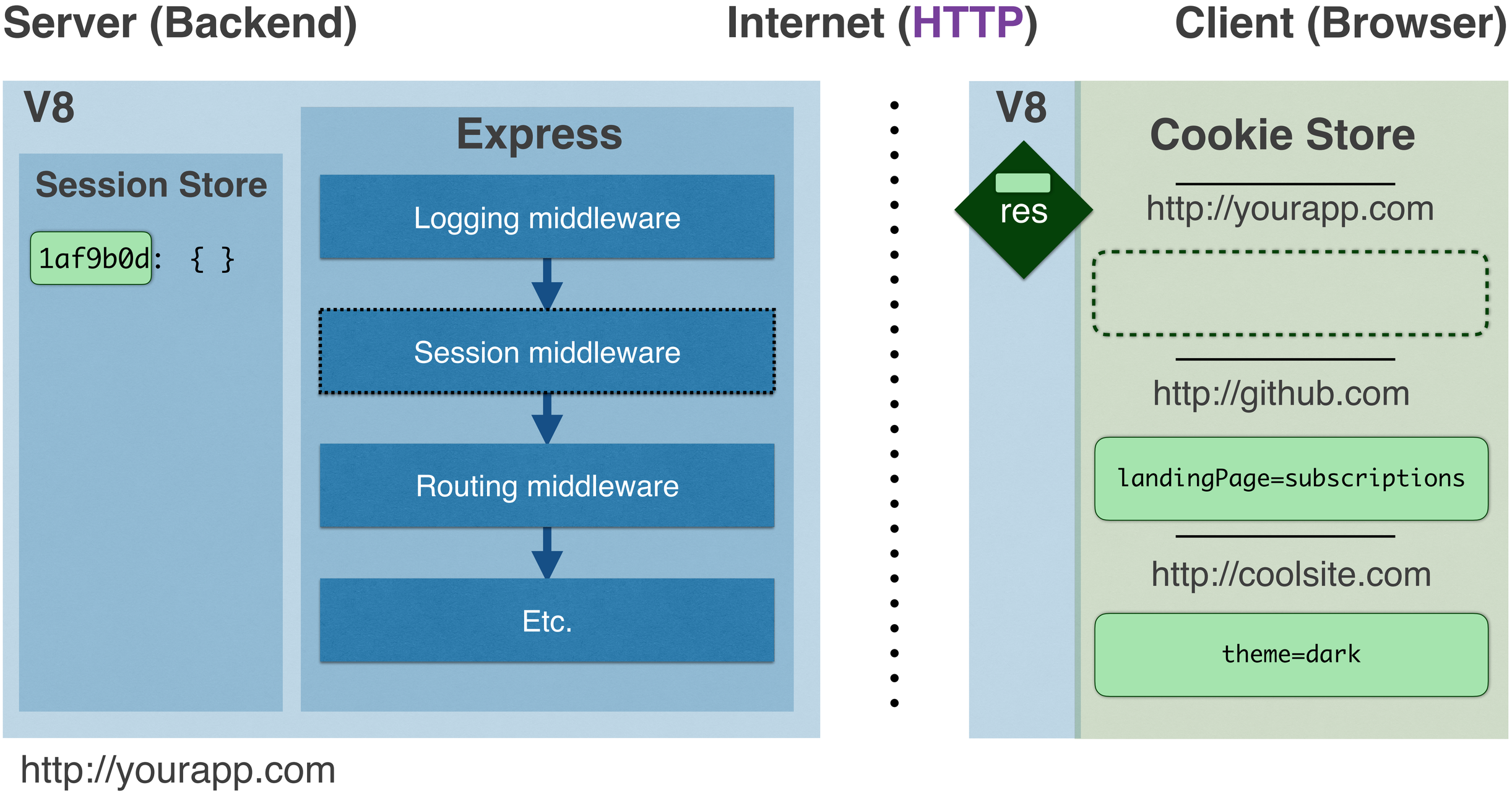
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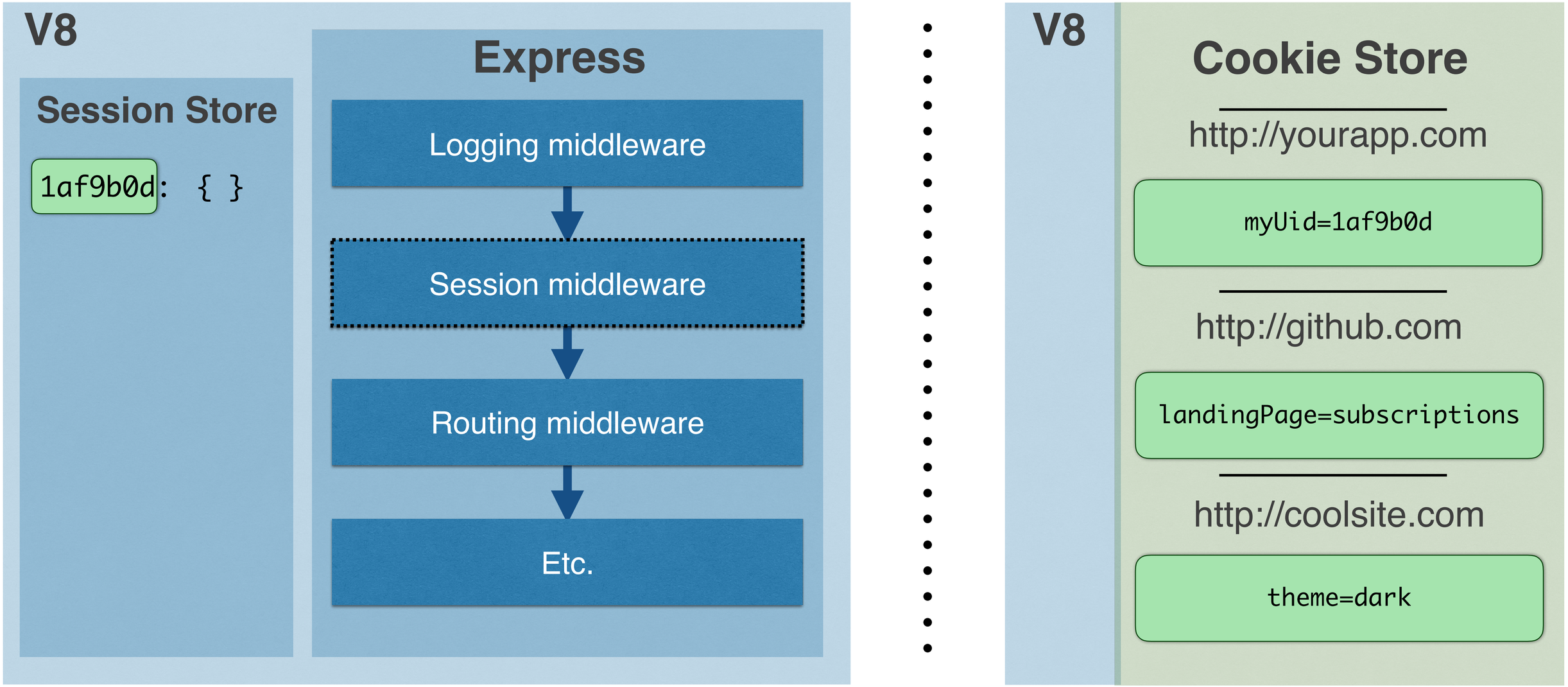
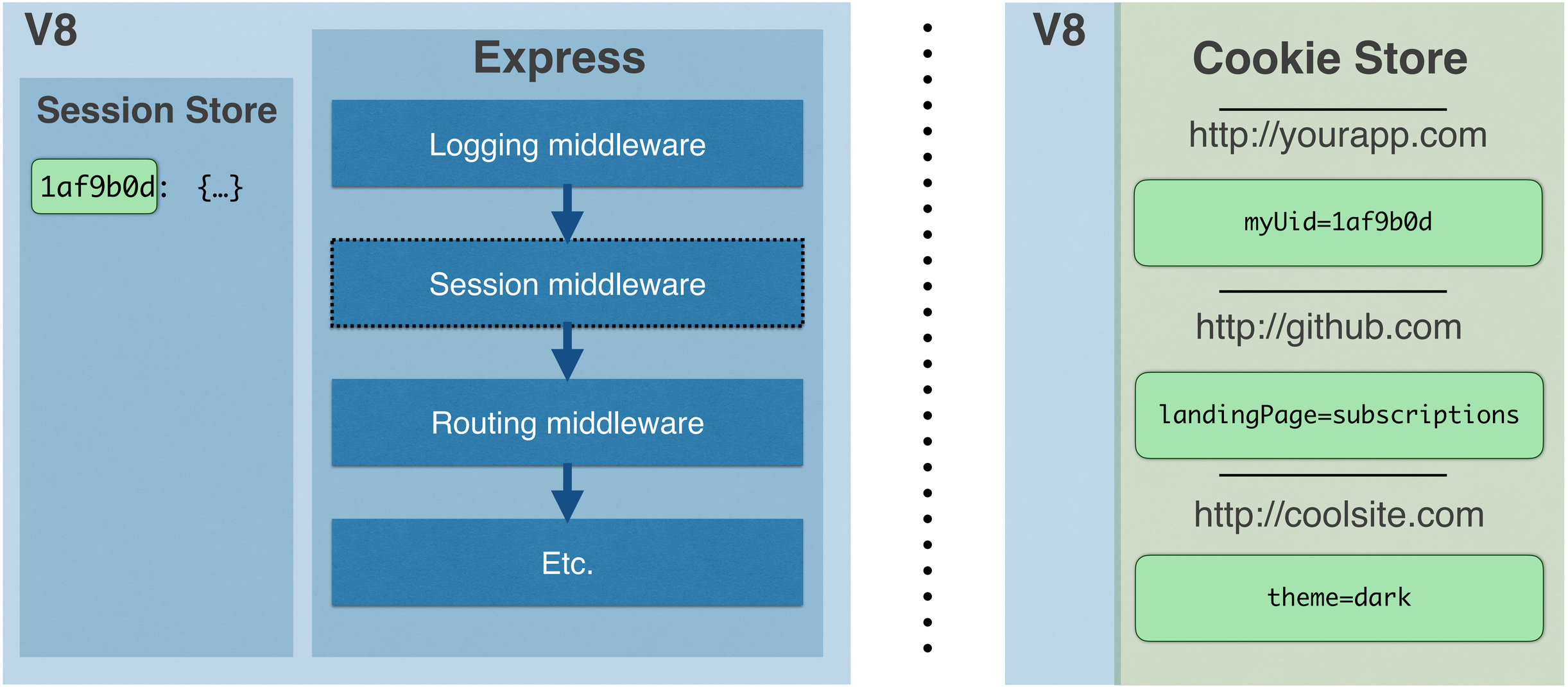
http://coolsite.com
theme=dark

Server (Backend) | Internet (HTTP) | Client (Browser)

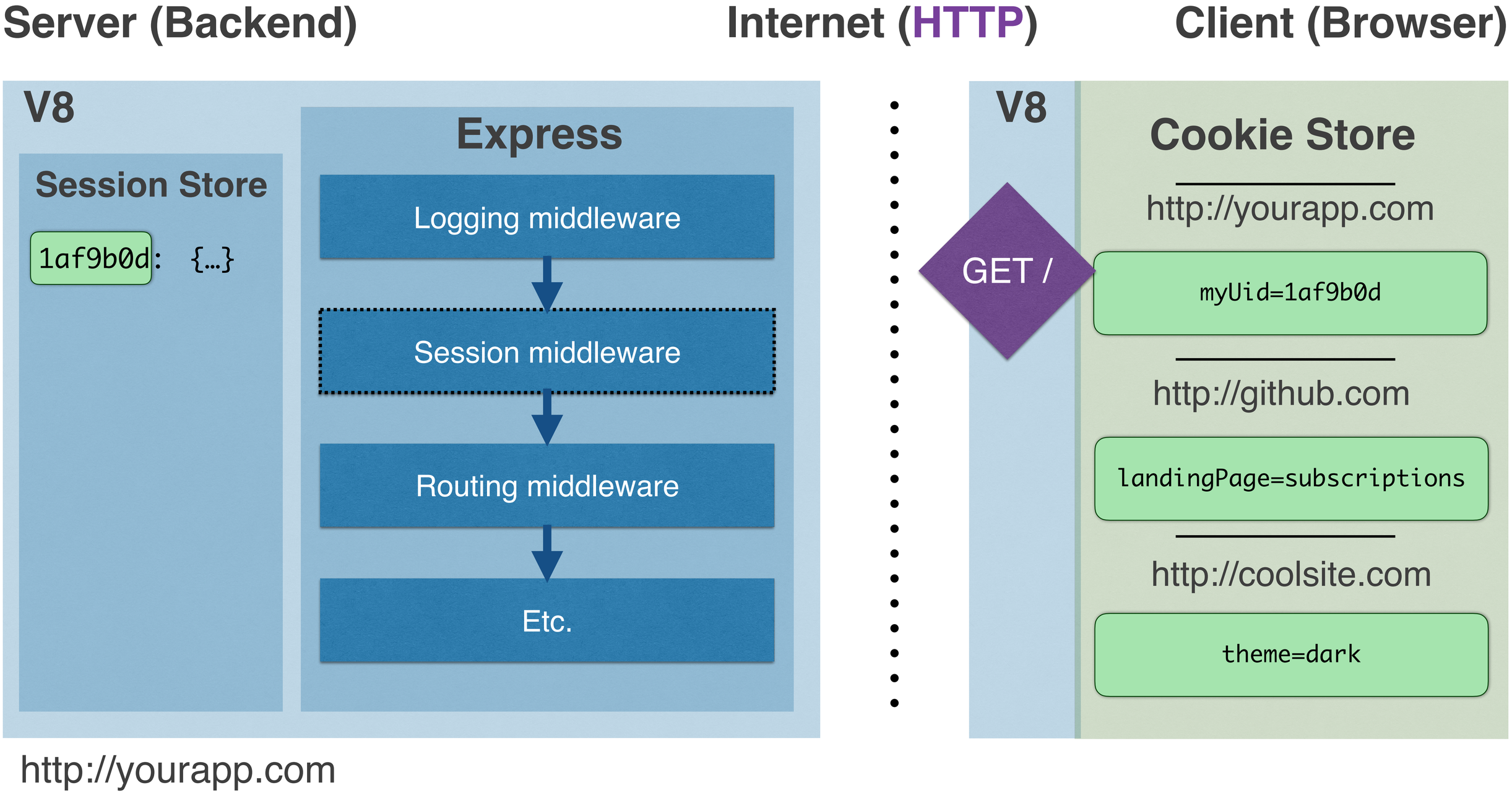


http://yourapp.com

Server (Backend) | Internet (HTTP) | Client (Browser)



http://yourapp.com


Server (Backend)
Internet (HTTP)
Client (Browser)
V8
Session Store
1af9b0d: {…}
Express
Logging middleware
Session middleware
Routing middleware
Etc.
http://yourapp.com
GET /
V8
Cookie Store
http://yourapp.com
myUid=1af9b0d
http://github.com
landingPage=subscriptions
http://coolsite.com
theme=dark

HTTP REQUEST

```
GET / HTTP/1.1
Host: yourapp.com
Connection: keep-alive
Accept: text/html
User-Agent: Chrome/
48.0.2564.116
```

(headers)

(body)

HTTP REQUEST

```
GET / HTTP/1.1
Host: yourapp.com
Connection: keep-alive
Accept: text/html
User-Agent: Chrome/
48.0.2564.116
Cookie: myUid=1af9b0d
```

(headers)

(body)

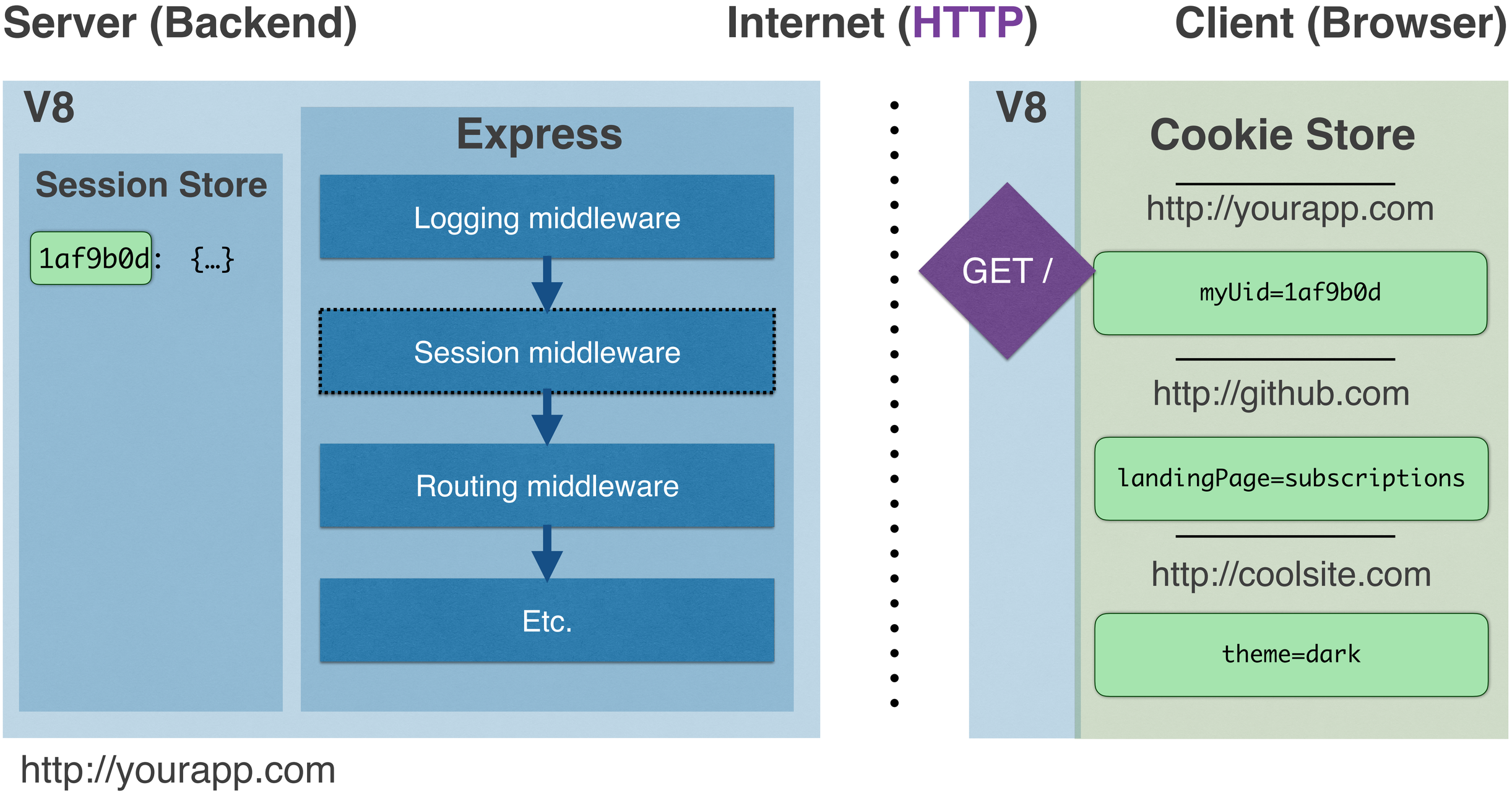
HTTP REQUEST

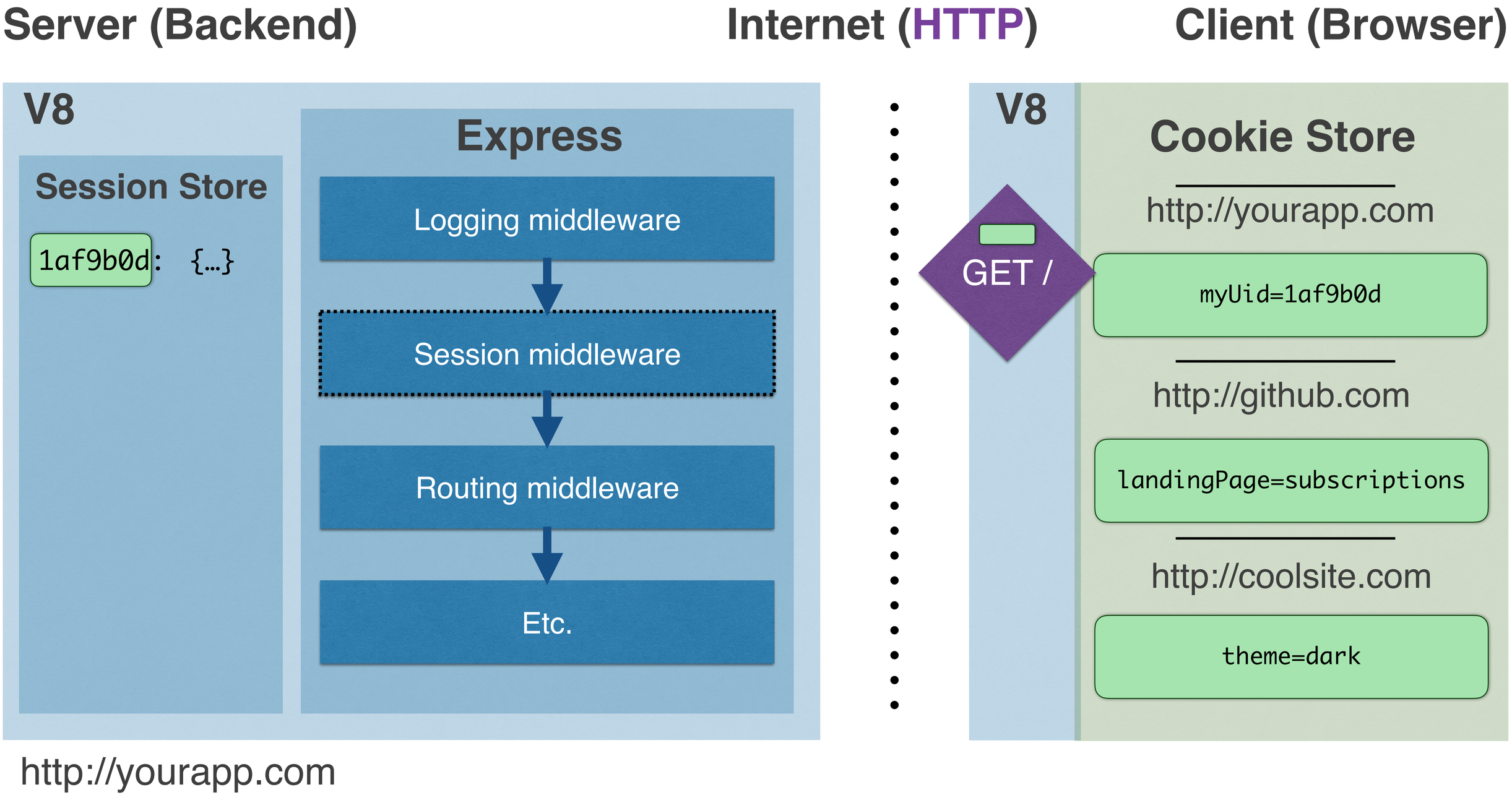
```
GET / HTTP/1.1
Host: yourapp.com
Connection: keep-alive
Accept: text/html
User-Agent: Chrome/
48.0.2564.116
Cookie: myUid=1af9b0d
```

(headers)

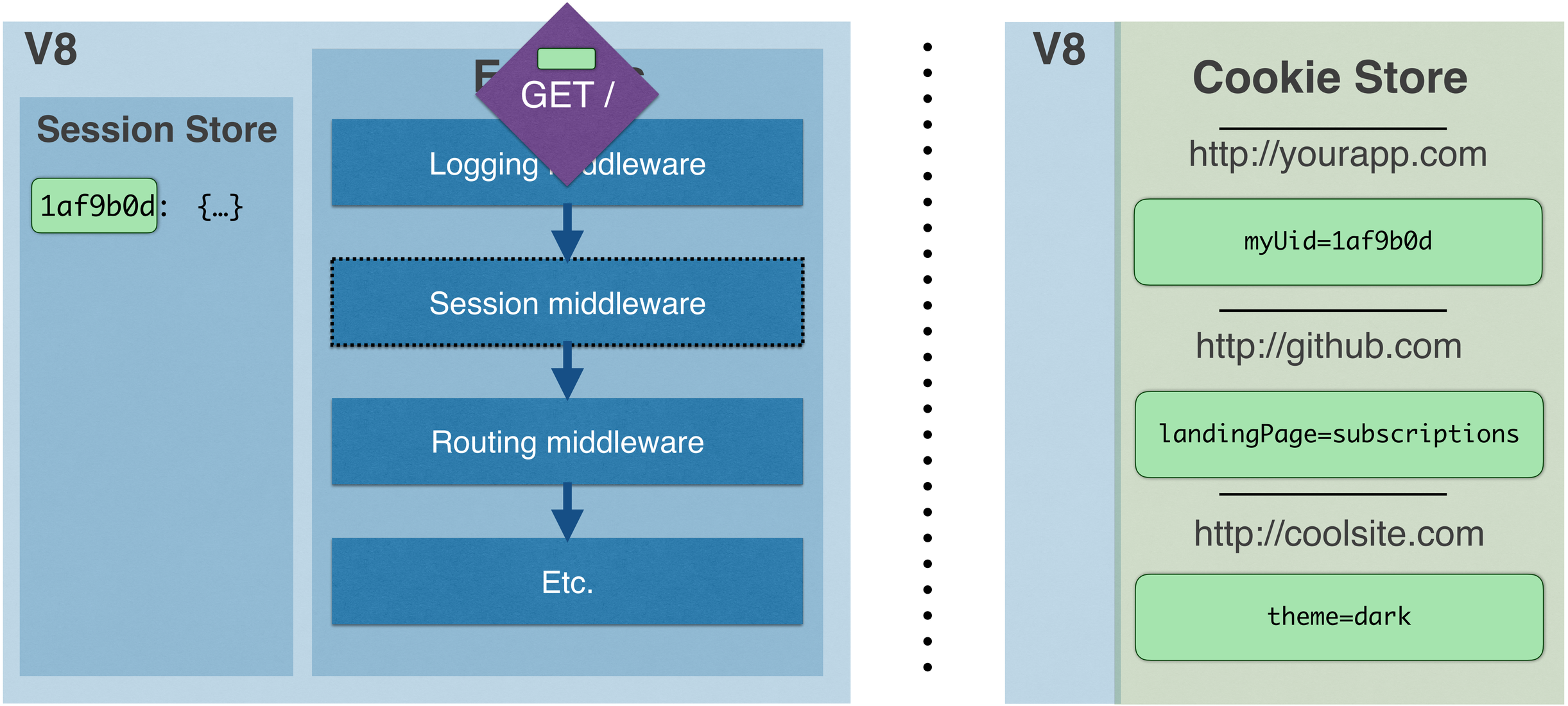
(body)

...attached cookie!


Server (Backend)
Internet (HTTP)
Client (Browser)
V8
Session Store
1af9b0d: {…}
Express
Logging middleware
Session middleware
Routing middleware
Etc.
http://yourapp.com
GET /
V8
Cookie Store
http://yourapp.com
myUid=1af9b0d
http://github.com
landingPage=subscriptions
http://coolsite.com
theme=dark

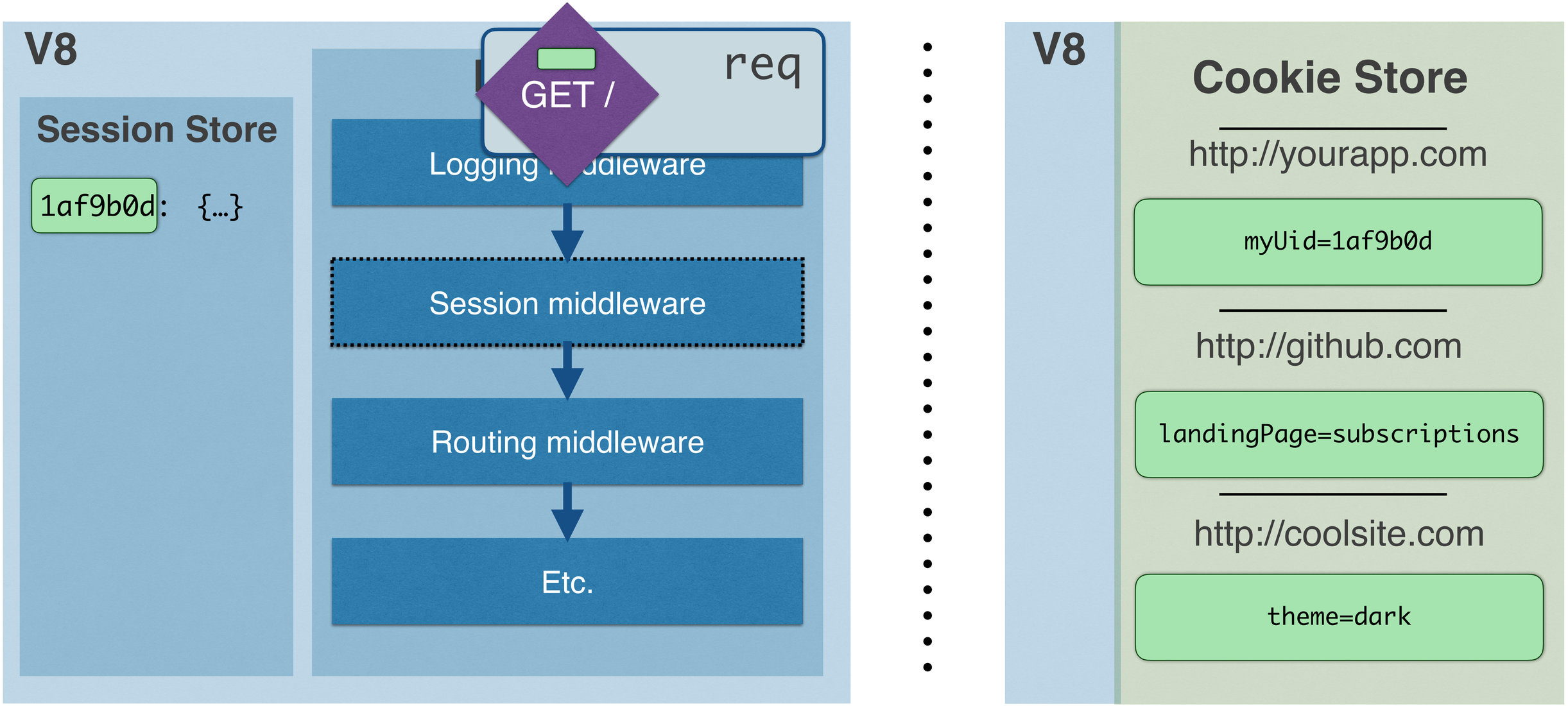

Server (Backend)
Internet (HTTP)
Client (Browser)
V8
Session Store
1af9b0d: {…}
Express
Logging middleware
Session middleware
Routing middleware
Etc.
http://yourapp.com
V8
GET /
Cookie Store
http://yourapp.com
myUid=1af9b0d
http://github.com
landingPage=subscriptions
http://coolsite.com
theme=dark

Server (Backend) | Internet (HTTP) | Client (Browser)



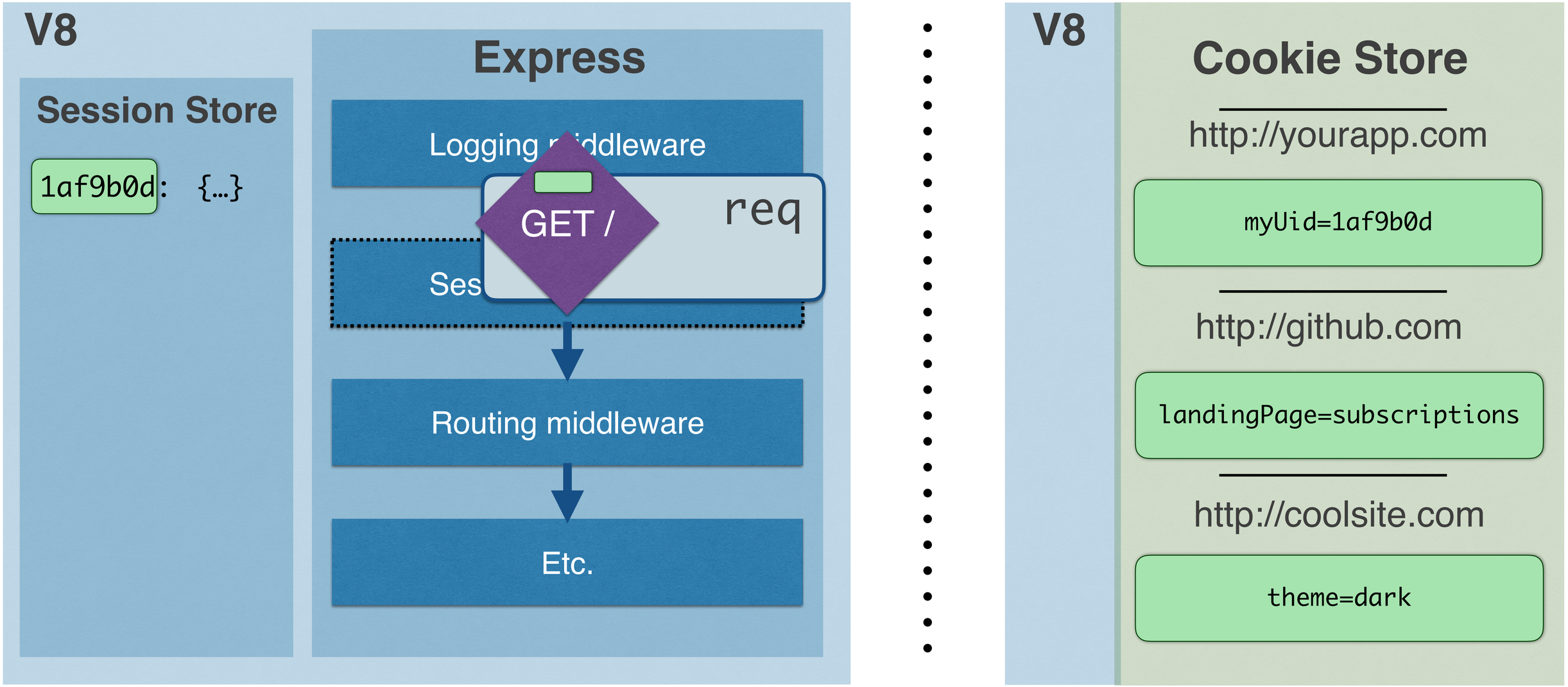
http://yourapp.com

Server (Backend) | Internet (HTTP) | Client (Browser)



http://yourapp.com

Server (Backend) | Internet (HTTP) | Client (Browser)



http://yourapp.com

HTTP REQUEST

```
GET / HTTP/1.1
Host: yourapp.com
Connection: keep-alive
Accept: text/html
User-Agent: Chrome/
48.0.2564.116
Cookie: myUid=1af9b0d
```

(headers)

(body)

HTTP REQUEST

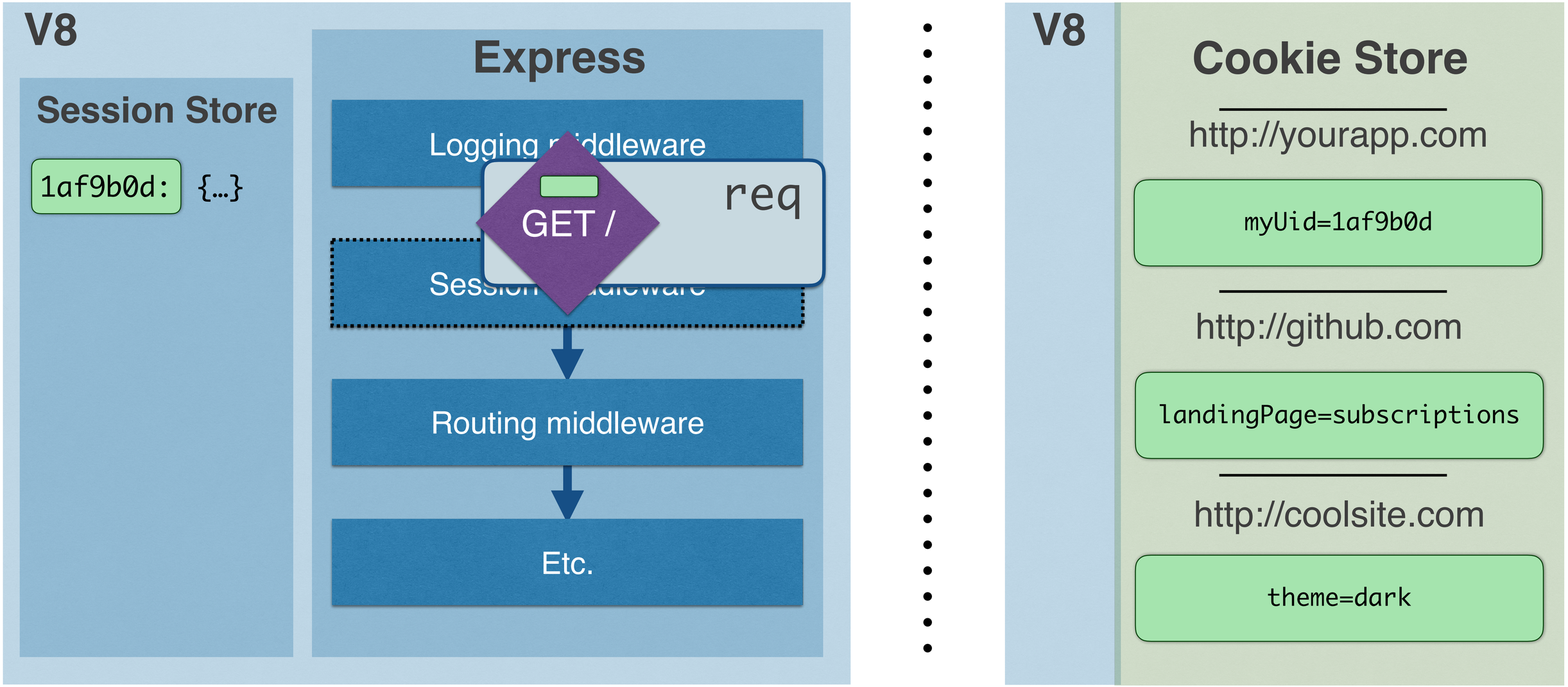
```
GET / HTTP/1.1
Host: yourapp.com
Connection: keep-alive
Accept: text/html
User-Agent: Chrome/
48.0.2564.116
Cookie: myUid=1af9b0d
```

(headers)

(body)

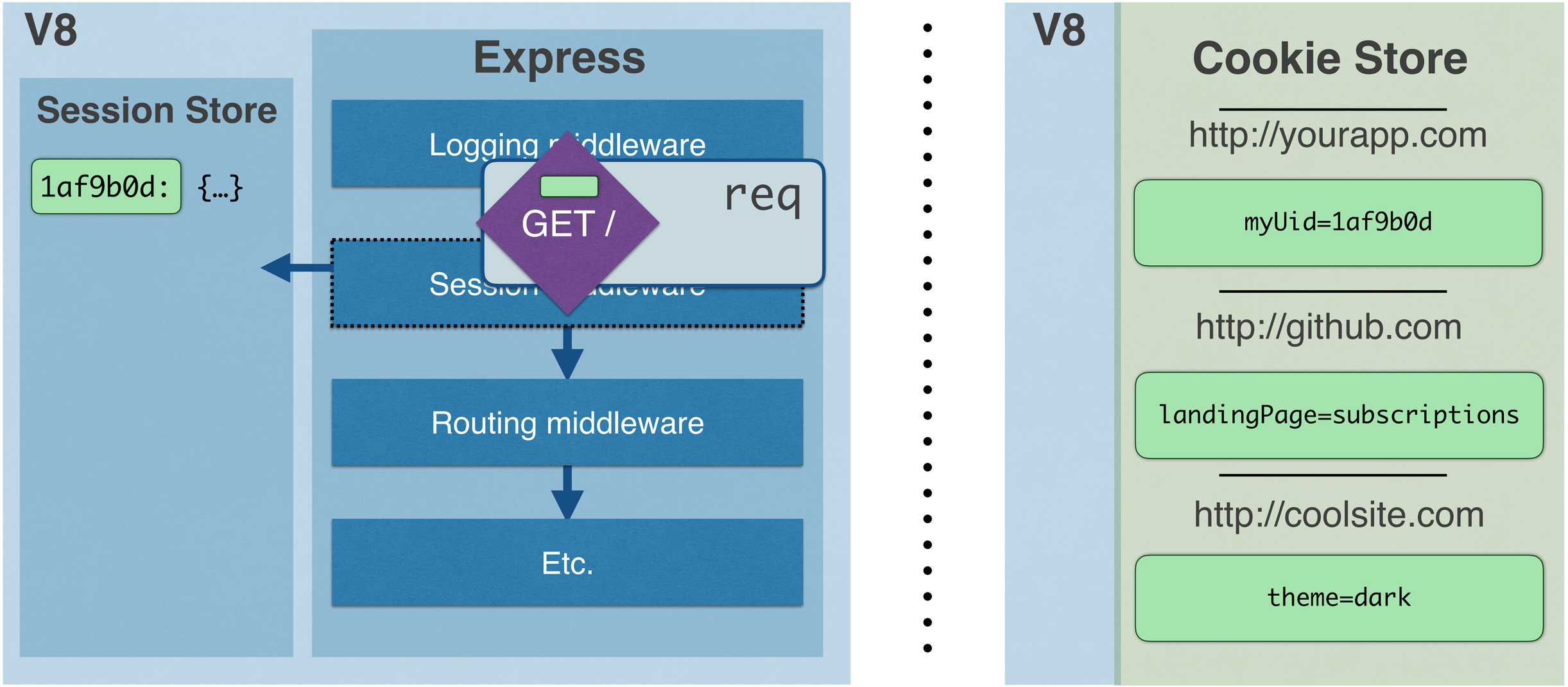
attached cookie, so session middleware: let's look up the session!

Server (Backend) | Internet (HTTP) | Client (Browser)



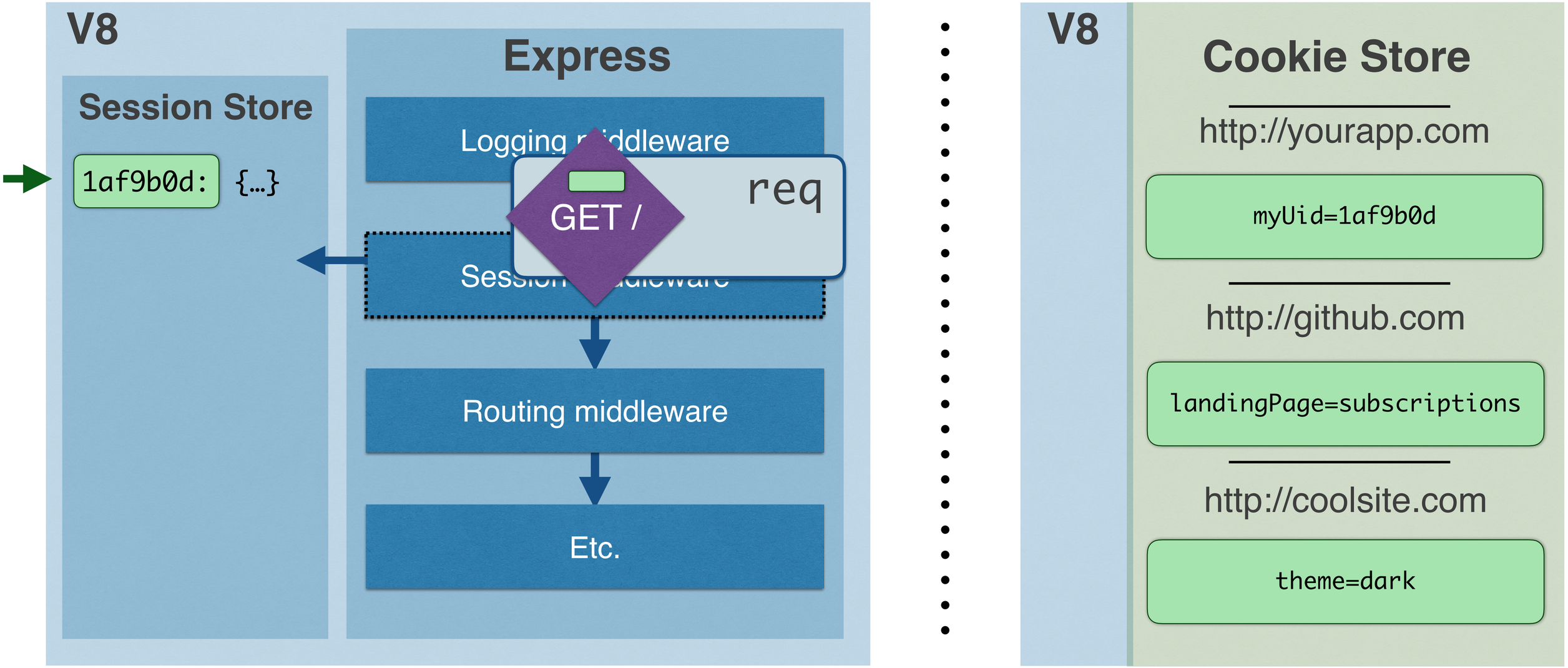
http://yourapp.com

Server (Backend) | Internet (HTTP) | Client (Browser)

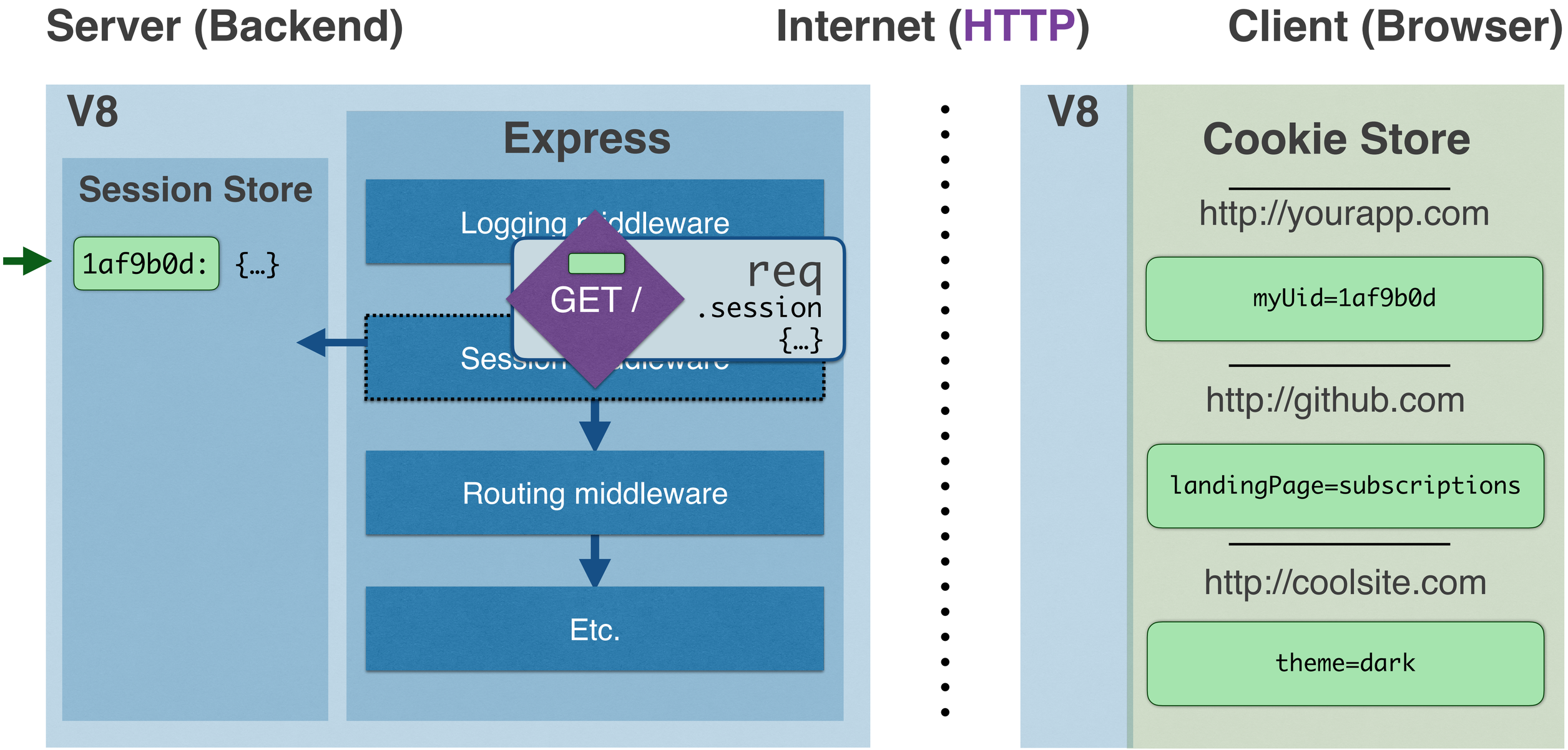


http://yourapp.com

Server (Backend) | Internet (HTTP) | Client (Browser)

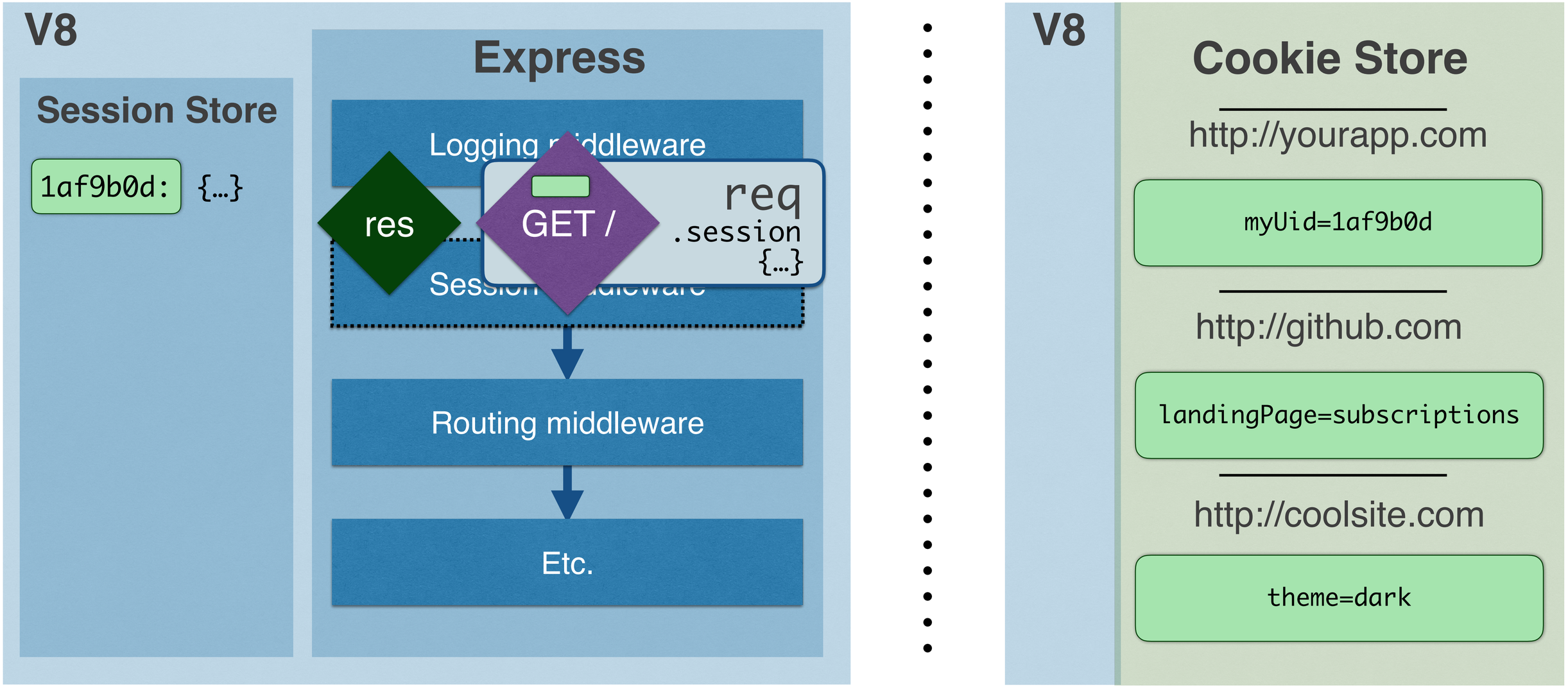


http://yourapp.com



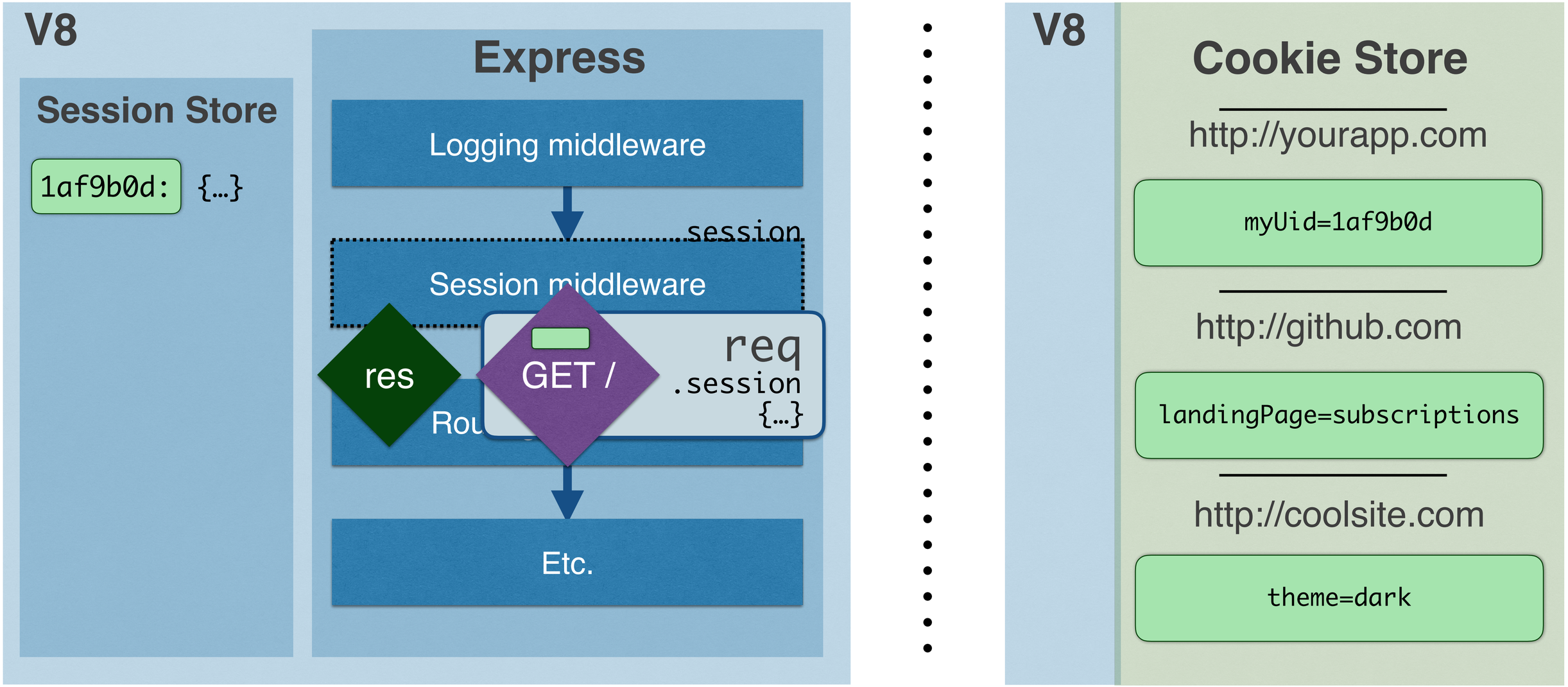
http://yourapp.com

Server (Backend) | Internet (HTTP) | Client (Browser)



http://yourapp.com

Server (Backend) | Internet (HTTP) | Client (Browser)



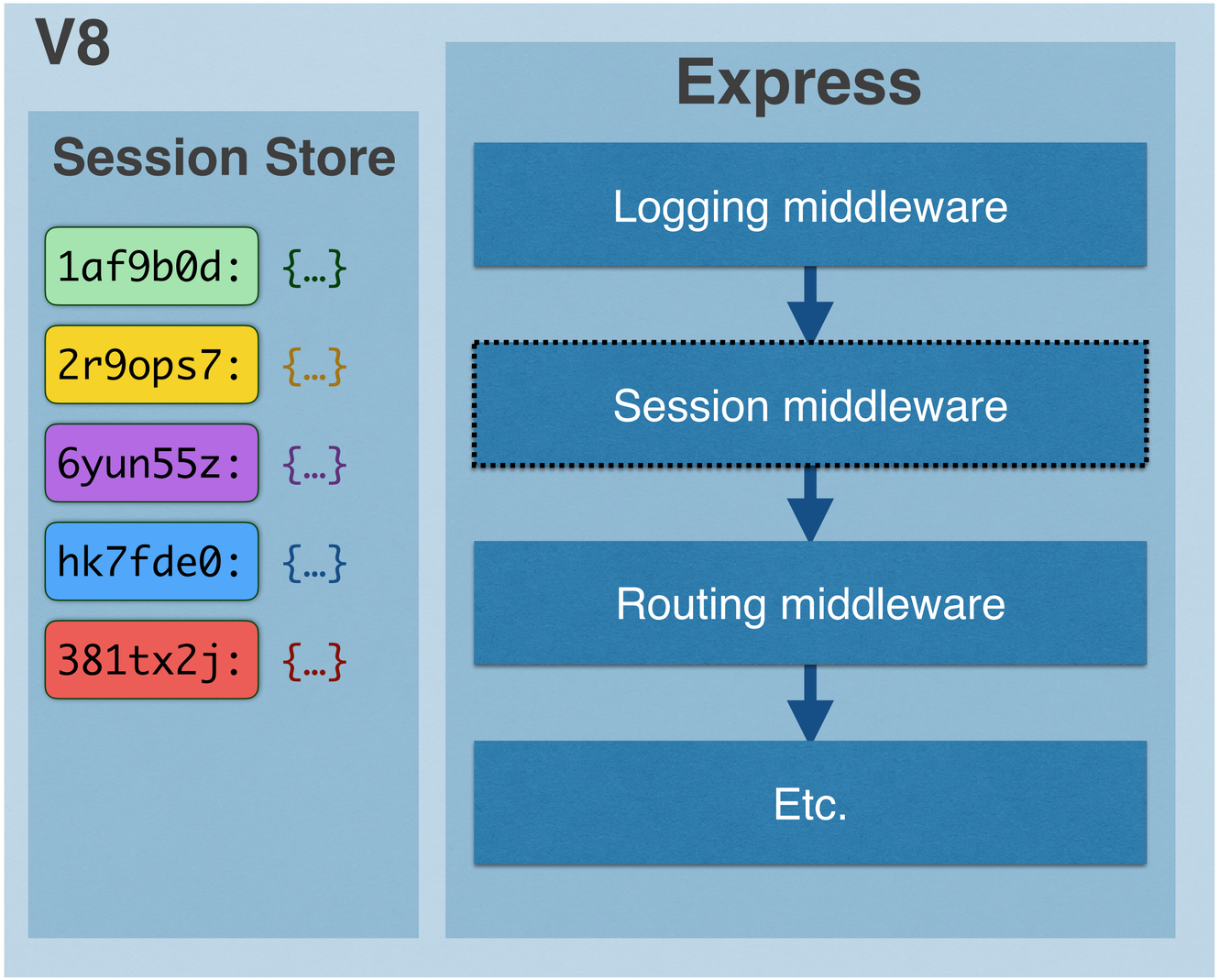
http://yourapp.com

Multiple Sessions

Server (Backend)

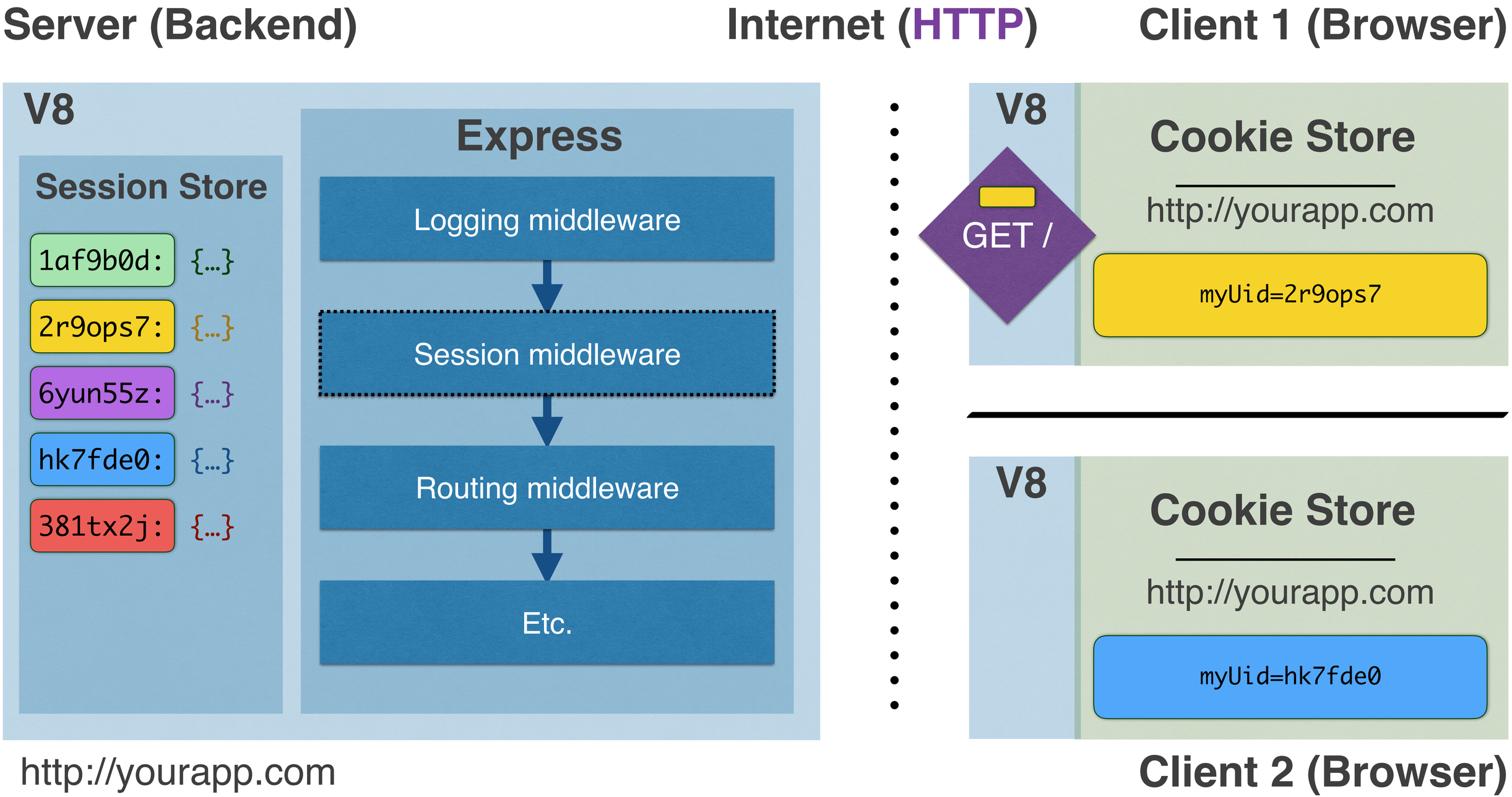
Internet (HTTP)

Client 1 (Browser)



http://yourapp.com

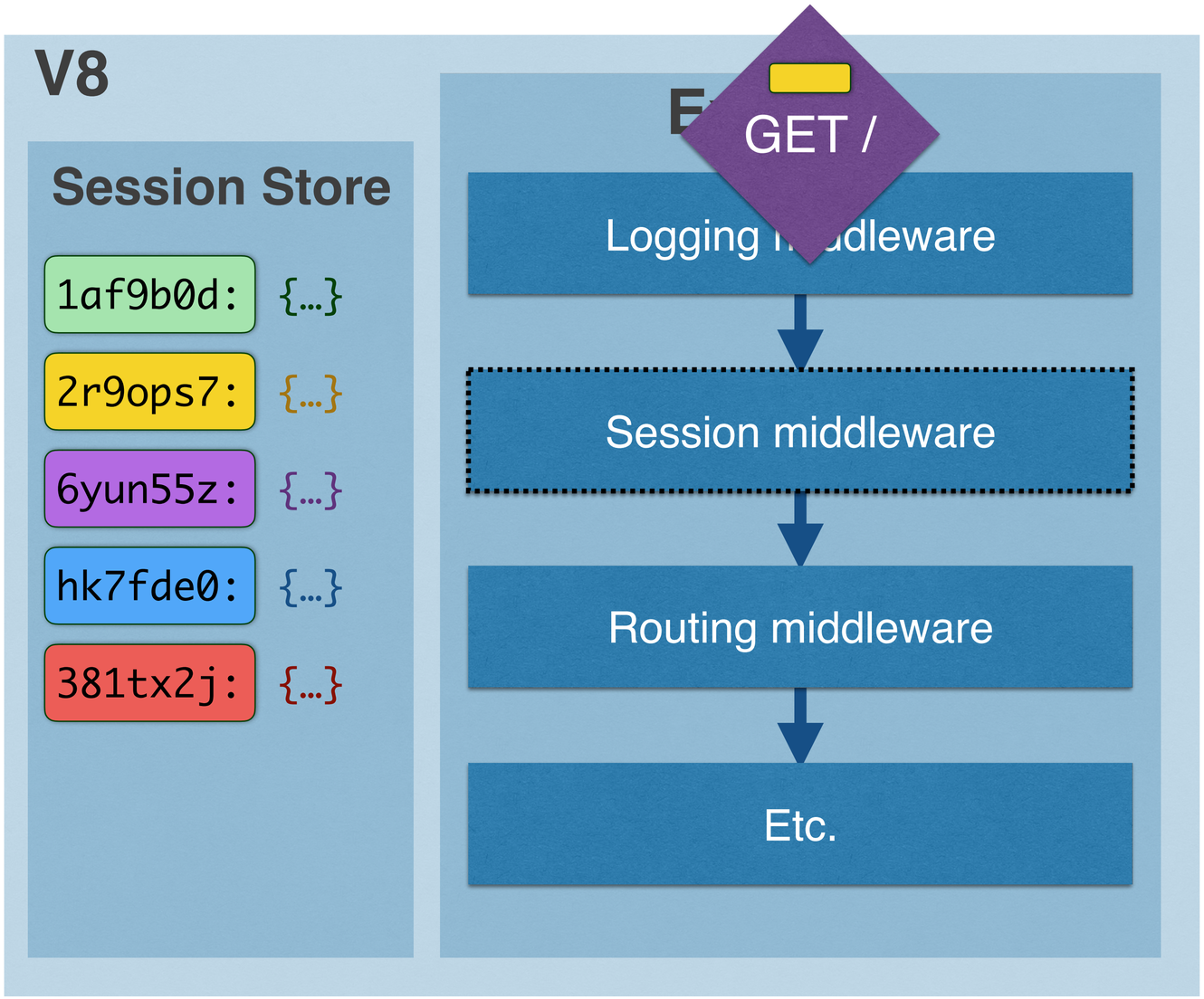
Client 2 (Browser)

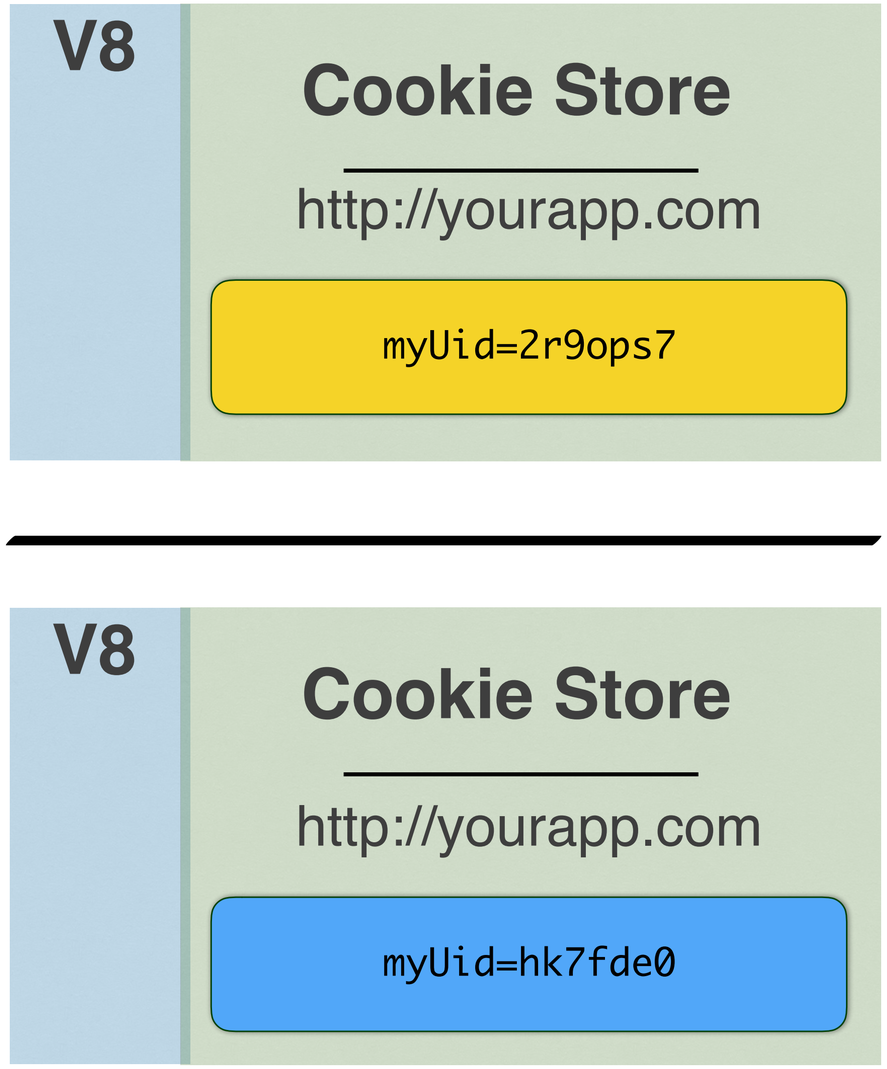

Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Session Store
1af9b0d: {...}
2r9ops7: {...}
6yun55z: {...}
hk7fde0: {...}
381tx2j: {...}
Express
Logging middleware
Session middleware
Routing middleware
Etc.
http://yourapp.com
V8
GET /
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
Client 2 (Browser)

Server (Backend)

Internet (HTTP)

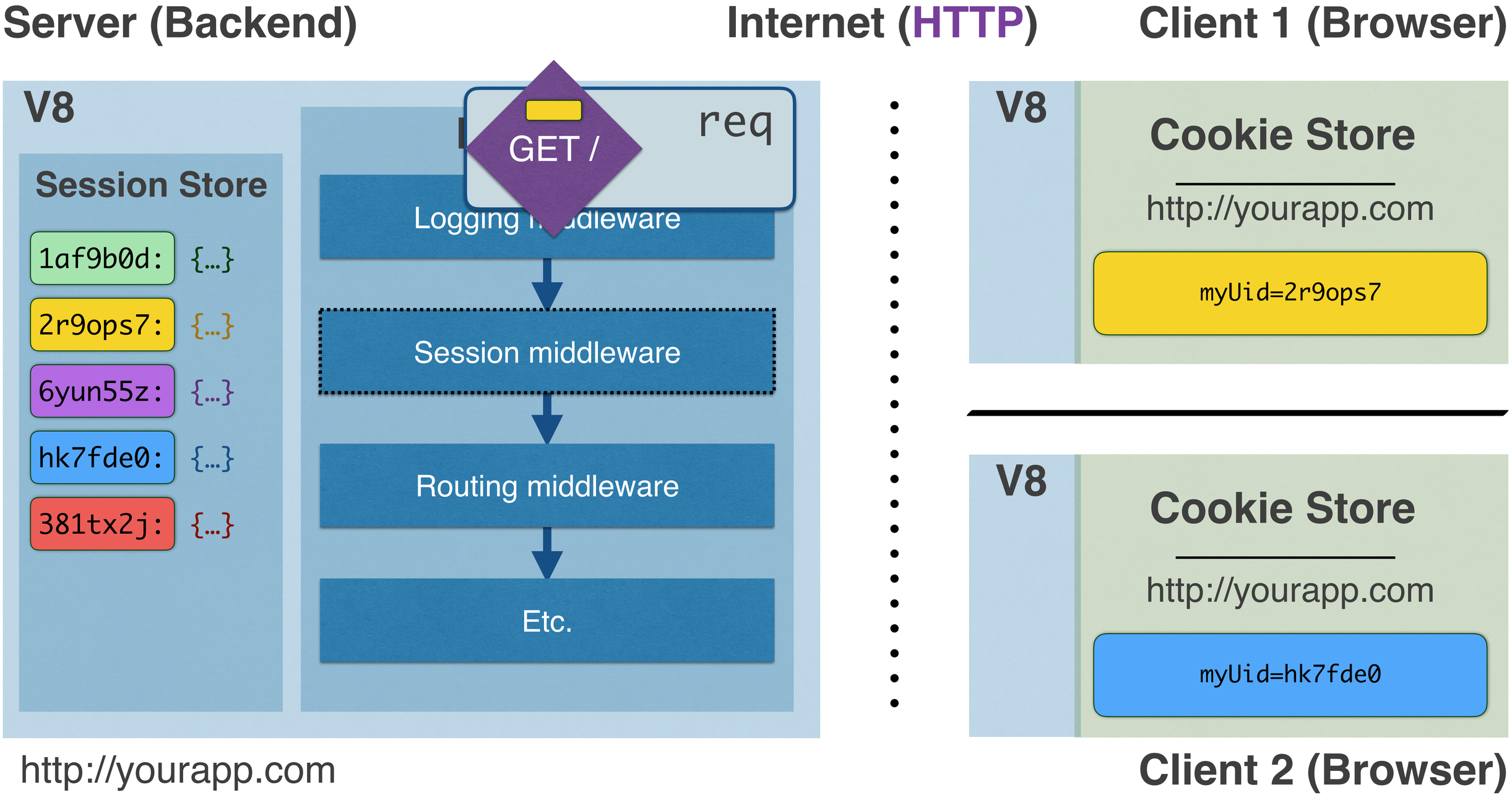
Client 1 (Browser)

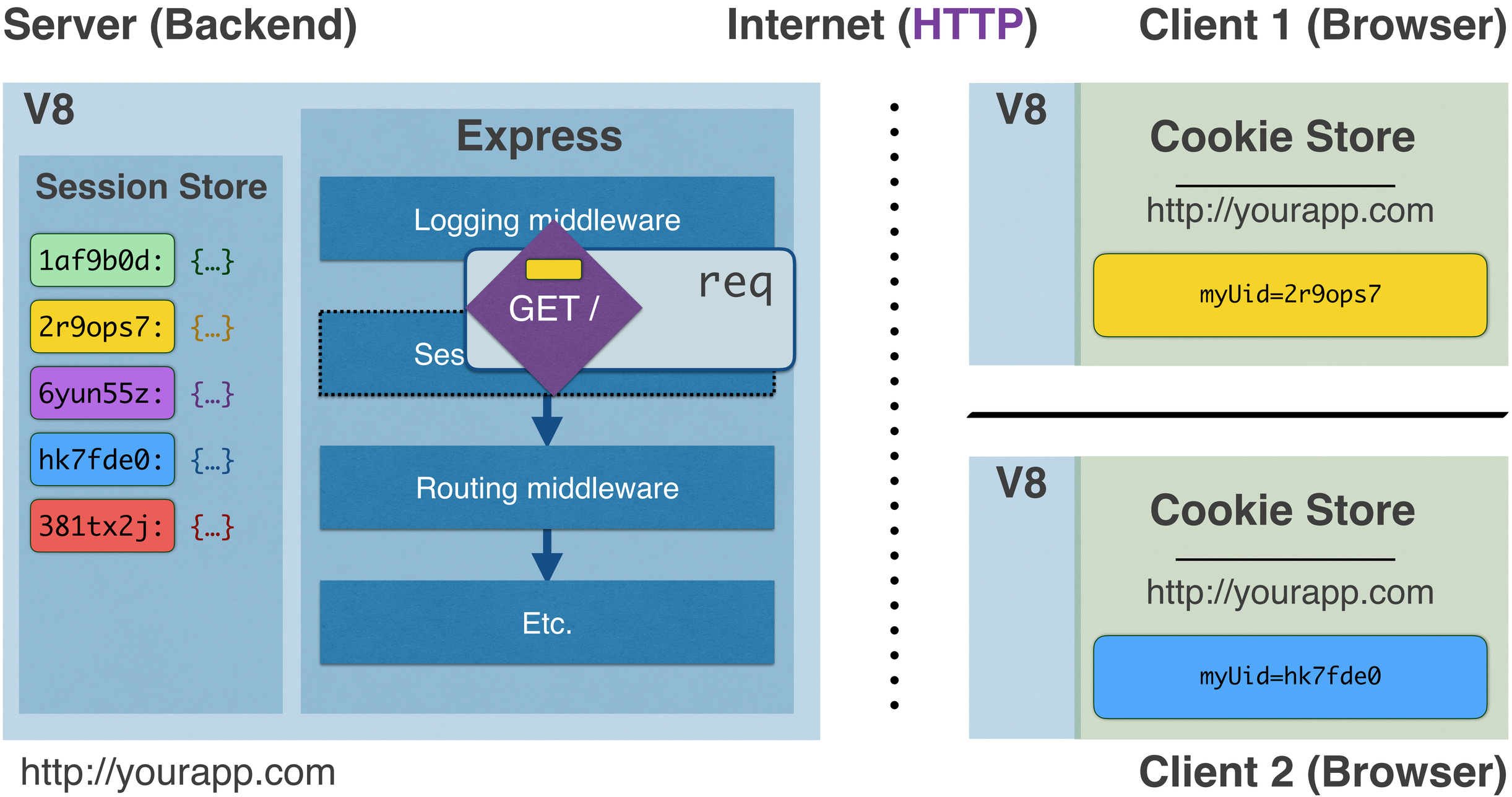


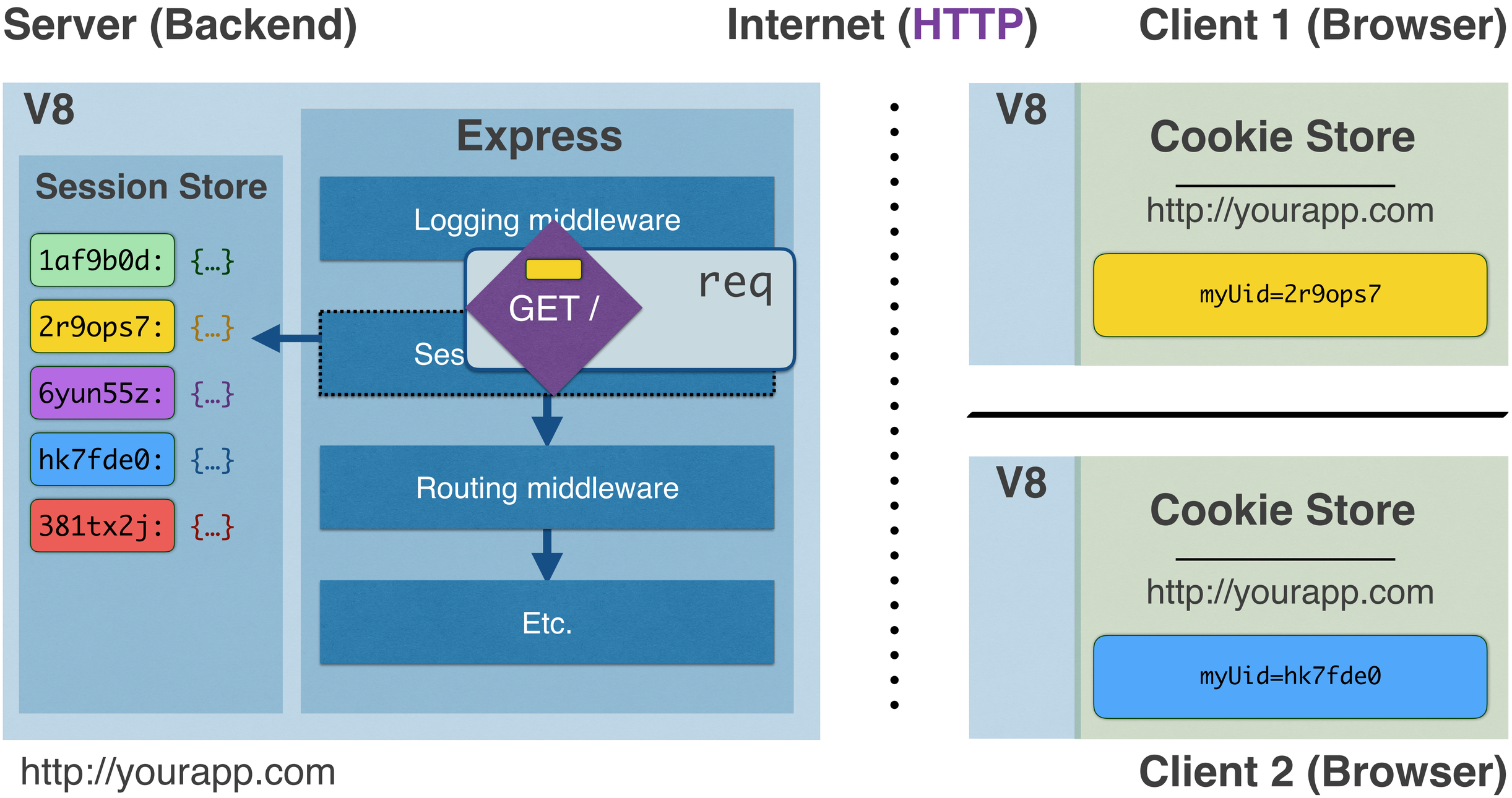


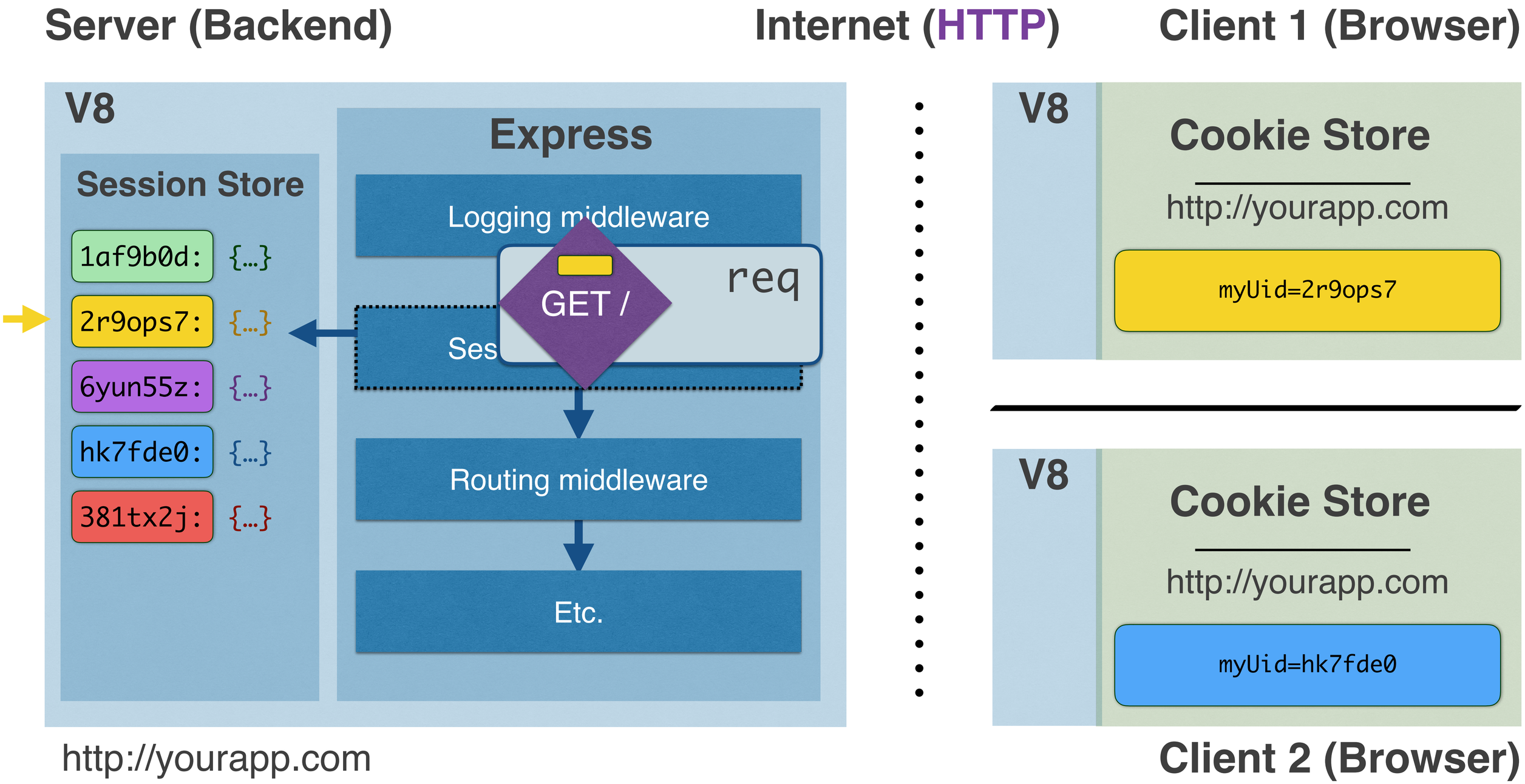
http://yourapp.com

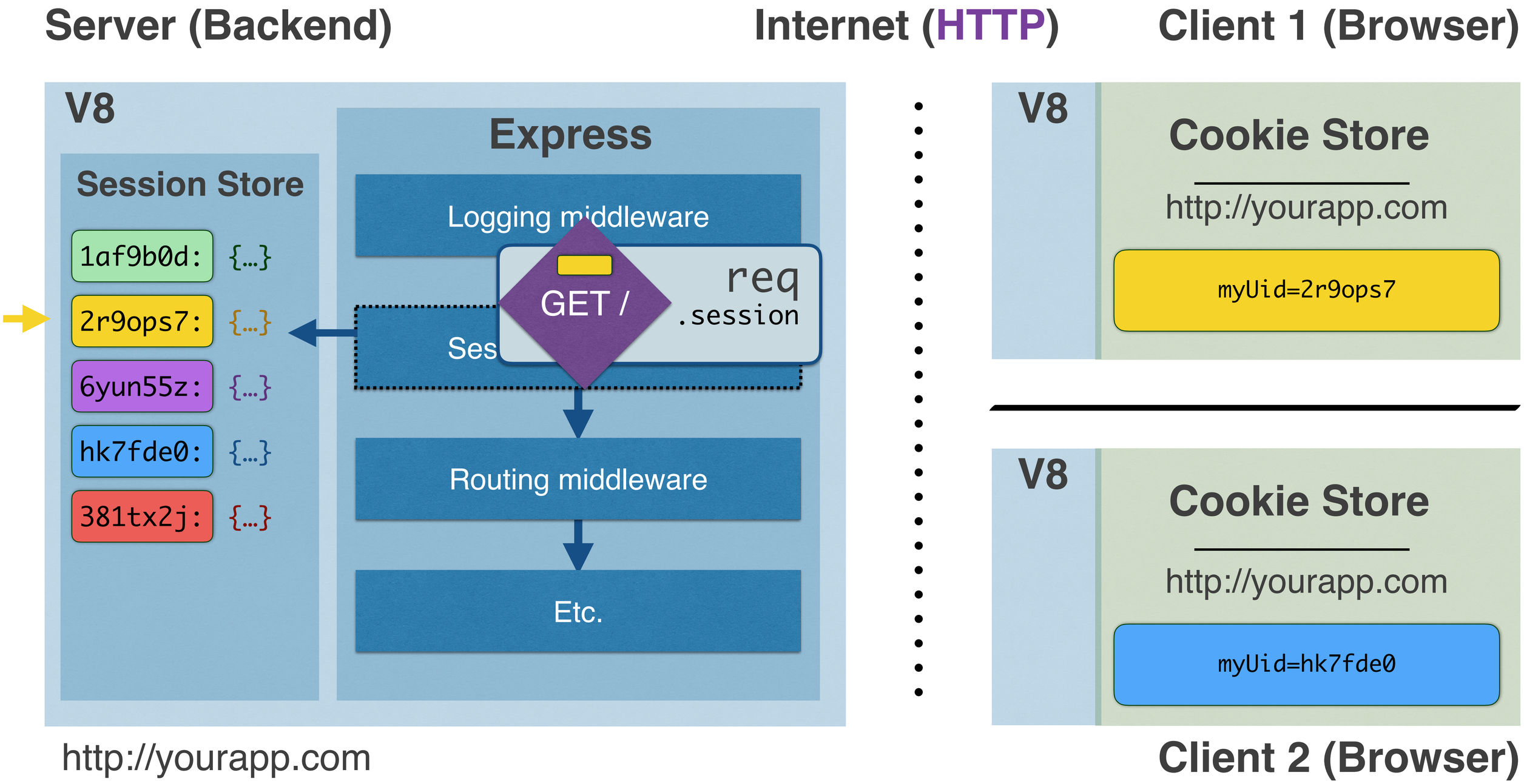
Client 2 (Browser)

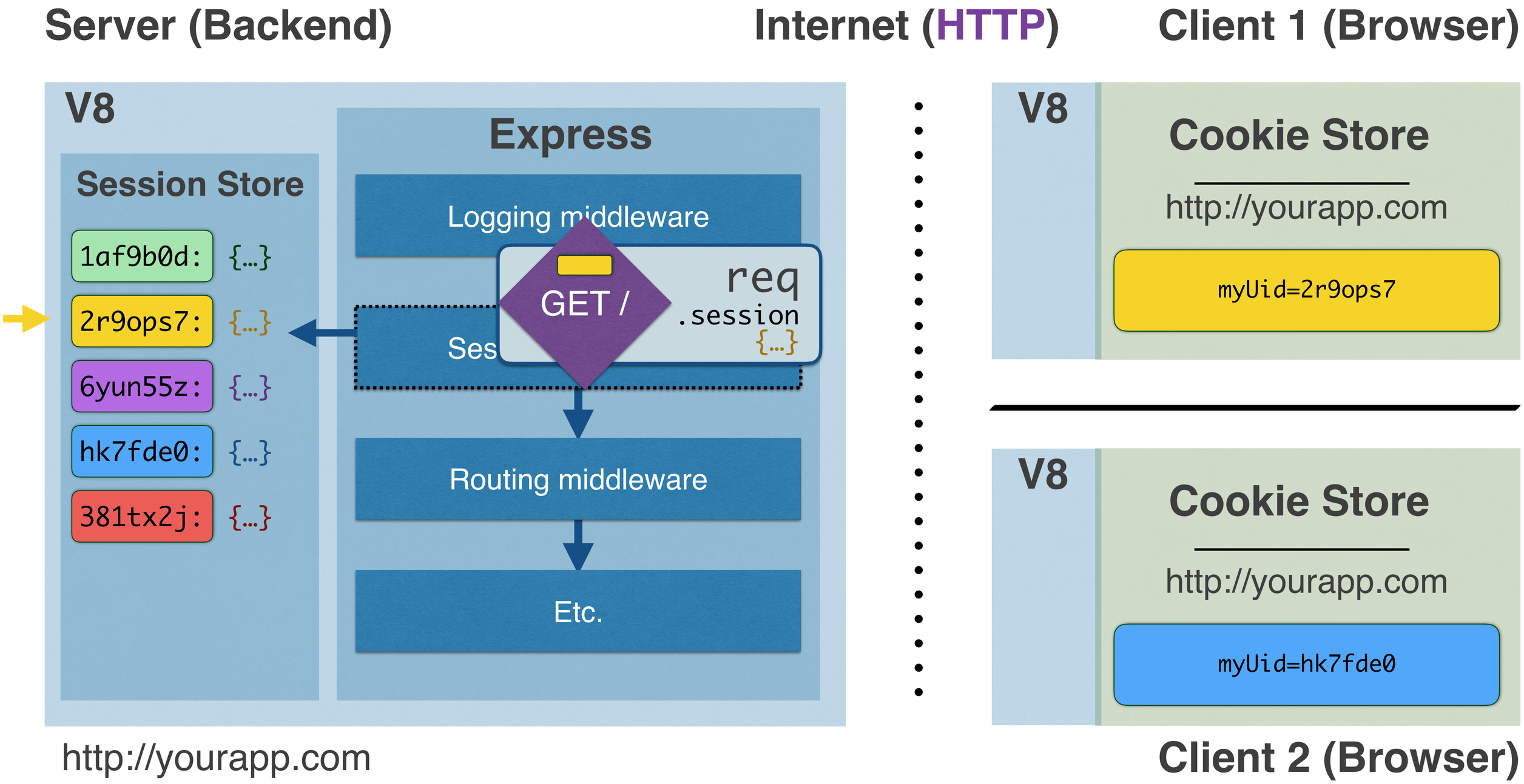

Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Session Store
1af9b0d: {…}
2r9ops7: {…}
6yun55z: {…}
hk7fde0: {…}
381tx2j: {…}
GET /
req
Logging middleware
Session middleware
Routing middleware
Etc.
V8
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
http://yourapp.com
Client 2 (Browser)

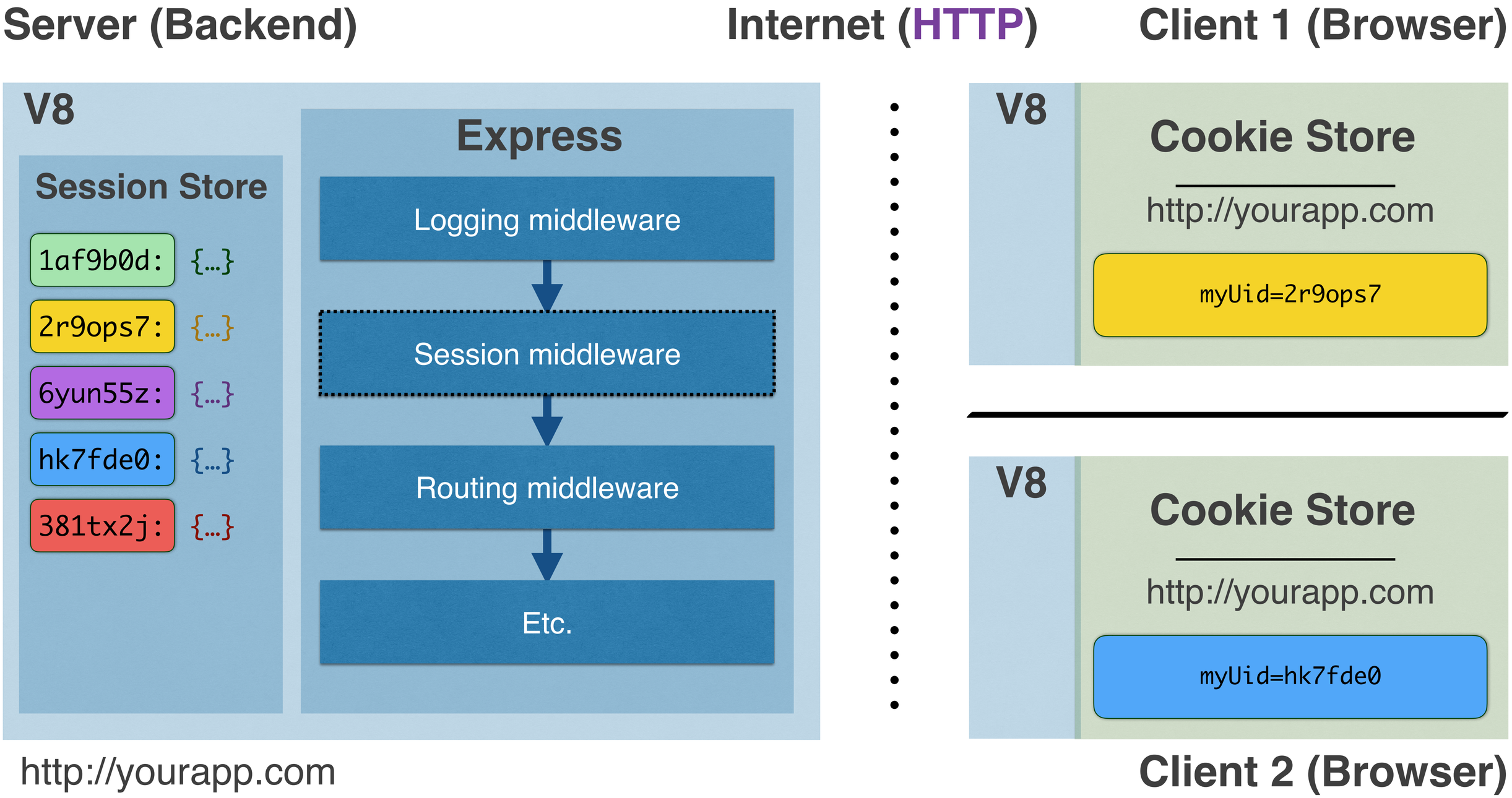

Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Session Store
1af9b0d: {...}
2r9ops7: {...}
6yun55z: {...}
hk7fde0: {...}
381tx2j: {...}
Express
Logging middleware
req
GET /
Ses
Routing middleware
Etc.
V8
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
http://yourapp.com
Client 2 (Browser)


Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Express
Session Store
1af9b0d: {...}
2r9ops7: {...}
6yun55z: {...}
hk7fde0: {...}
381tx2j: {...}
Logging middleware
GET /
req
Ses
Routing middleware
Etc.
V8
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
http://yourapp.com
Client 2 (Browser)


Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Express
Session Store
1af9b0d: {…}
2r9ops7: {…}
6yun55z: {…}
hk7fde0: {…}
381tx2j: {…}
Logging middleware
GET /
req
Ses
Routing middleware
Etc.
http://yourapp.com
V8
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
Client 2 (Browser)


Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Express
Session Store
1af9b0d: {…}
2r9ops7: {…}
6yun55z: {…}
hk7fde0: {…}
381tx2j: {…}
Logging middleware
GET /
req
.session
Ses
Routing middleware
Etc.
V8
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
http://yourapp.com
Client 2 (Browser)


Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Express
Session Store
1af9b0d: {…}
2r9ops7: {…}
6yun55z: {…}
hk7fde0: {…}
381tx2j: {…}
Logging middleware
GET /
req
.session
{…}
Ses
Routing middleware
Etc.
V8
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
http://yourapp.com
Client 2 (Browser)


Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Session Store
1af9b0d: {...}
2r9ops7: {...}
6yun55z: {...}
hk7fde0: {...}
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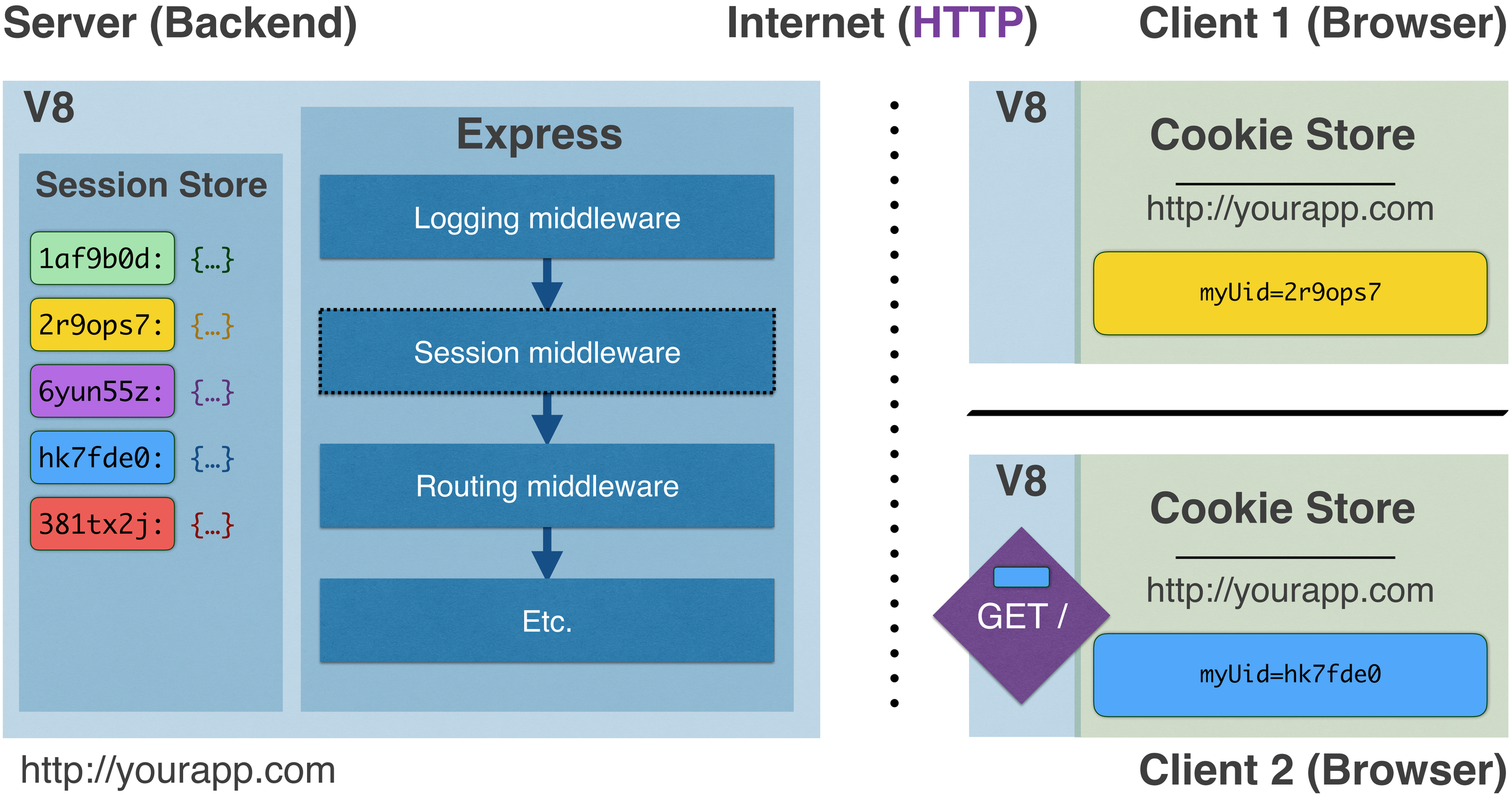
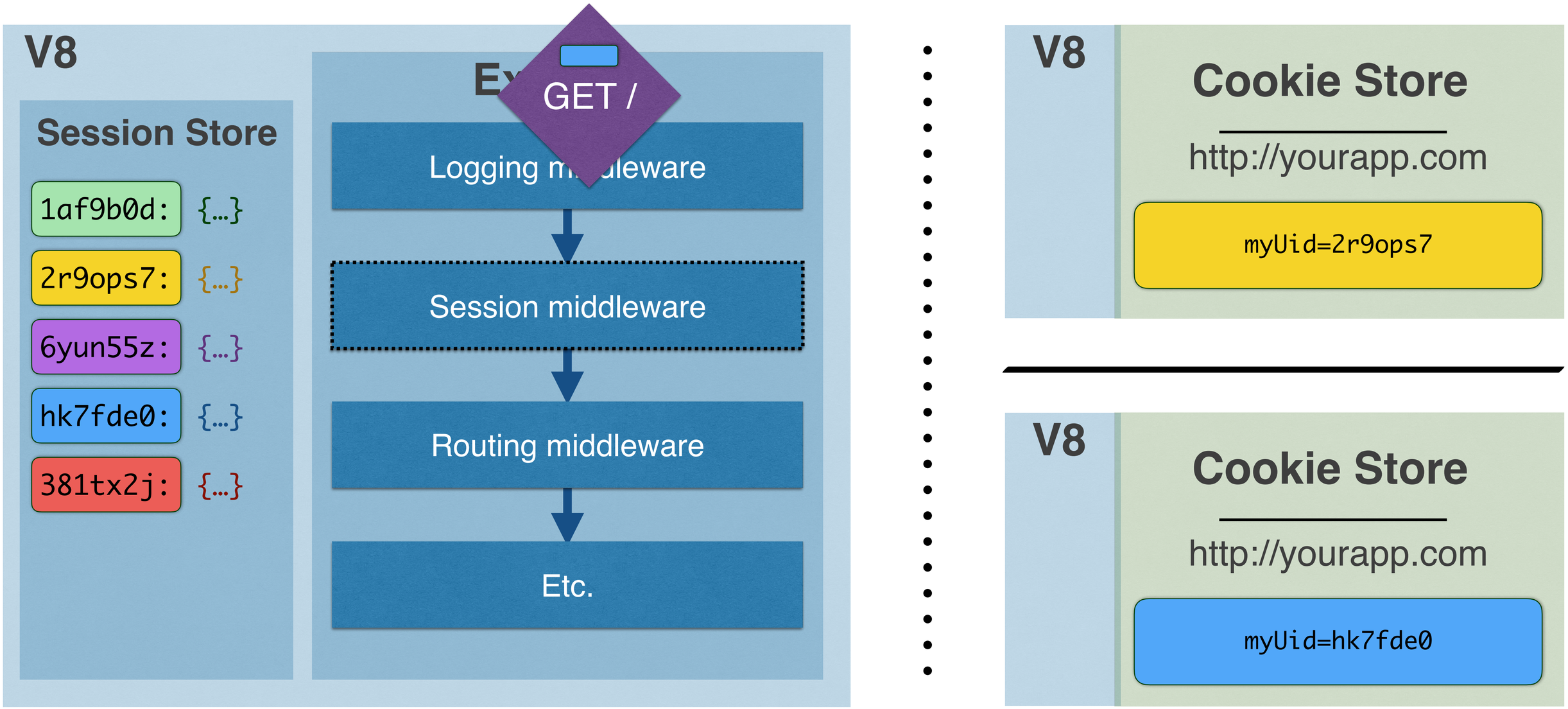
Logging middleware
Session middleware
Routing middleware
Etc.
http://yourapp.com
V8
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
Client 2 (Browser)


Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Session Store
1af9b0d: {…}
2r9ops7: {…}
6yun55z: {…}
hk7fde0: {…}
381tx2j: {…}
Express
Logging middleware
Session middleware
Routing middleware
Etc.
http://yourapp.com
V8
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
GET /
Cookie Store
http://yourapp.com
myUid=hk7fde0
Client 2 (Browser)

Server (Backend)

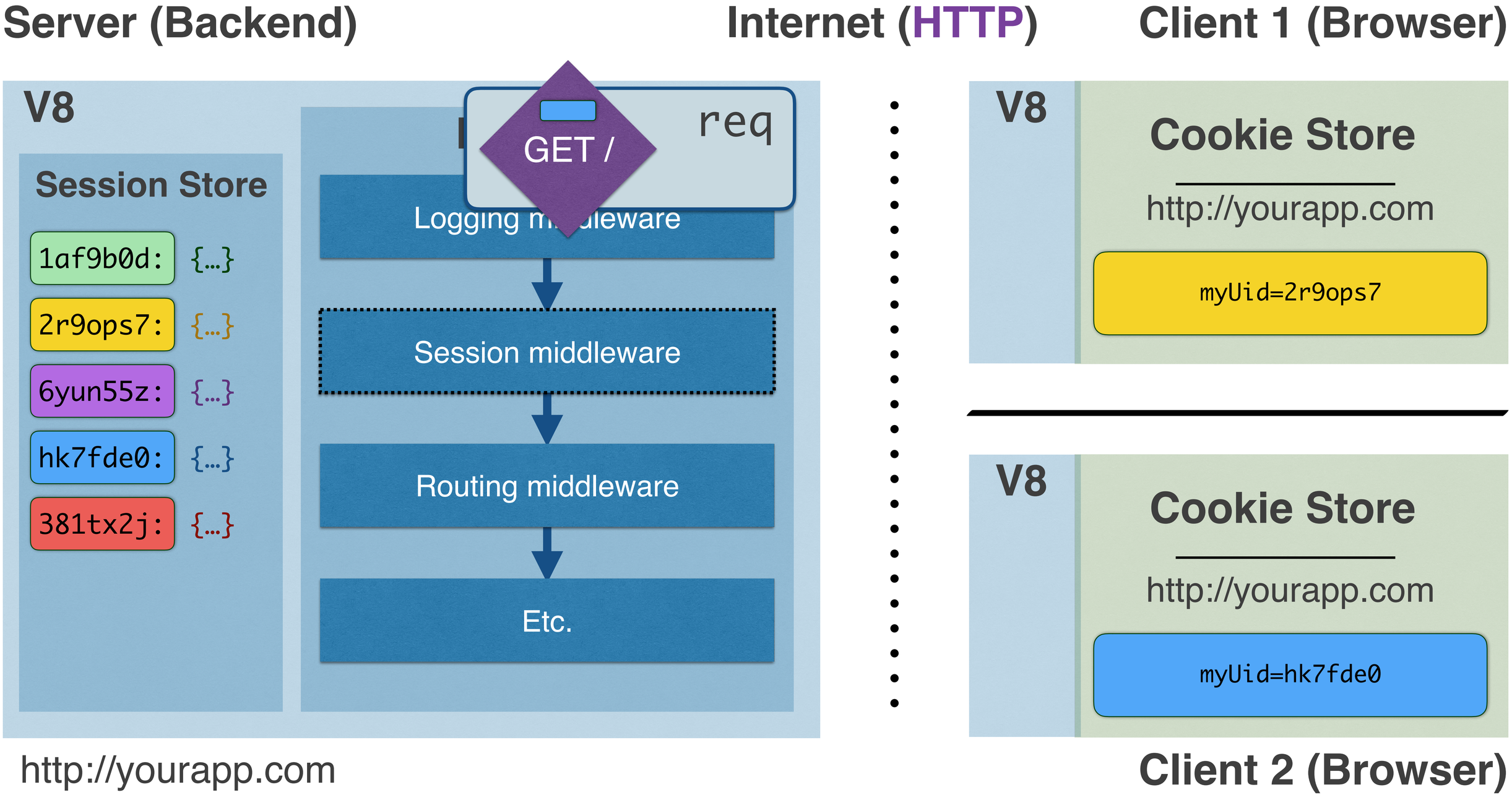
Internet (HTTP)

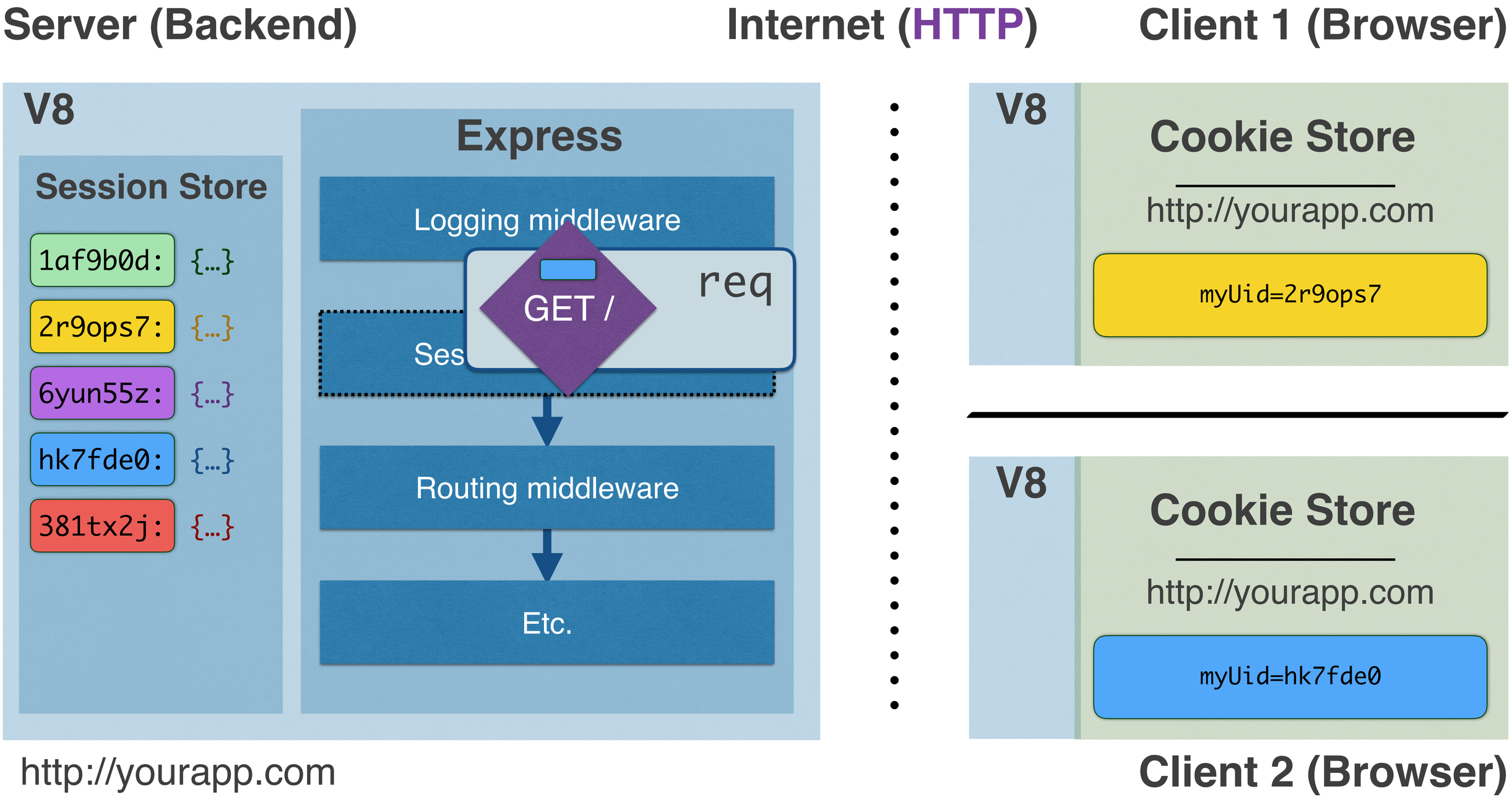
Client 1 (Browser)



http://yourapp.com

Client 2 (Browser)


Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Session Store
1af9b0d: {…}
2r9ops7: {…}
6yun55z: {…}
hk7fde0: {…}
381tx2j: {…}
GET /
req
Logging middleware
Session middleware
Routing middleware
Etc.
V8
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
http://yourapp.com
Client 2 (Browser)


Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Session Store
1af9b0d: {...}
2r9ops7: {...}
6yun55z: {...}
hk7fde0: {...}
381tx2j: {...}
Express
Logging middleware
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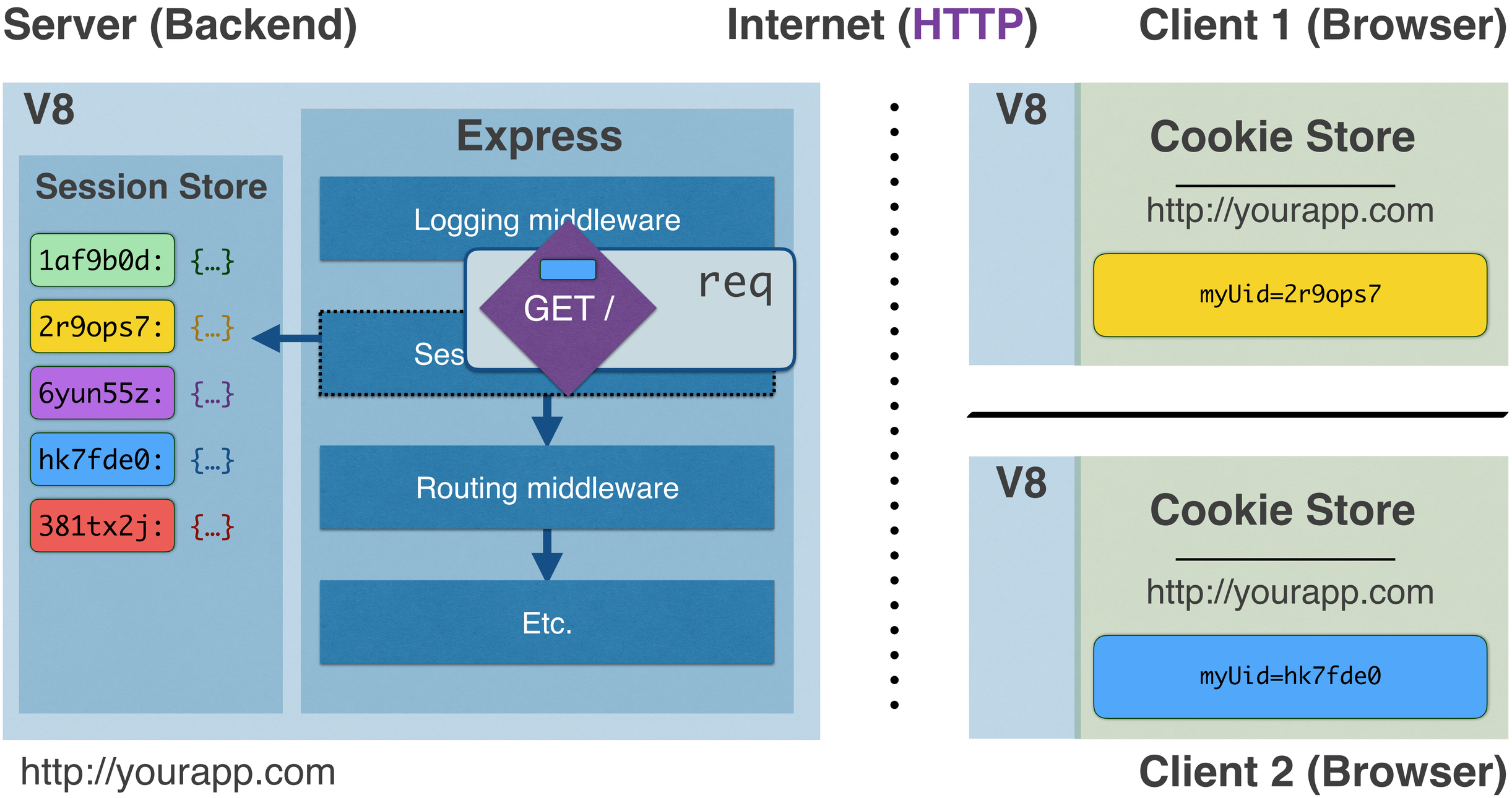
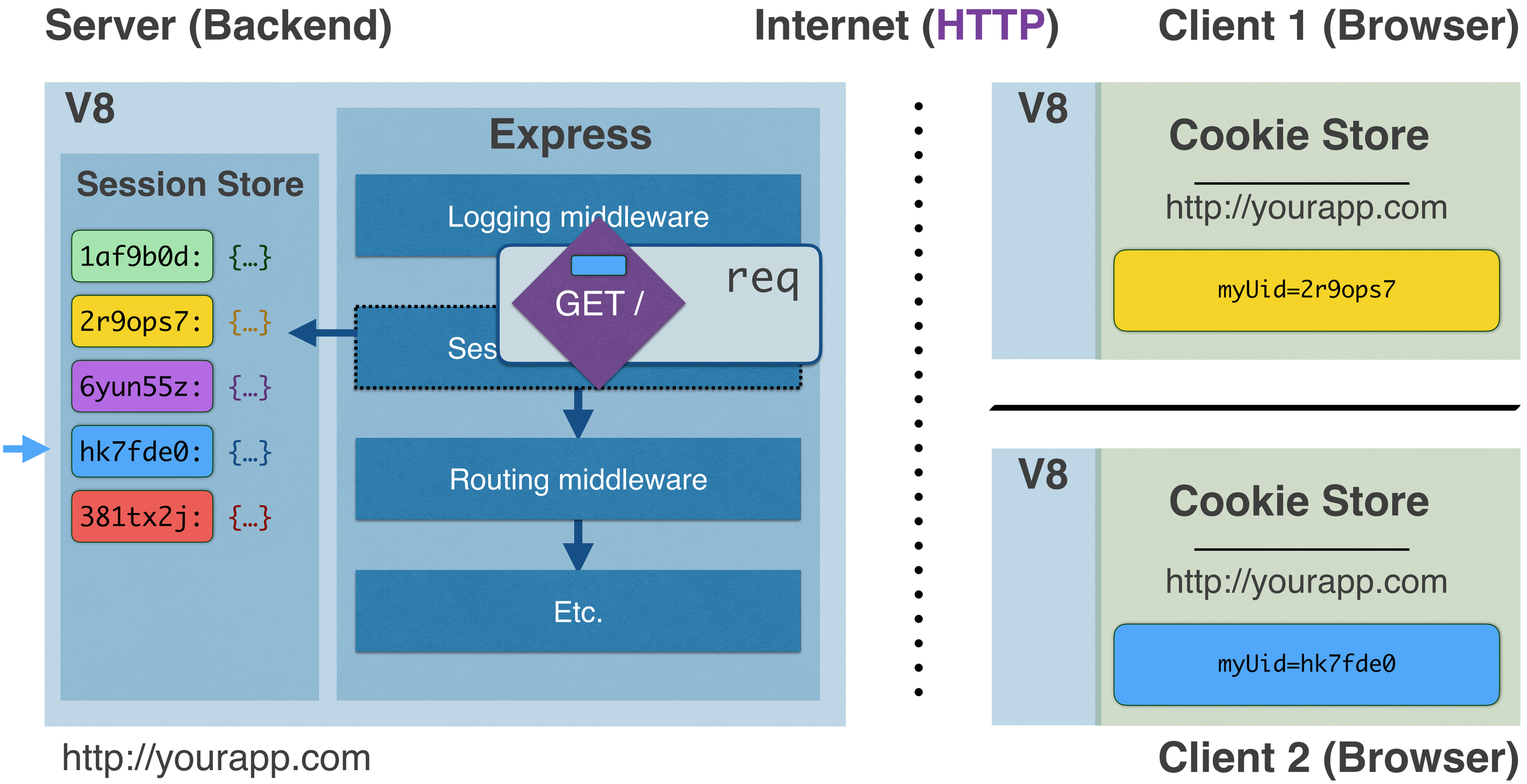
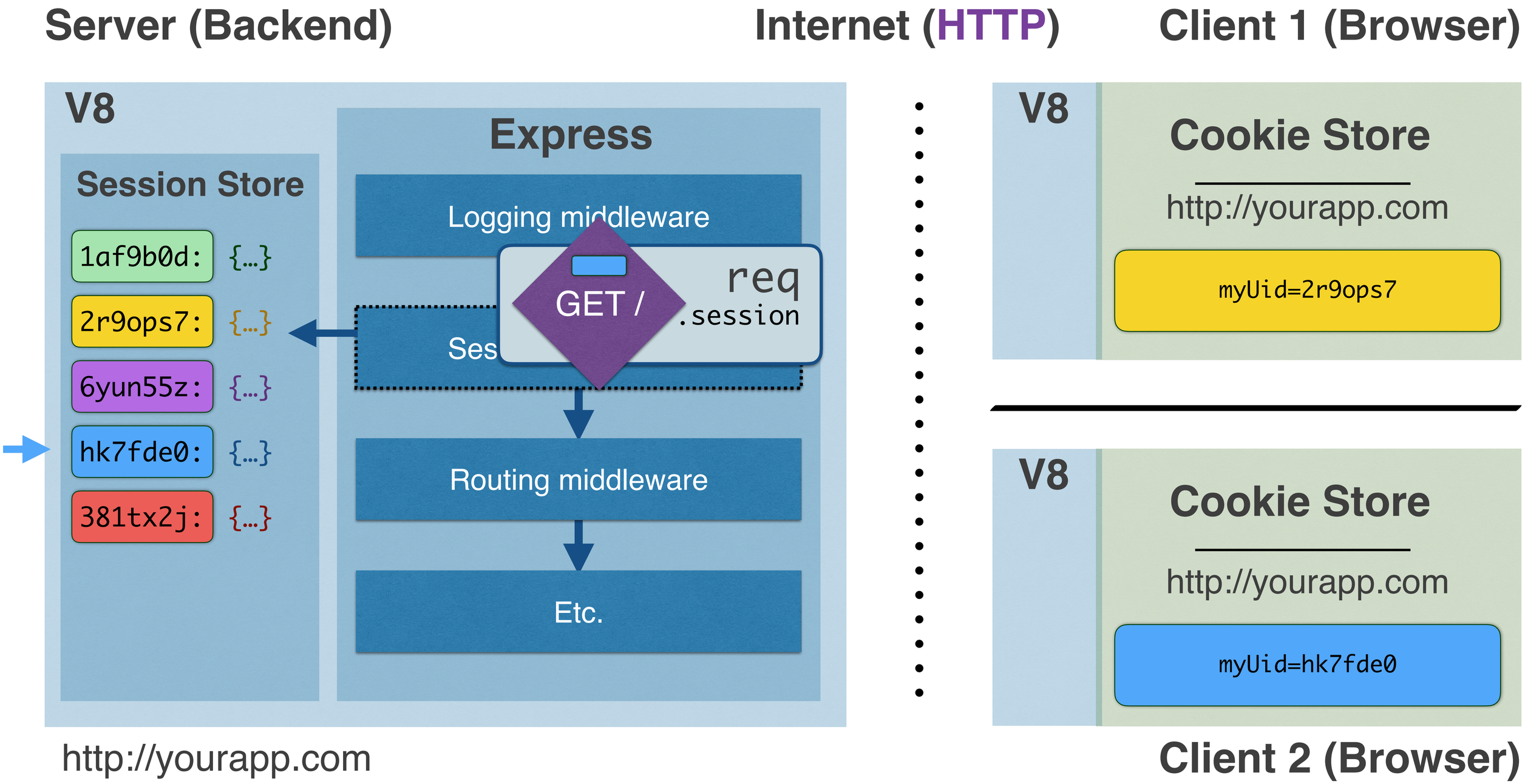
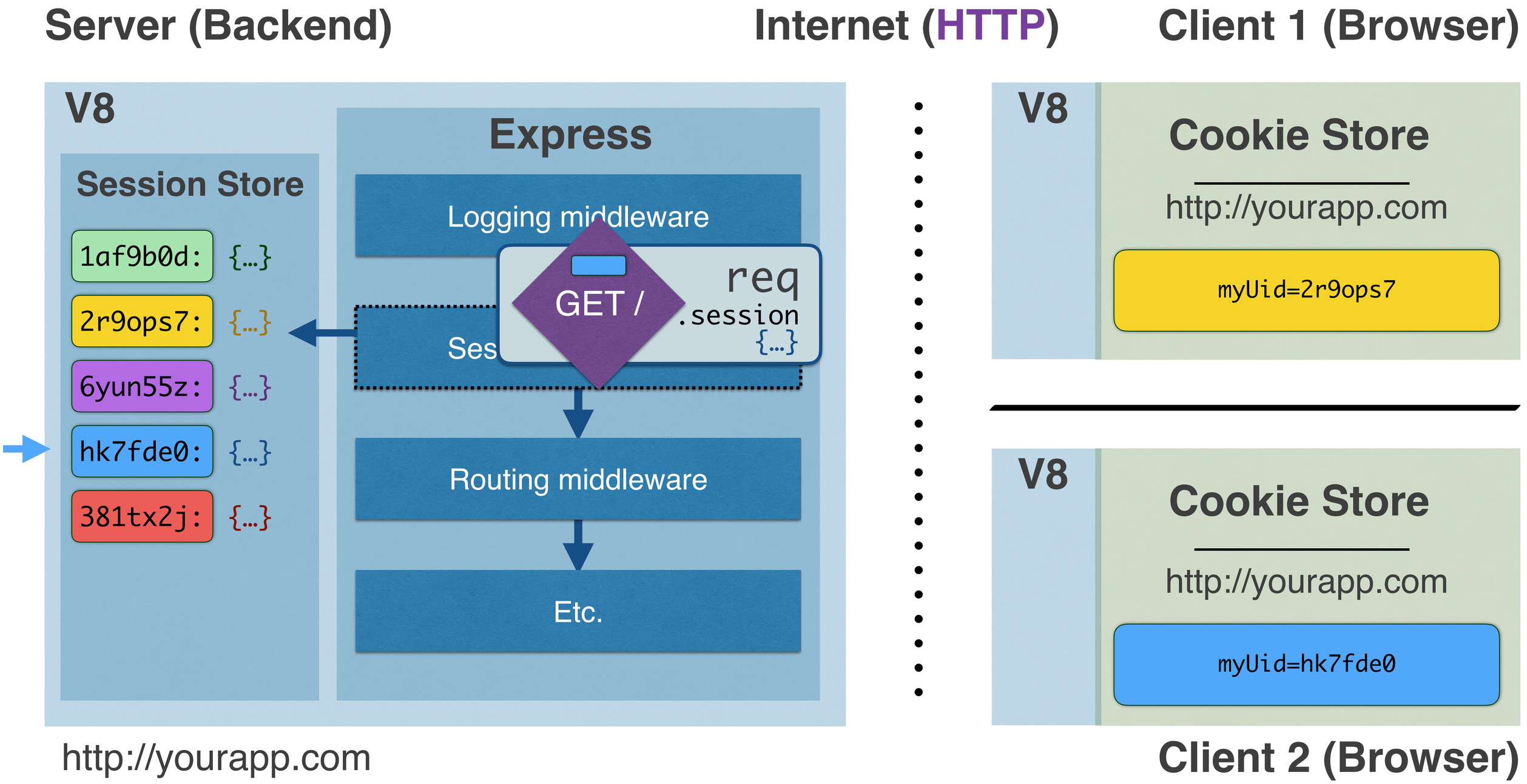
GET /
Ses
Routing middleware
Etc.
http://yourapp.com
V8
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
Client 2 (Browser)


Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Express
Session Store
1af9b0d: {...}
2r9ops7: {...}
6yun55z: {...}
hk7fde0: {...}
381tx2j: {...}
Logging middleware
GET /
req
Ses
Routing middleware
Etc.
http://yourapp.com
V8
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
Client 2 (Browser)


Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Express
Session Store
1af9b0d: {...}
2r9ops7: {...}
6yun55z: {...}
hk7fde0: {...}
381tx2j: {...}
Logging middleware
GET /
req
Ses
Routing middleware
Etc.
http://yourapp.com
V8
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
Client 2 (Browser)


Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Express
Session Store
1af9b0d: {...}
2r9ops7: {...}
6yun55z: {...}
hk7fde0: {...}
381tx2j: {...}
Logging middleware
GET /
req
.session
Ses
Routing middleware
Etc.
V8
Cookie Store
http://yourapp.com
myUid=2r9ops7
V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
http://yourapp.com
Client 2 (Browser)


Server (Backend)
Internet (HTTP)
Client 1 (Browser)
V8
Express
Session Store
1af9b0d: {…}
2r9ops7: {…}
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V8
Cookie Store
http://yourapp.com
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V8
Cookie Store
http://yourapp.com
myUid=hk7fde0
http://yourapp.com
Client 2 (Browser)

"You get a session, you get a session, everybody gets a session!"

–NOT OPRAH

OAUTH
OAUTH

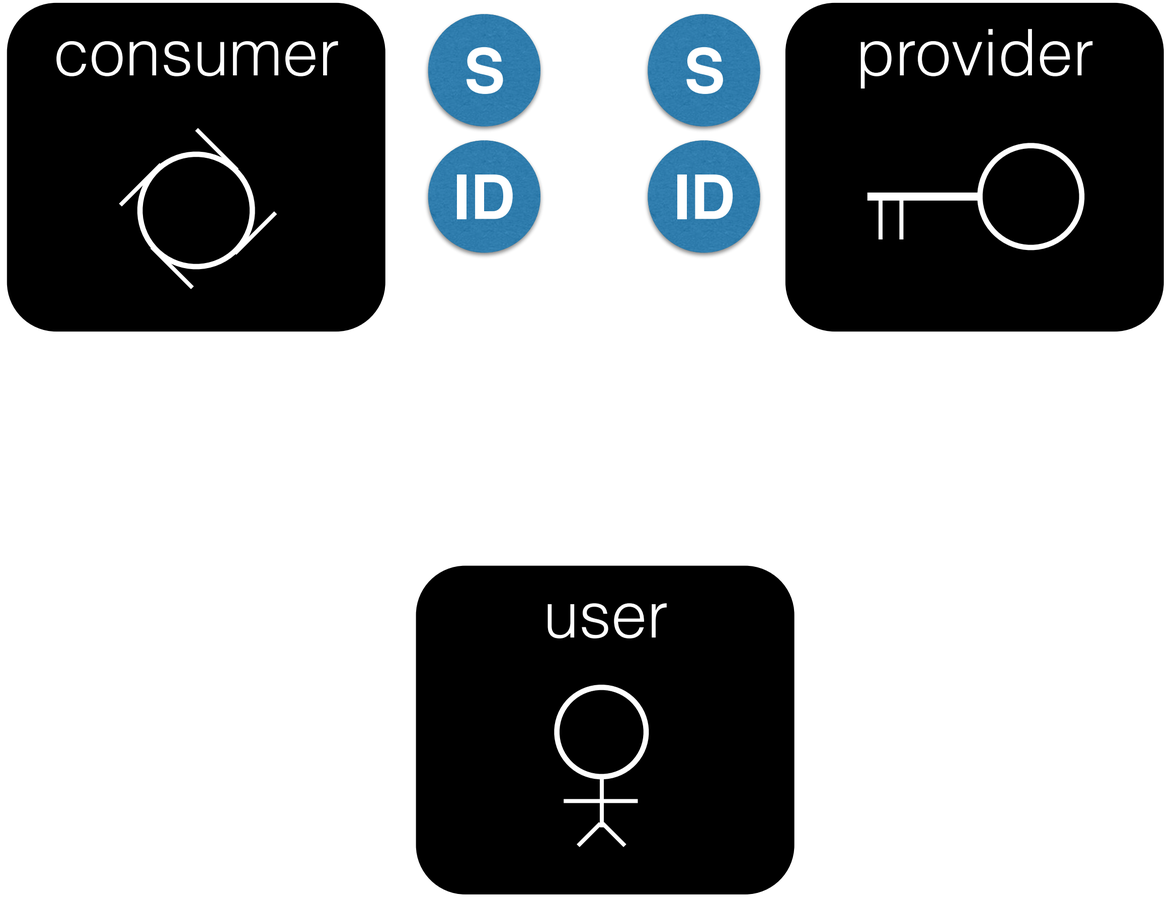
OAUTH

Standard protocol for auth piggybacking

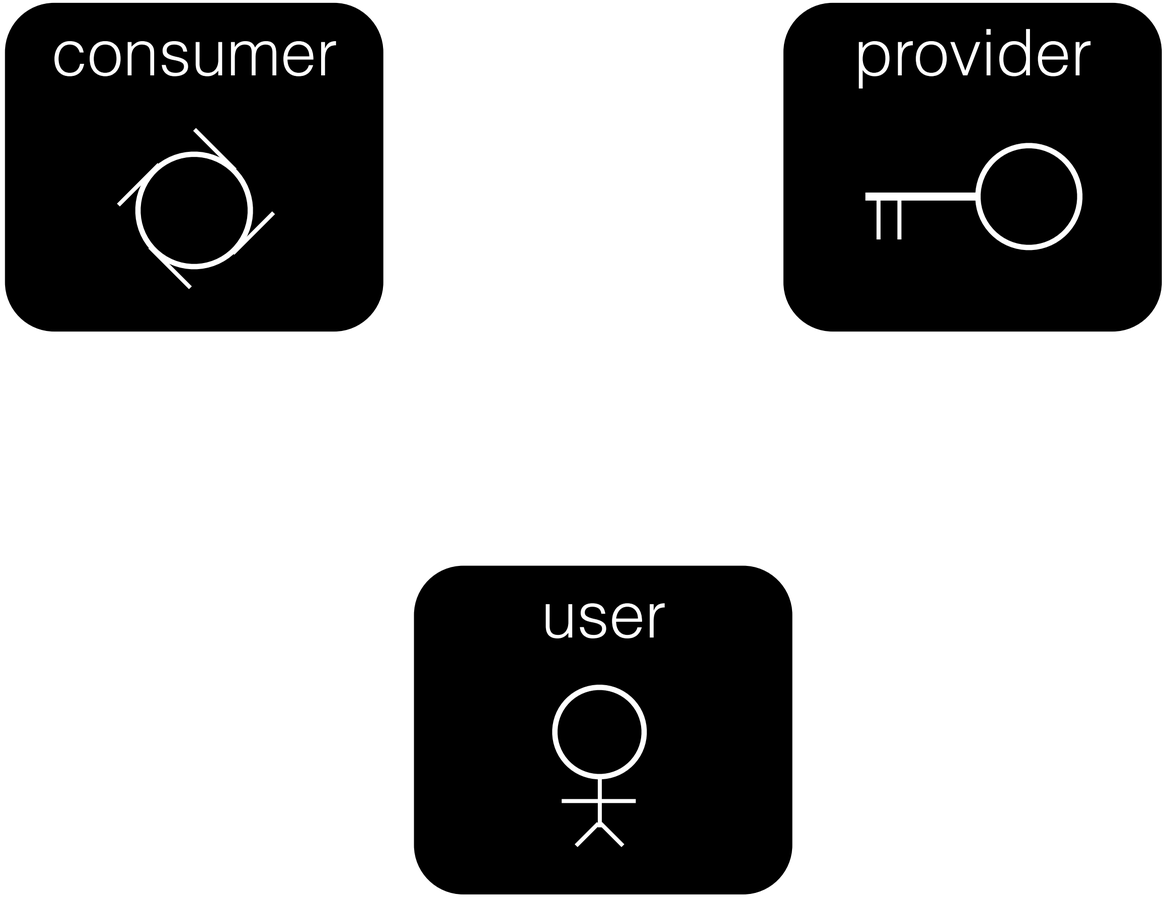
Your Application	User	3rd Party Authority
“consumer”	“user”	“provider”

OAUTH - PREP

- Consumer app has a registered dev account with the provider.
- Provider gives consumer a public client ID and private client Secret.
- Both services hold on to these credentials so the consumer can prove who it is to the provider.

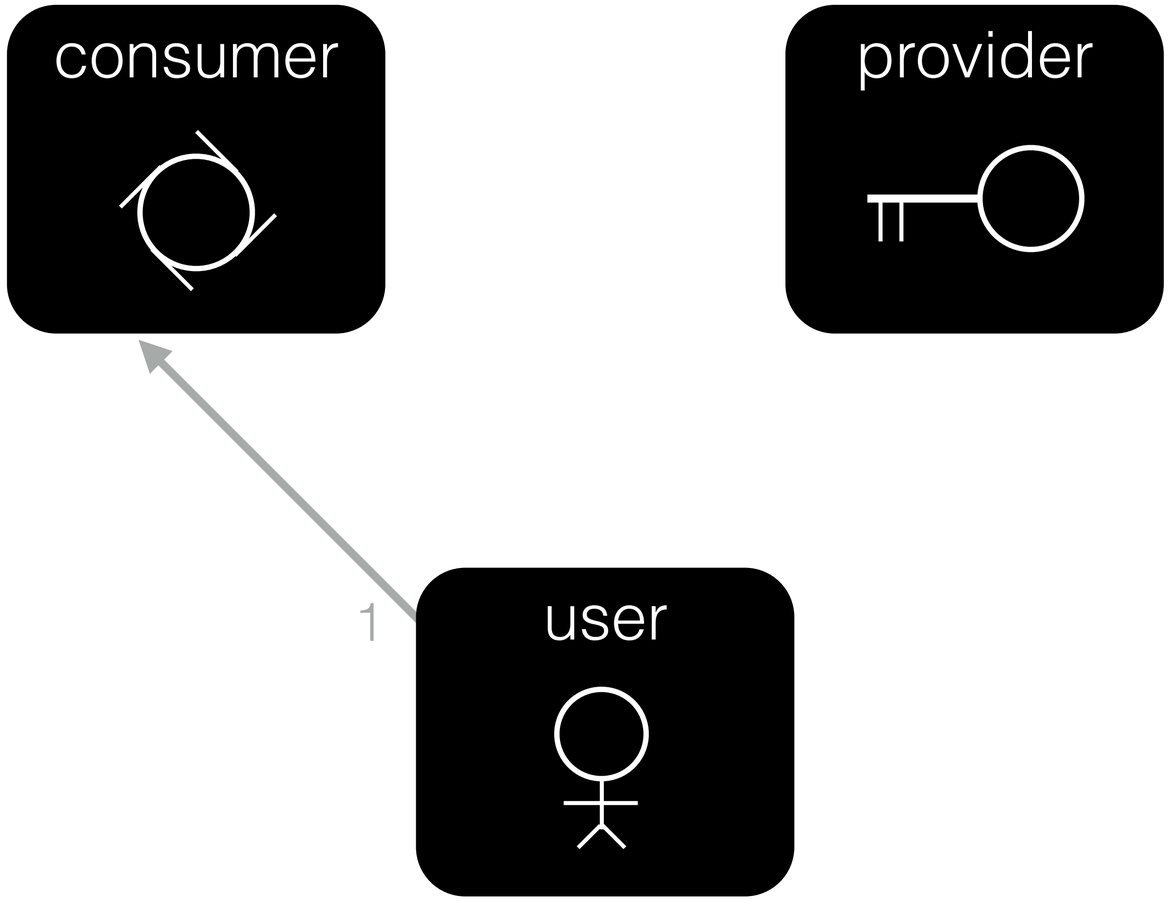


OAUTH - PETITION



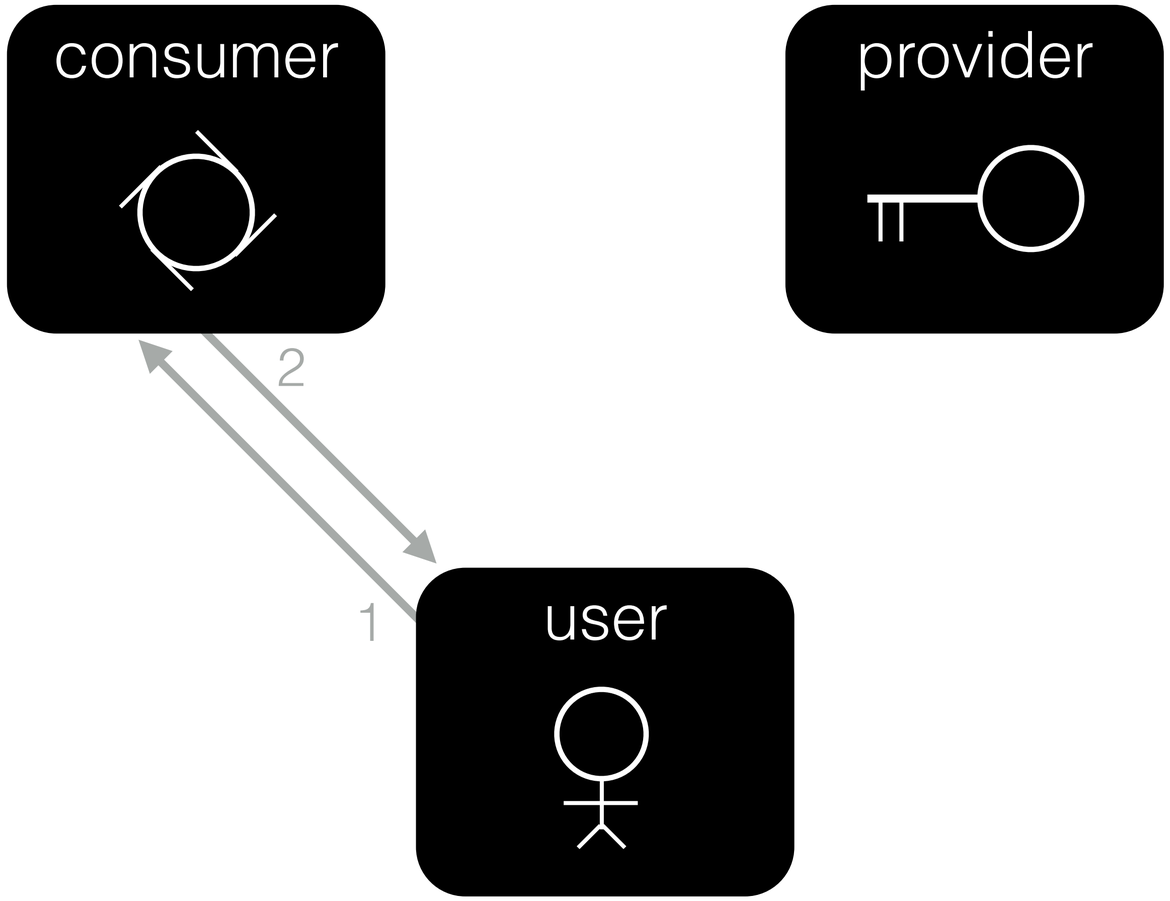
OAUTH - PETITION

1.Request: load login



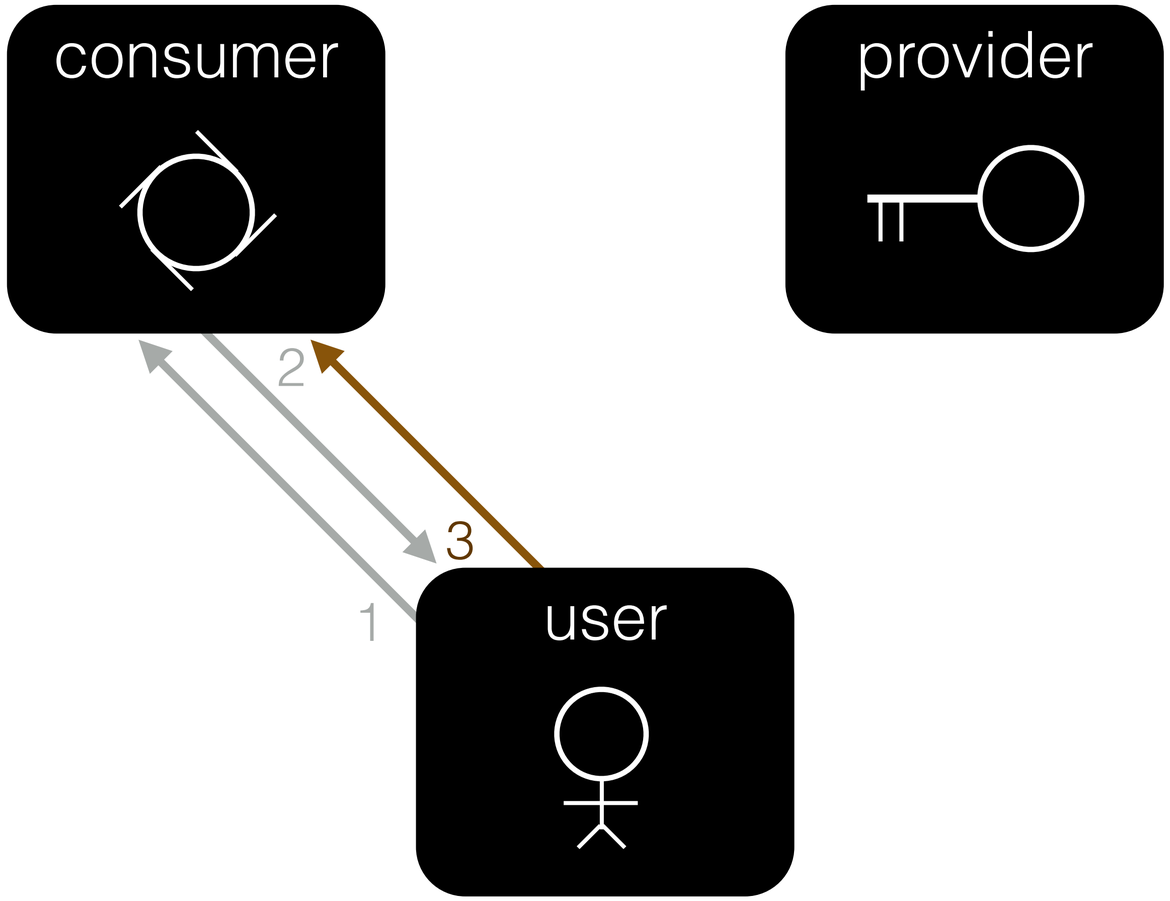
OAUTH - PETITION

1. Request: load login
2. Response: rendered login



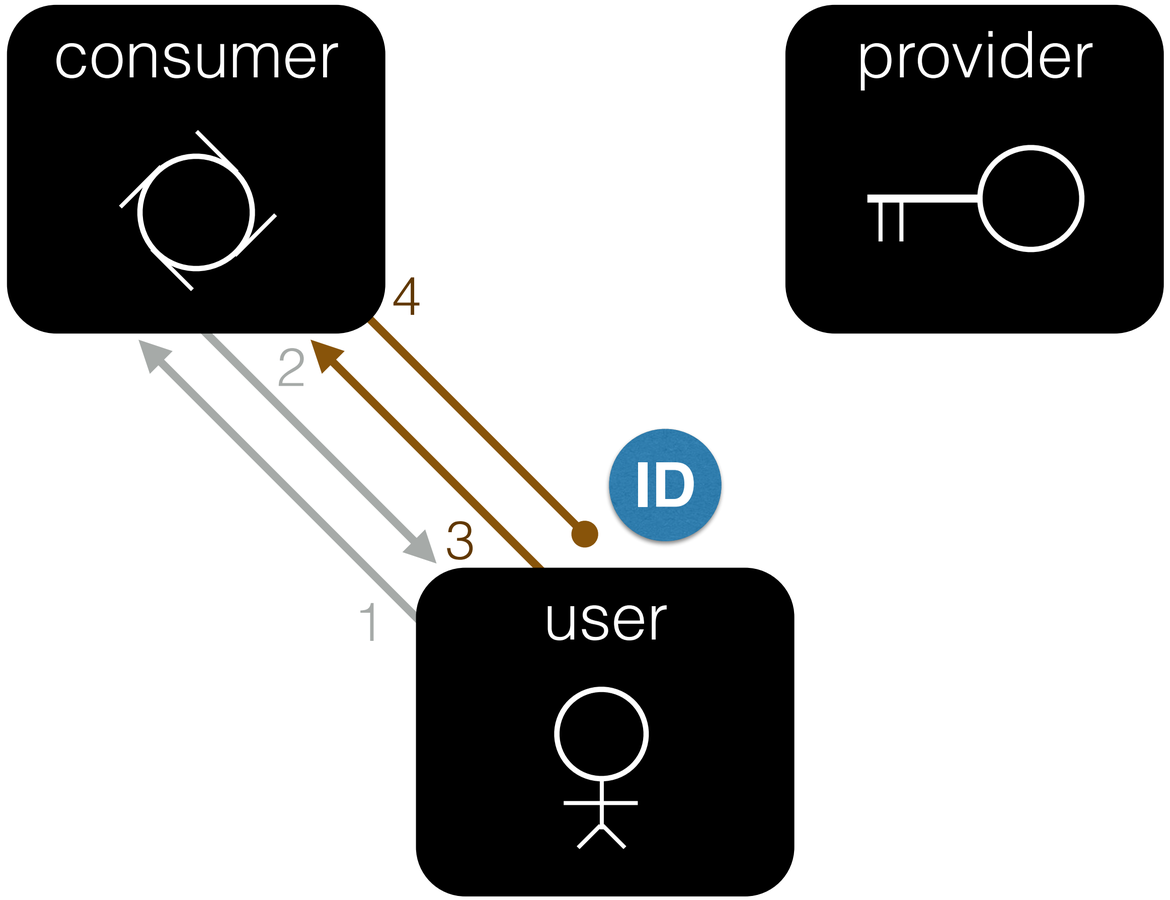
OAUTH - PETITION

1. Request: load login
2. Response: rendered login
3. Request: login through provider



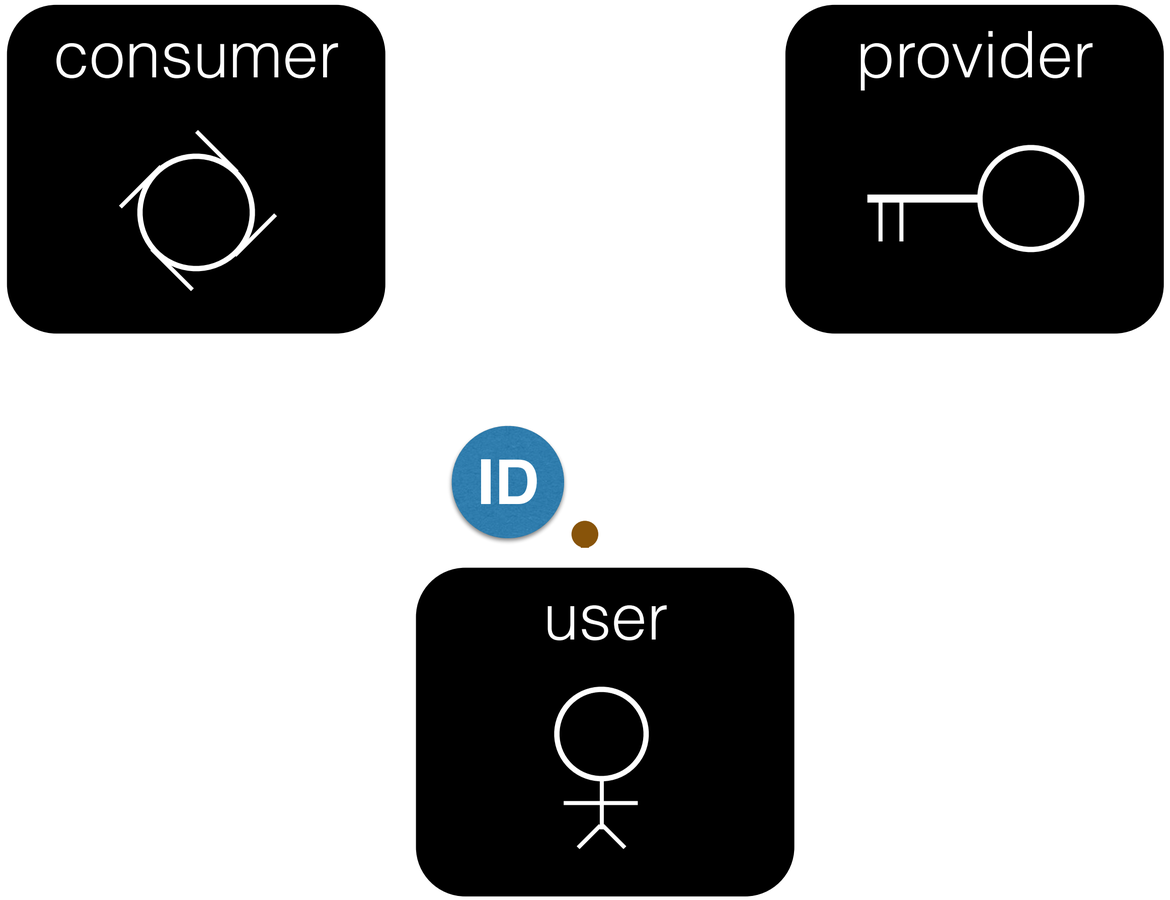
OAUTH - PETITION

1. Request: load login
2. Response: rendered login
3. Request: login through provider
4. Response: redirect to provider



http://provider.com/oauth/authorize?client_id=123&callback_url=consumer.com/confirm&scope=read

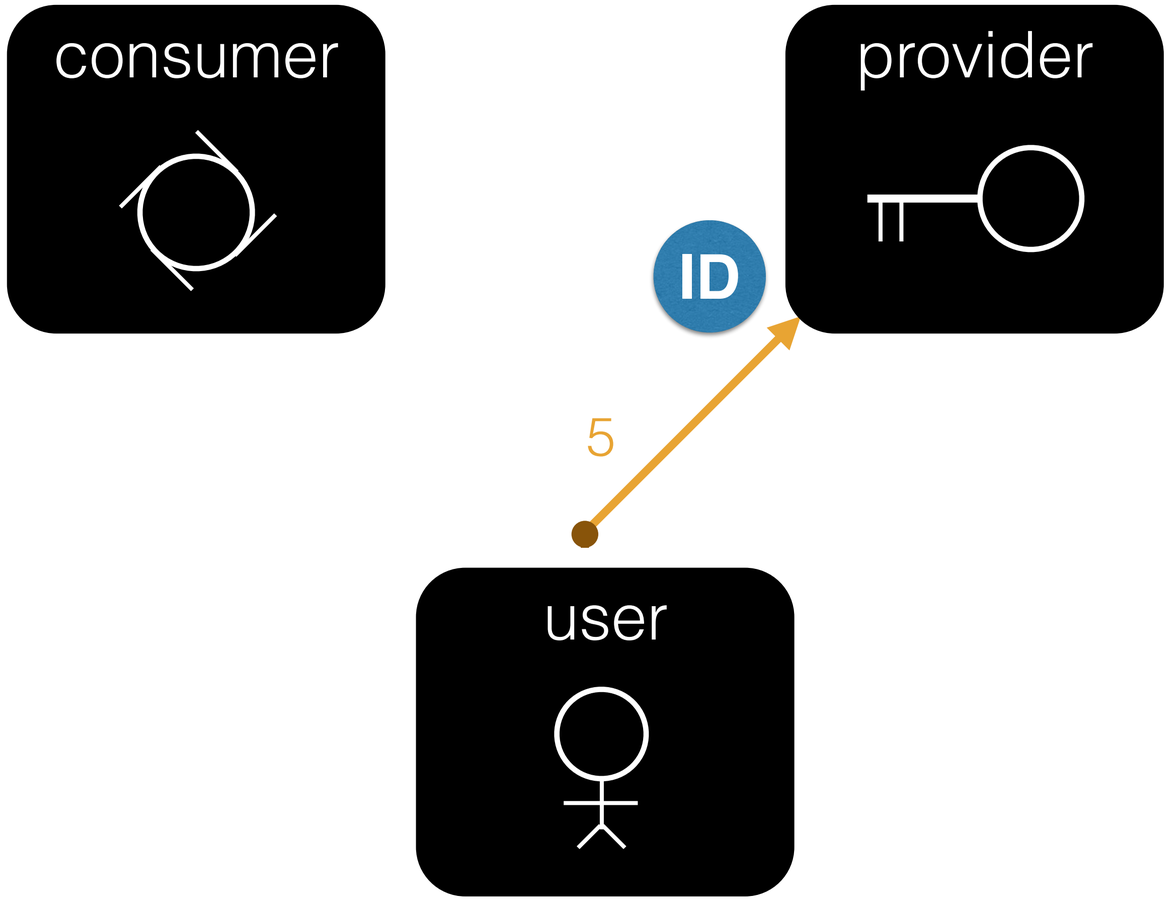
OAUTH - USER AUTHENTICATION



http://provider.com/oauth/authorize?client_id=123&callback_url=consumer.com/confirm&scope=read

OAUTH - USER AUTHENTICATION

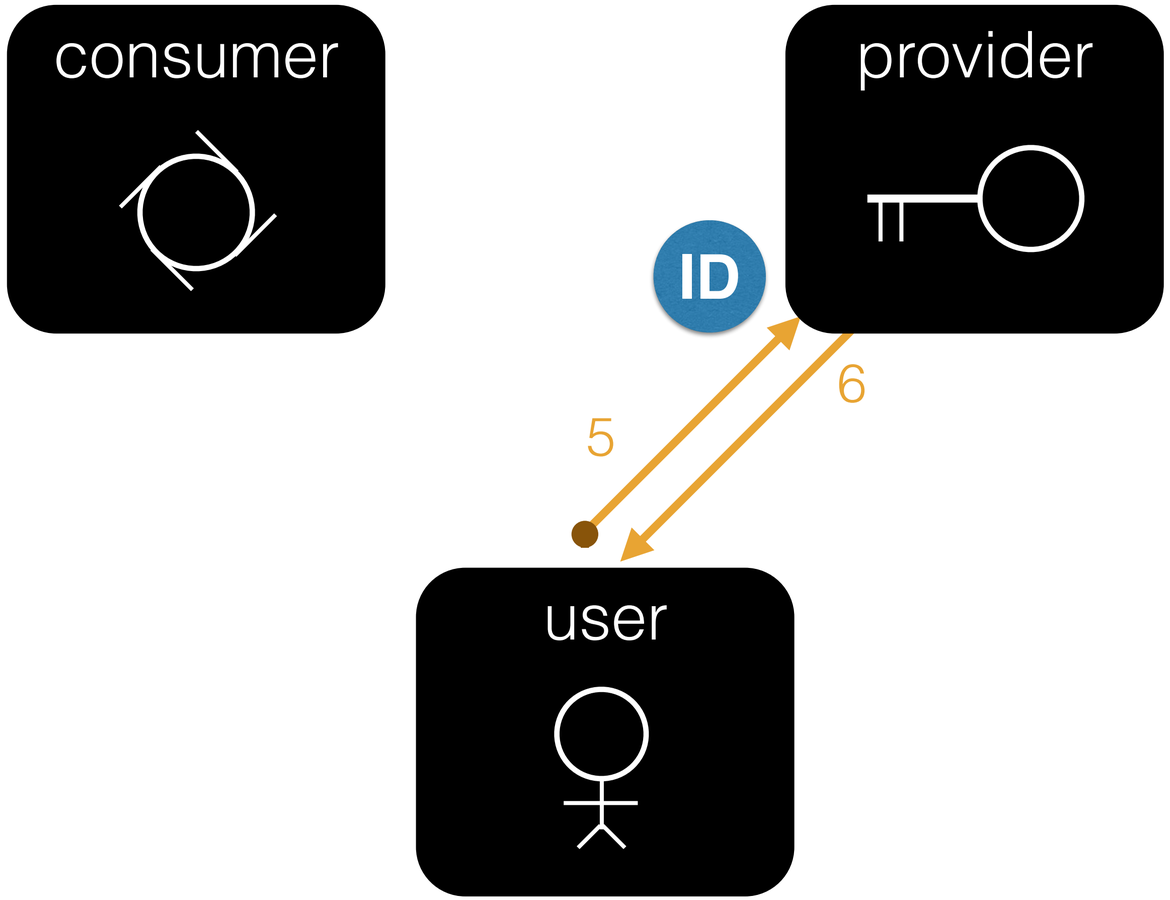
5.Request: load login



http://provider.com/oauth/authorize?client_id=123&callback_url=consumer.com/confirm&scope=read

OAUTH - USER AUTHENTICATION

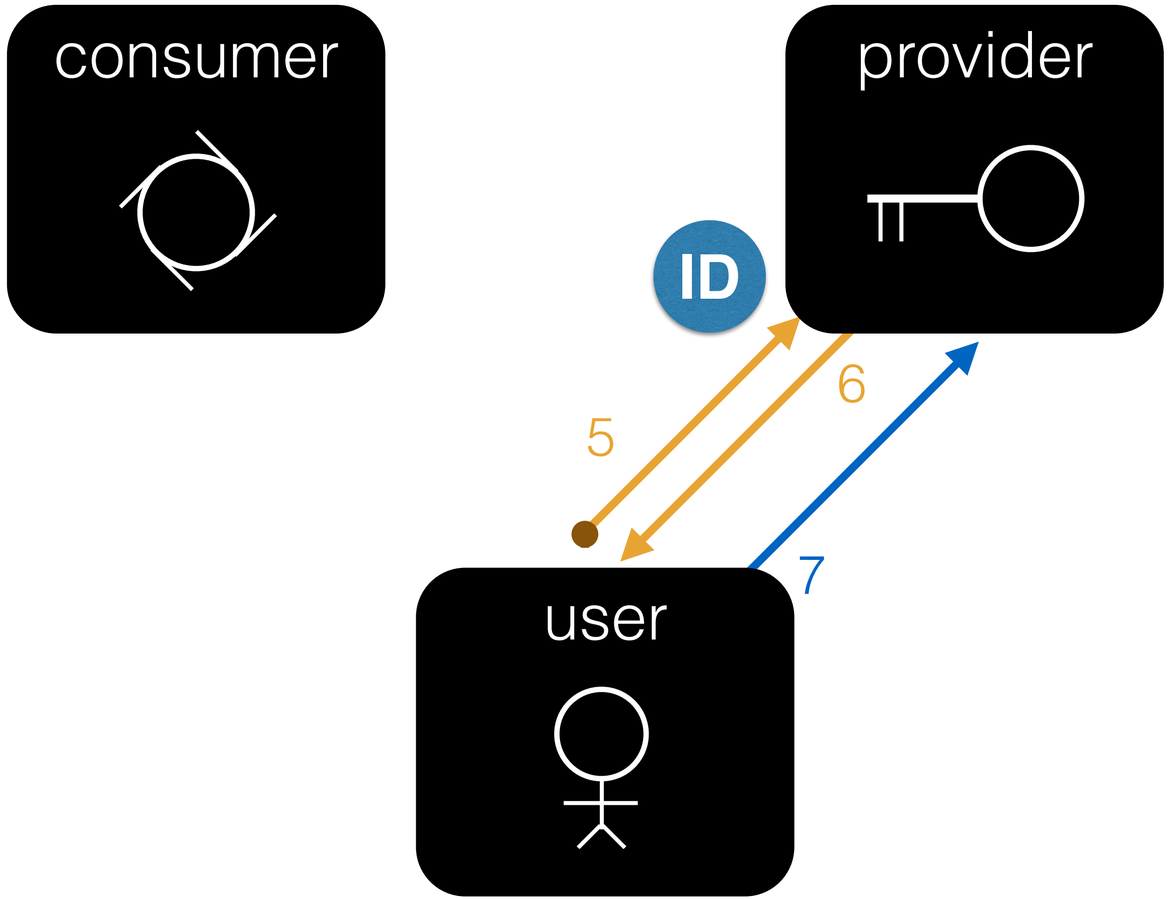
5. Request: load login
6. Response: rendered login



http://provider.com/oauth/authorize?client_id=123&callback_url=consumer.com/confirm&scope=read

OAUTH - USER AUTHENTICATION

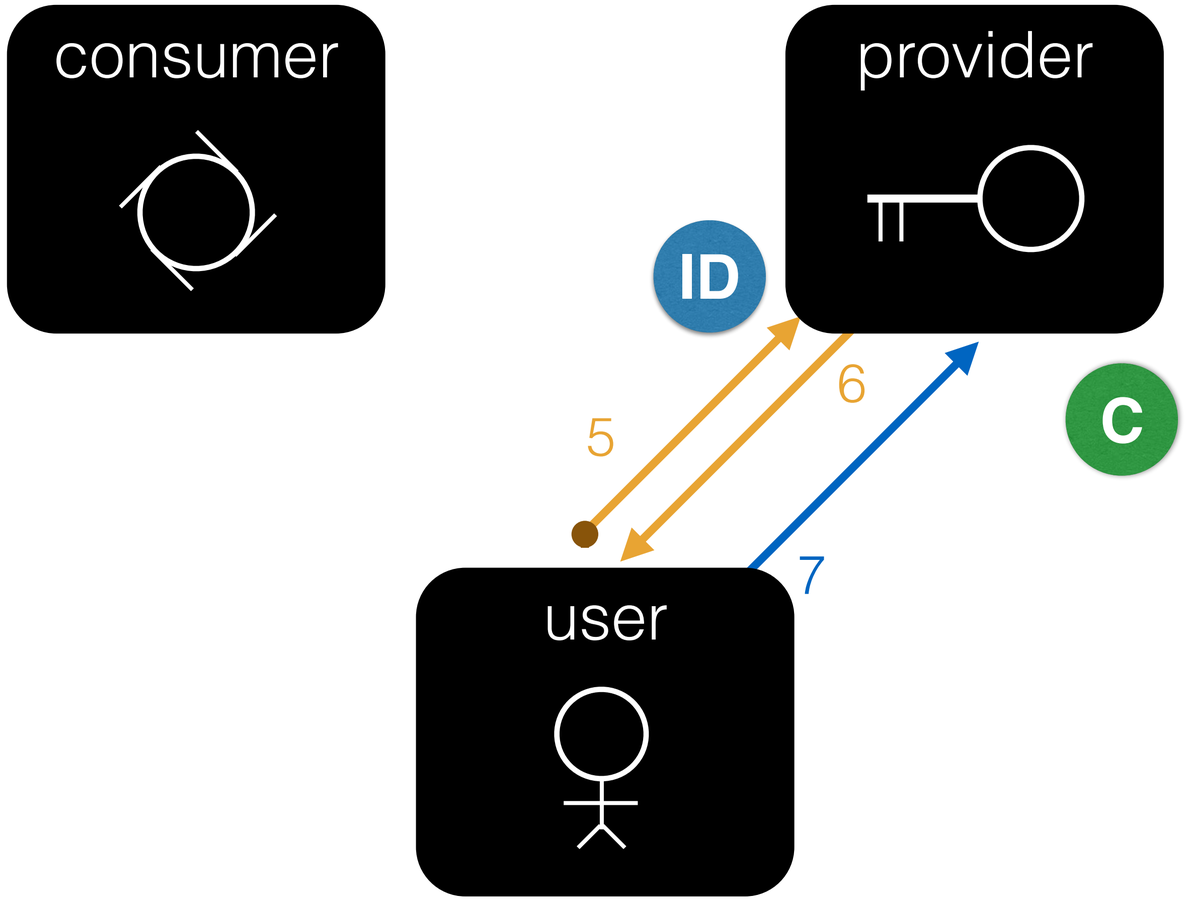
5. Request: load login
6. Response: rendered login
7. Request: login to provider



http://provider.com/oauth/authorize?client_id=123&callback_url=consumer.com/confirm&scope=read

OAUTH - USER AUTHENTICATION

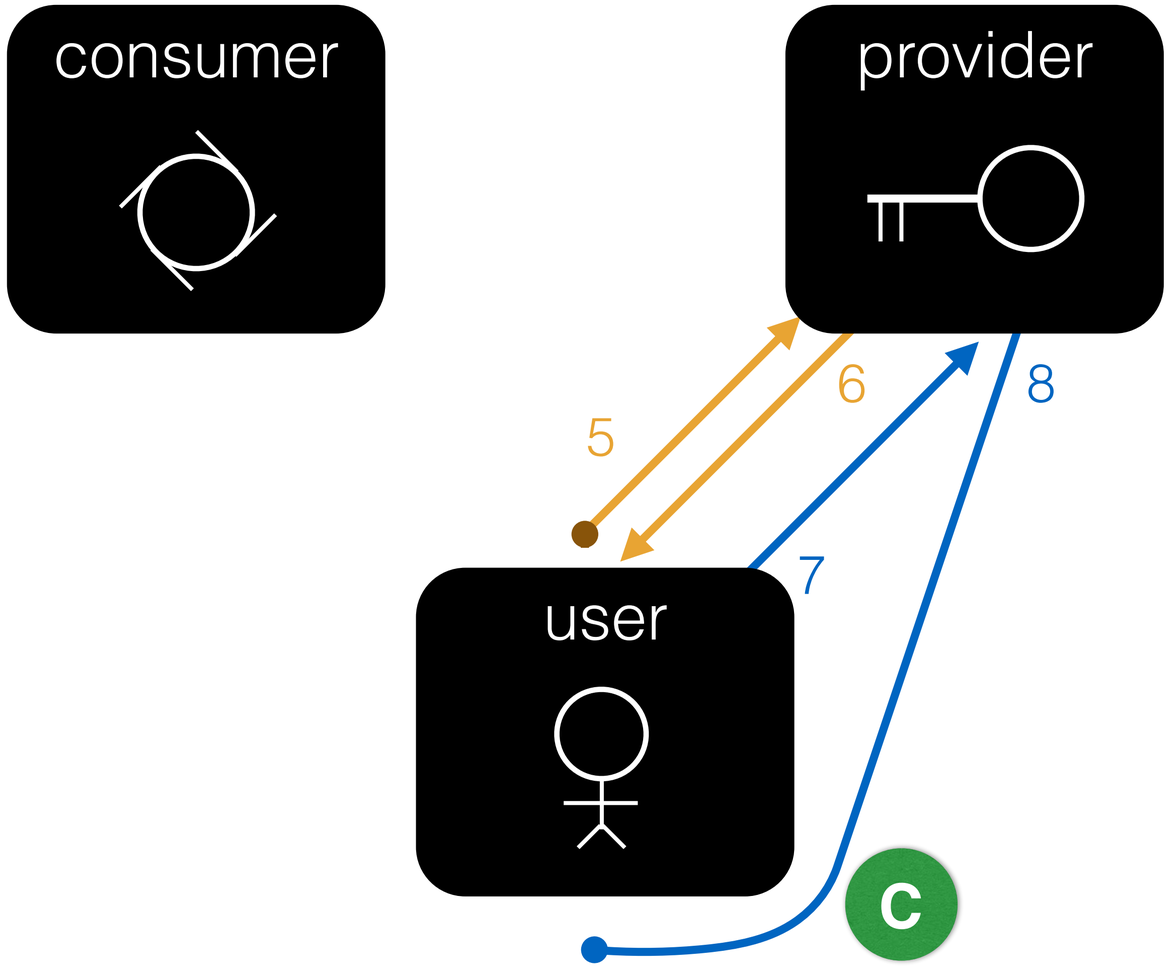
5. Request: load login
6. Response: rendered login
7. Request: login to provider



http://consumer.com/confirm?authcode=789
http://provider.com/oauth/authorize?client_id=123&callback_url=consumer.com/confirm&scope=read

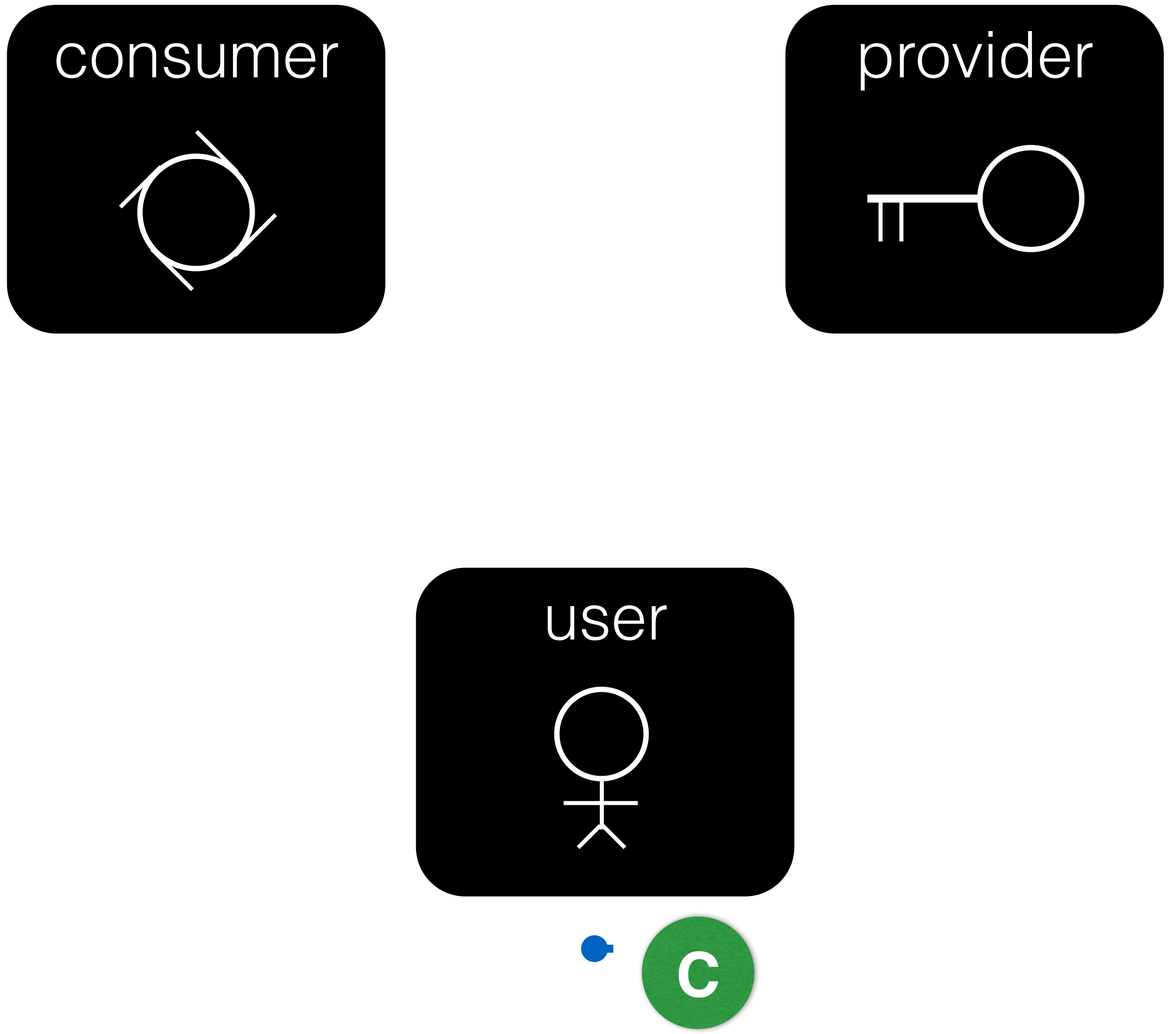
OAUTH - USER AUTHENTICATION

5. Request: load login
6. Response: rendered login
7. Request: login to provider
8. Response: redirect callback URL



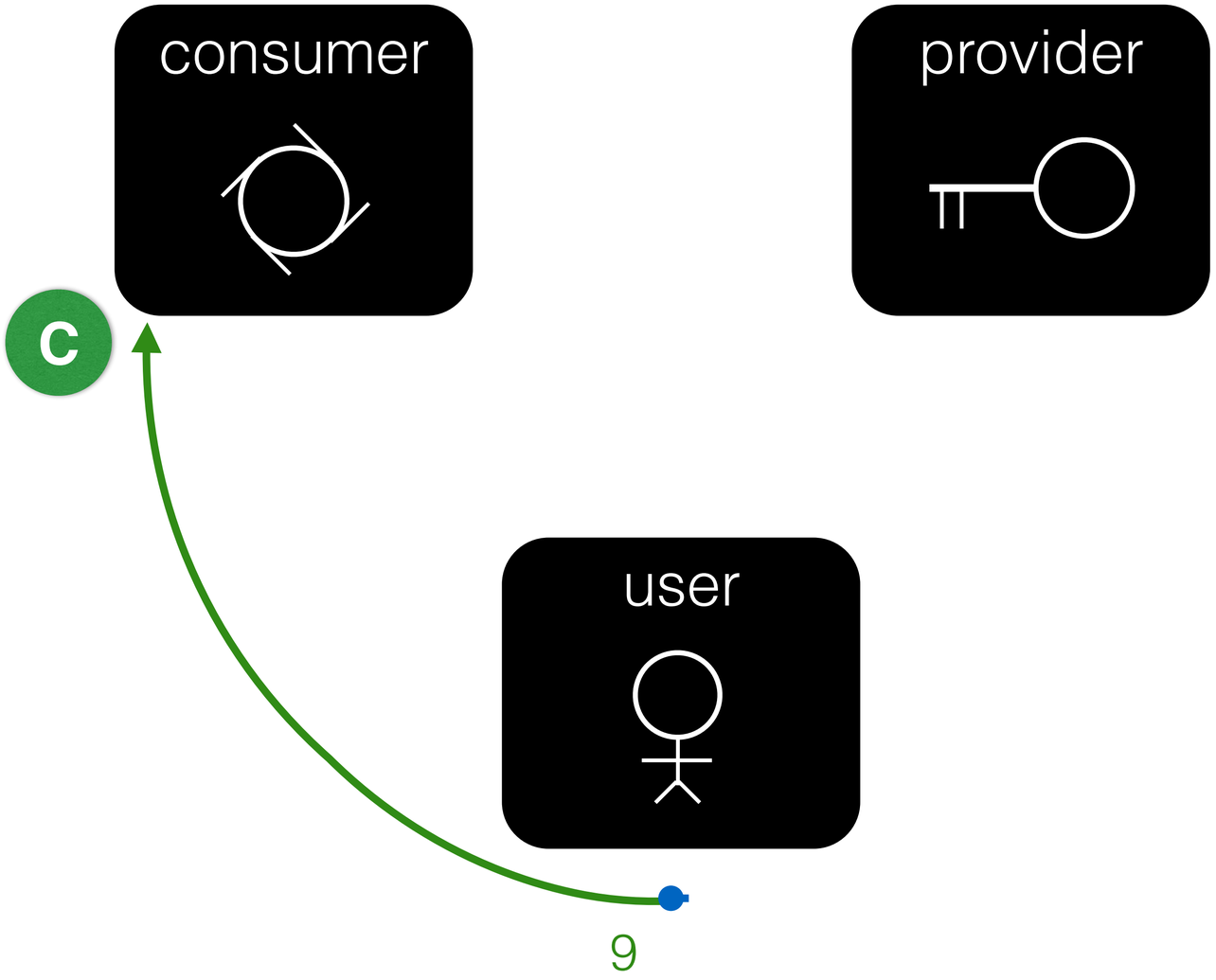
http://consumer.com/confirm?authcode=789

OAUTH - APP AUTHENTICATION



http://consumer.com/confirm?authcode=789

OAUTH - APP AUTHENTICATION

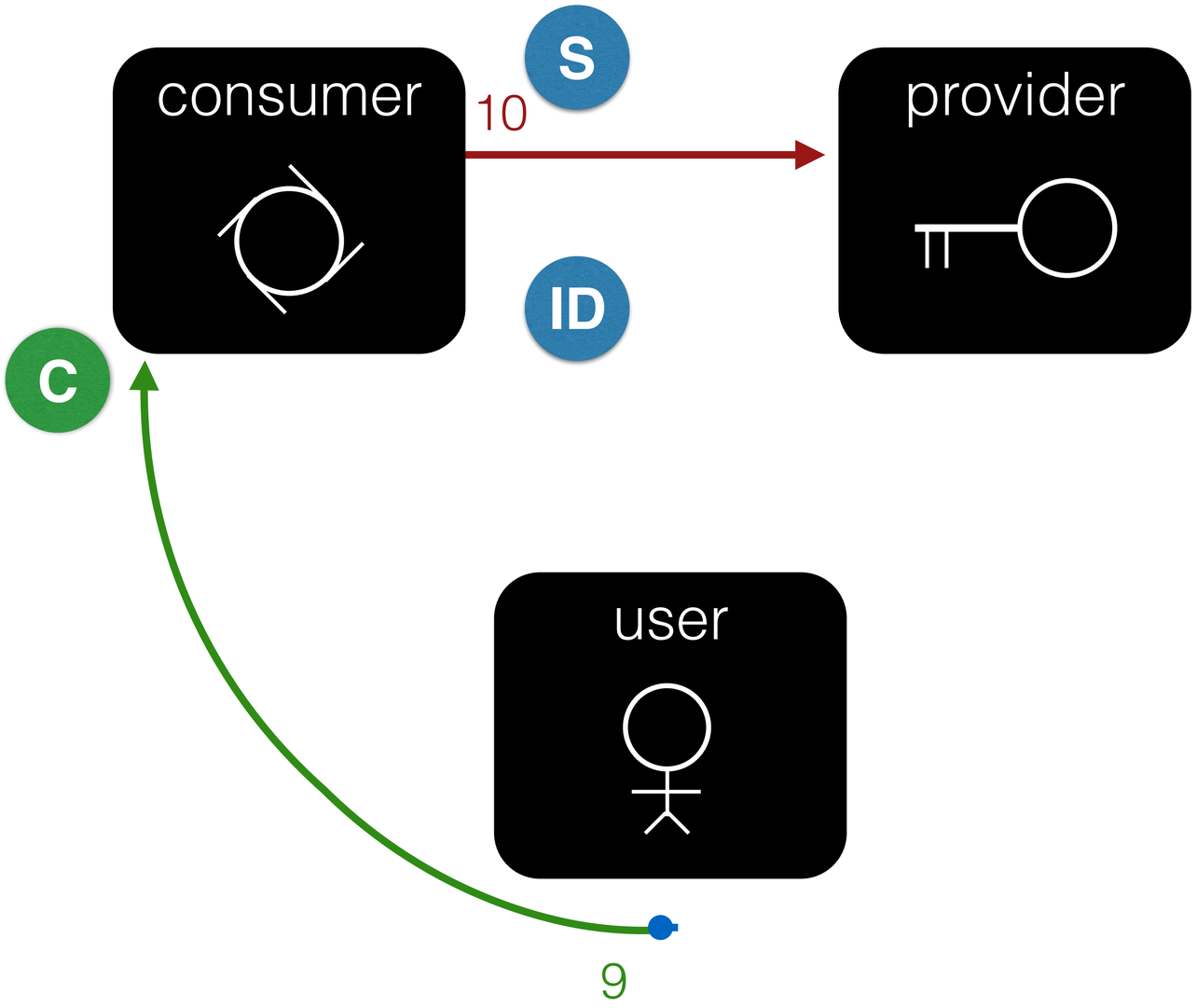


9.Request: callback URL

http://consumer.com/confirm?authcode=789

http://provider.com/oauth/token?client_id=123&client_secret=911&authcode=789

OAUTH - APP AUTHENTICATION

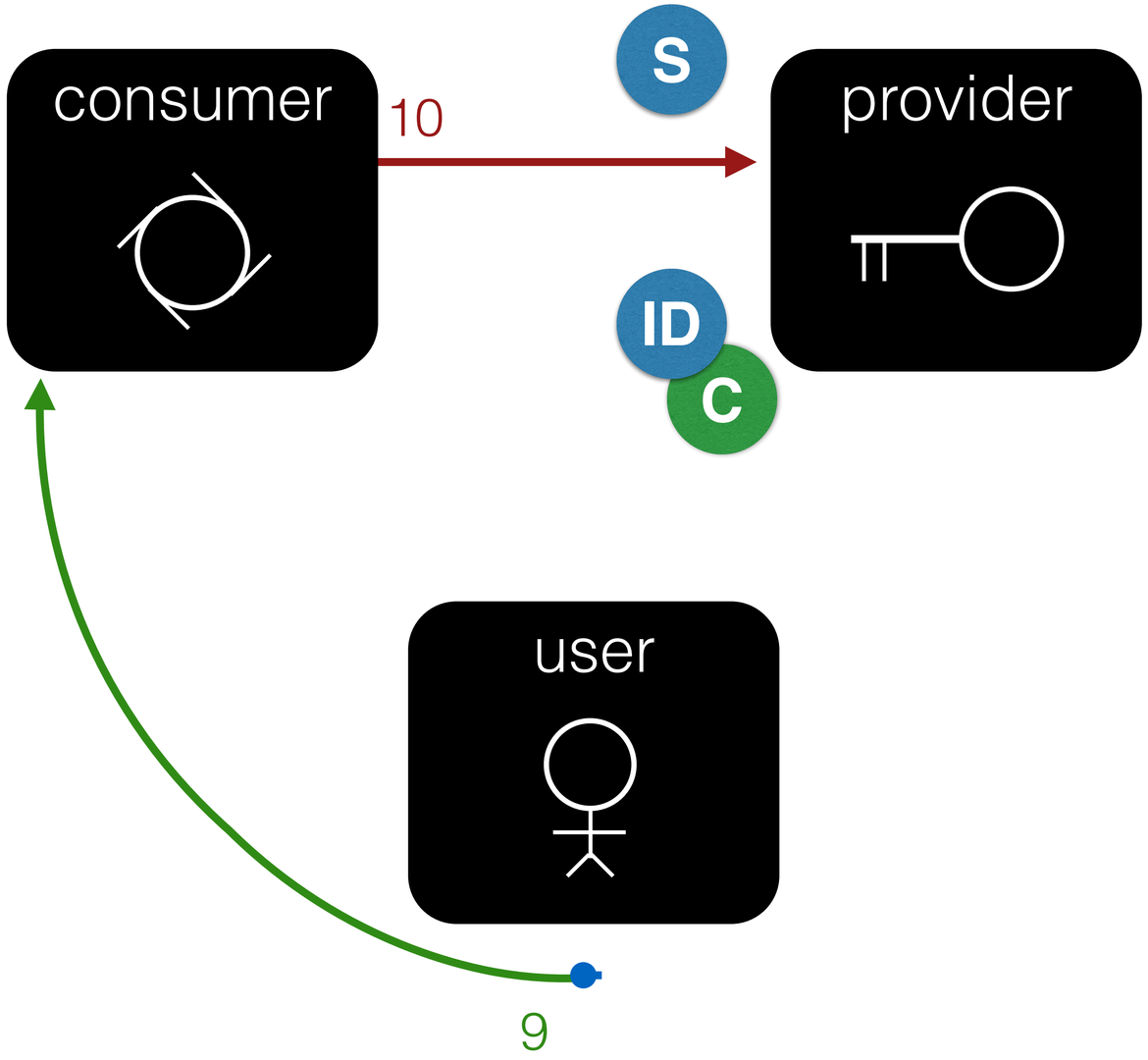


9.Request: callback URL

10.Request: authorization

http://provider.com/oauth/token?client_id=123&client_secret=911&authcode=789

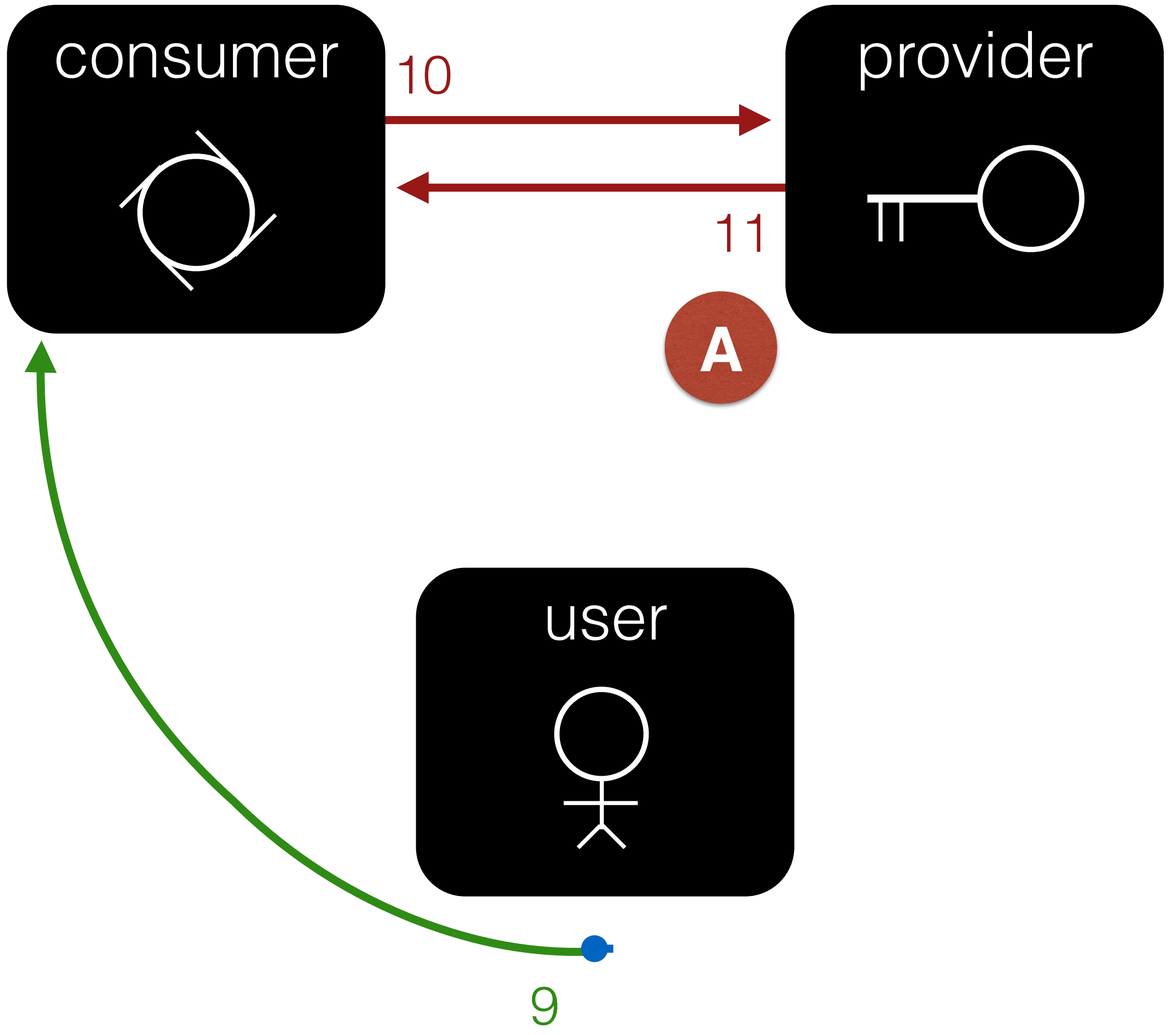
OAUTH - APP AUTHENTICATION



9.Request: callback URL

10.Request: authorization

OAUTH - APP AUTHENTICATION

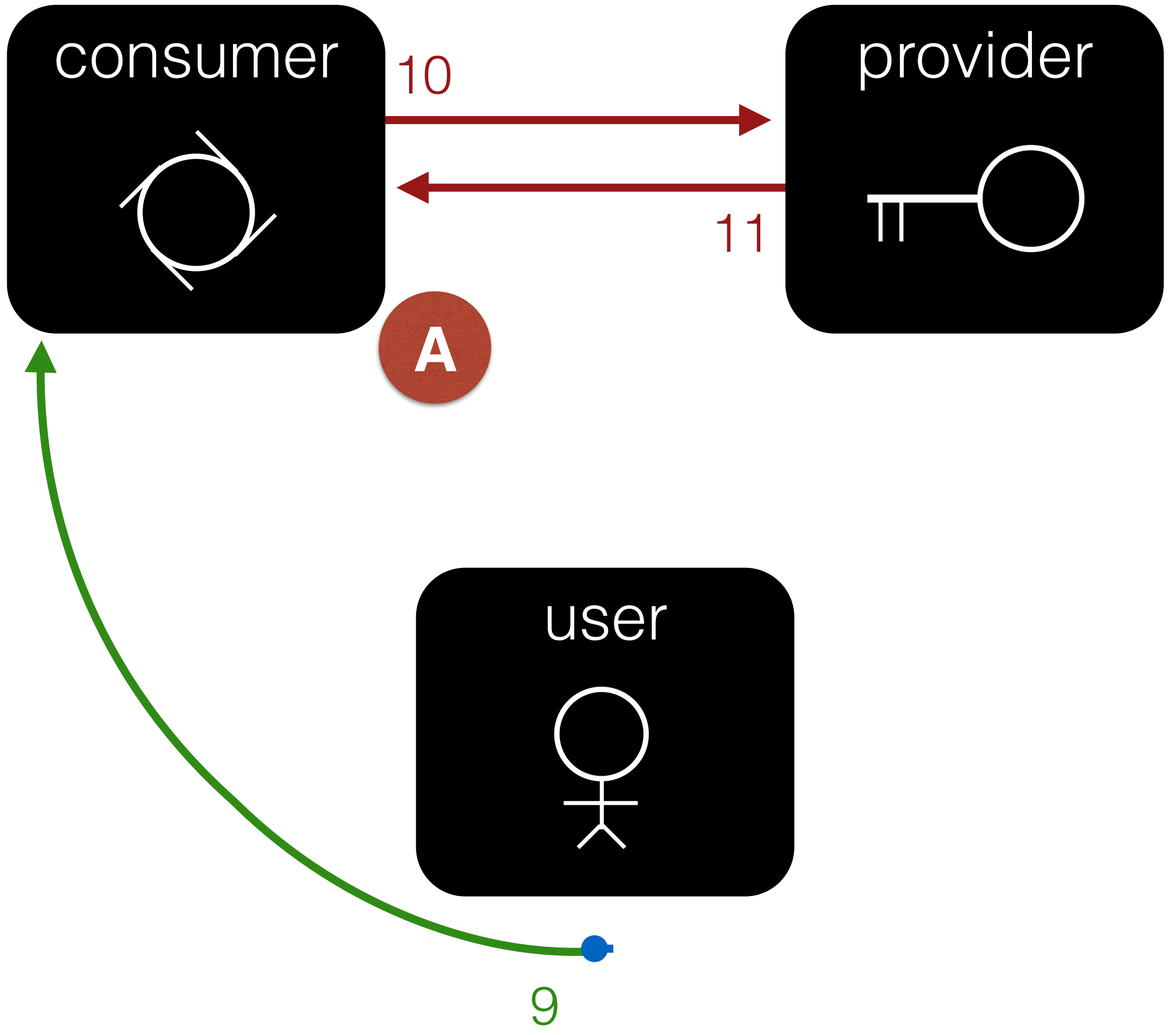


9.Request: callback URL

10.Request: authorization

11.Response: access token

OAUTH - APP AUTHENTICATION



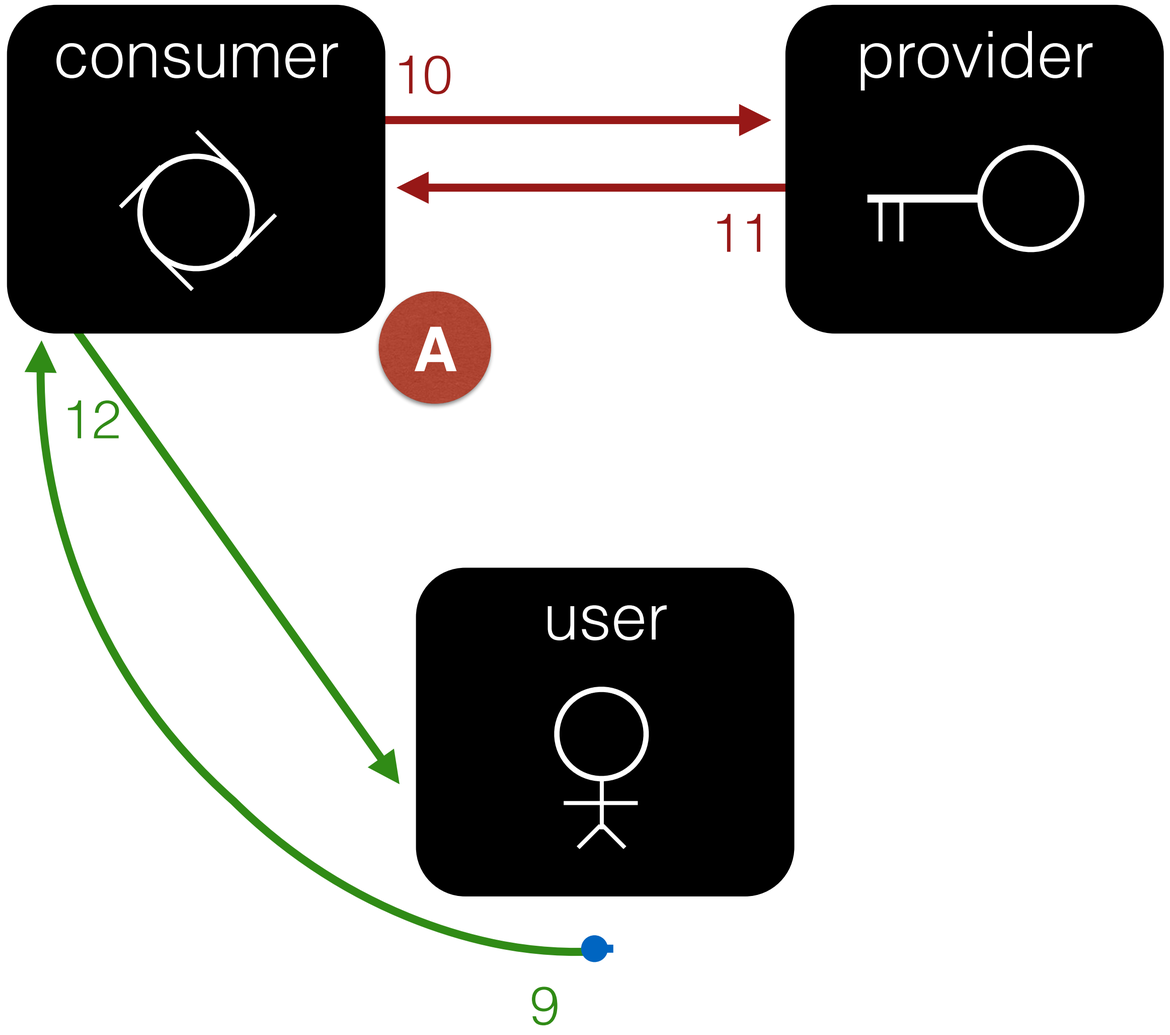
9.Request: callback URL

10.Request: authorization

11.Response: access token

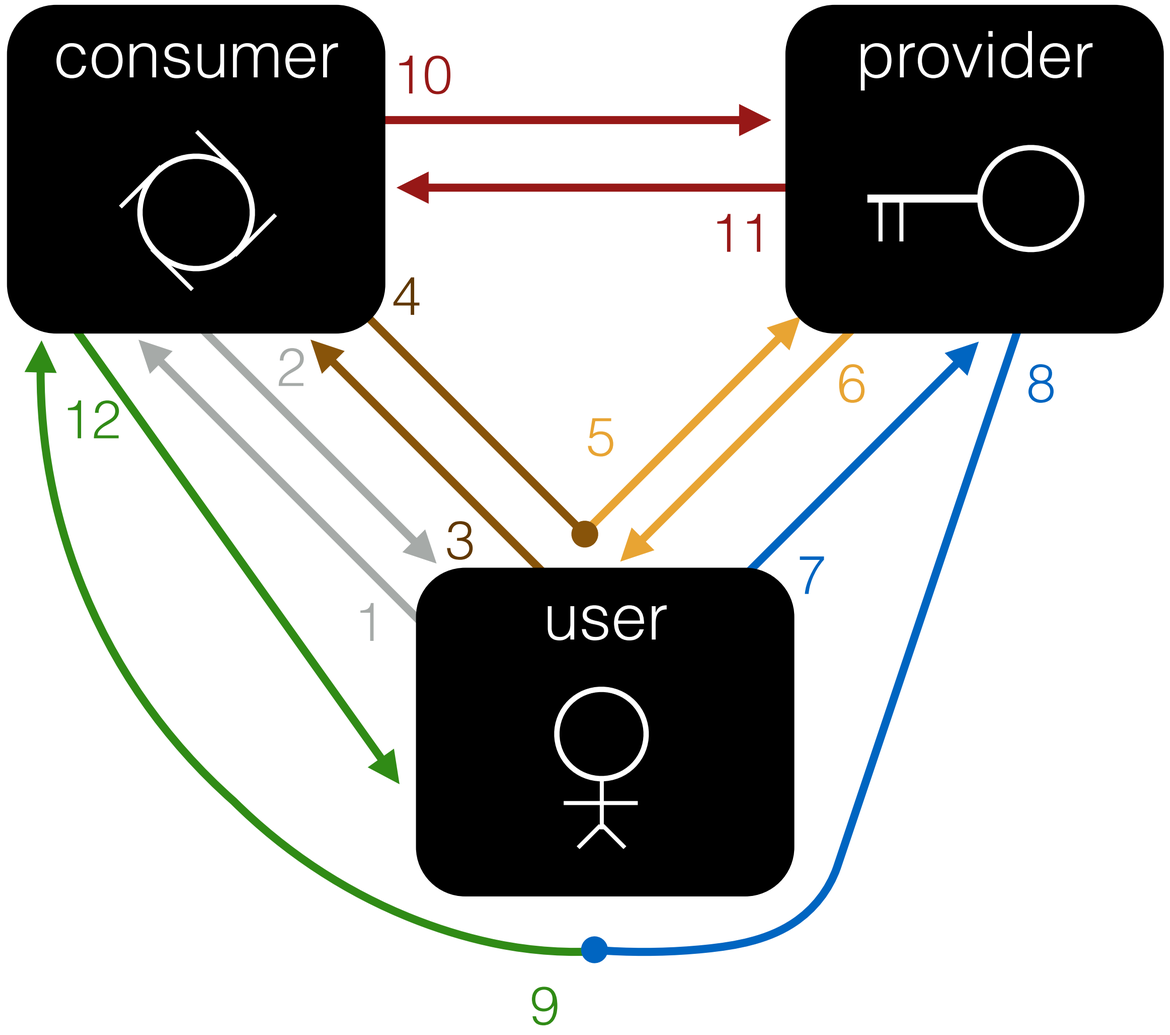
OAUTH - APP AUTHENTICATION

9. Request: callback URL
10. Request: authorization
11. Response: access token
12. Response: yay!



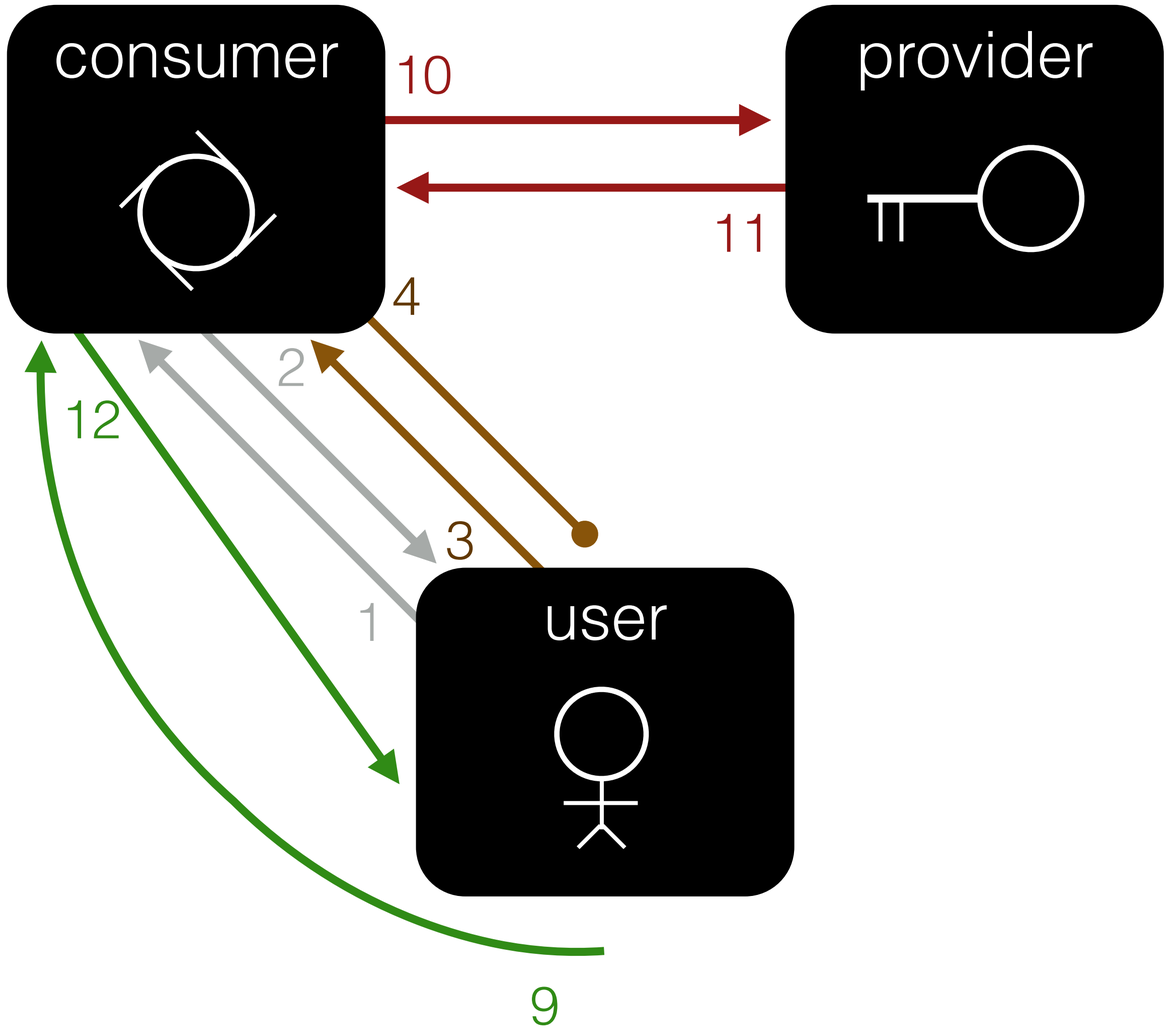
OAUTH - ALL OF IT

1. Request (user to app): load login page
2. Response (app to user): rendered login page
3. Request (user to app): allow app to use provider as me [user petitions app for a special contract to allow the app to do certain things on the user's behalf]
4. Response (app to user): redirect to provider login, passing along (to provider) an app id, a success "callback URL", and a permissions "contract" [app transfers this petition to provider]
5. Request (implicit, user to provider): load login page
6. Response (provider to user): rendered login page
7. Request (user to provider): login to provider [the user signs the contract]
8. Response (provider to user): on success, redirect to callback URL, passing along a new temporary code [the provider approves the user's signature]
9. Request (implicit, user to app): initiate callback
10. Request (app to provider): request for authorization given temporary code and app secret key [the app signs the contract]
11. Response (provider to app): on success, passes back an access token [the provider approves the app's signature and puts the contract into effect]
12. Response (app to user): we're good to go!



OAUTH - CONSUMER ROLE

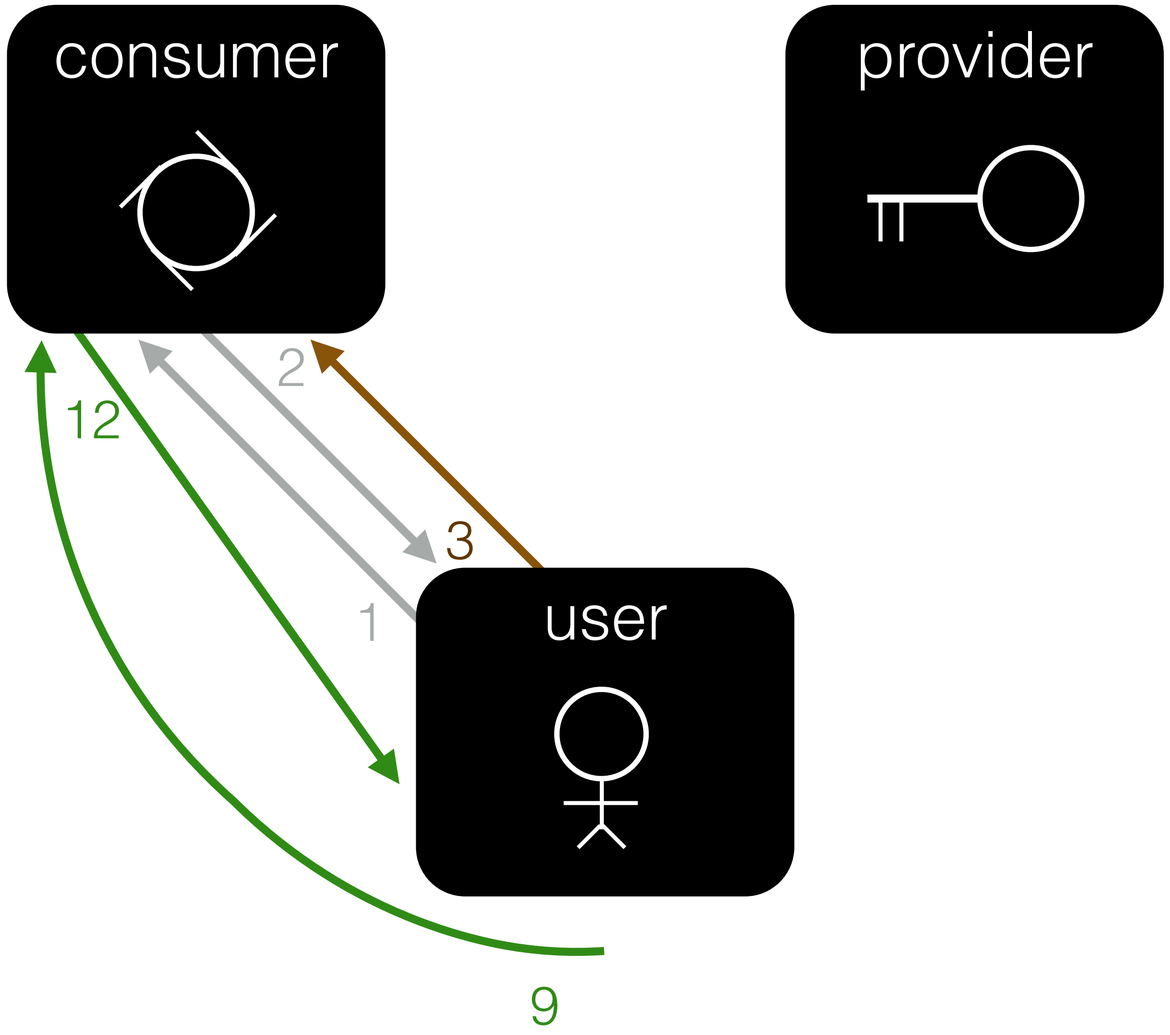
1. Request (user to app): load login page
2. Response (app to user): rendered login page
3. Request (user to app): allow app to use provider as me [user petitions app for a special contract to allow the app to do certain things on the user's behalf]
4. Response (app to user): redirect to provider login, passing along (to provider) an app id, a success "callback URL", and a permissions "contract" [app transfers this petition to provider]



9. Request (implicit, user to app): initiate callback
10. Request (app to provider): request for authorization given temporary code and app secret key [the app signs the contract]
11. Response (provider to app): on success, passes back an access token [the provider approves the app's signature and puts the contract into effect]
12. Response (app to user): we're good to go!

OAUTH - CONSUMER ROLE WITH PASSPORT

1. Request (user to app): load login page
2. Response (app to user): rendered login page
3. Request (user to app): allow app to use provider as me [user petitions app for a special contract to allow the app to do certain things on the user's behalf]



9. Request (implicit, user to app): initiate callback

12. Response (app to user): we're good to go!

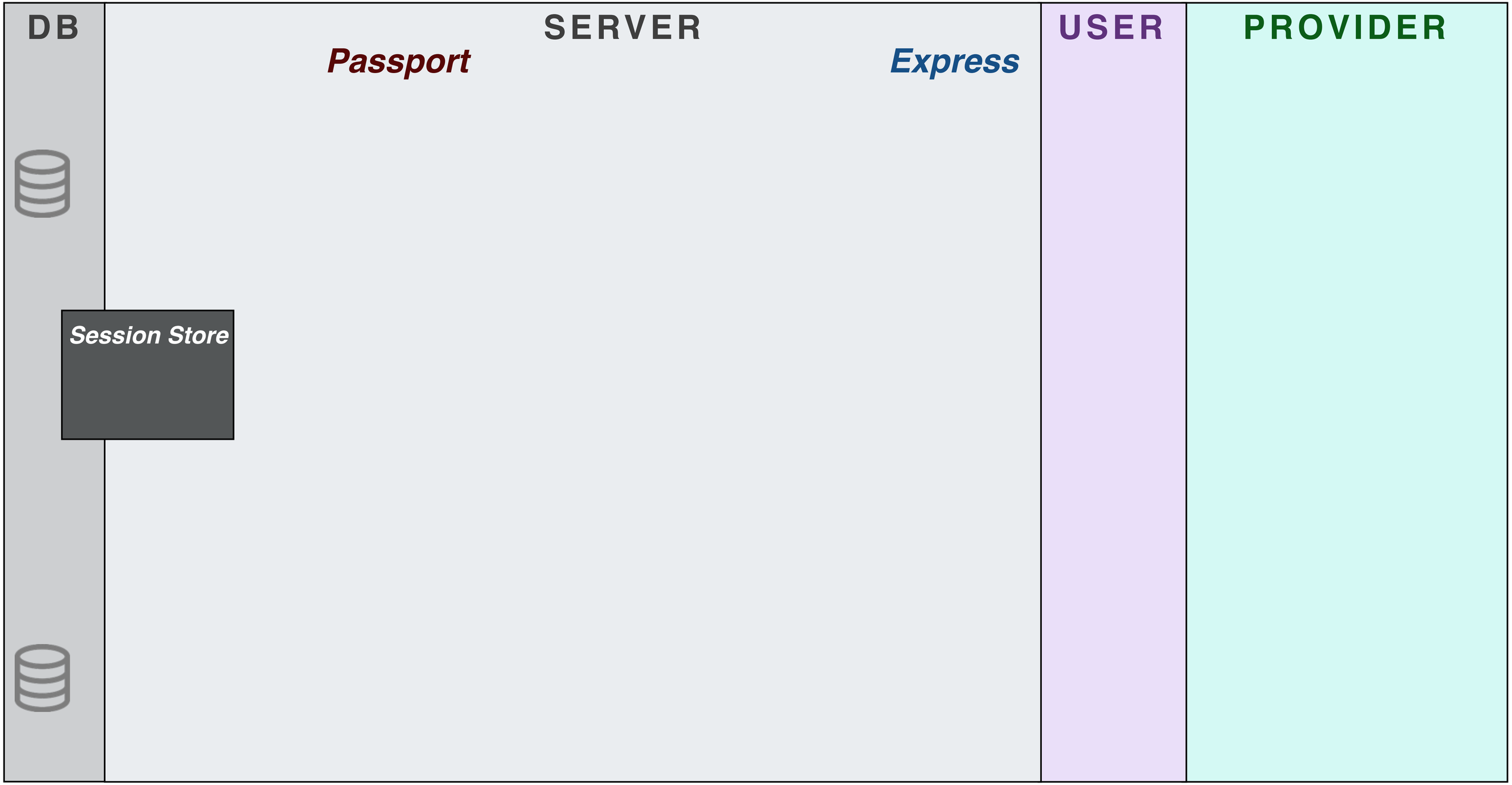
Passport

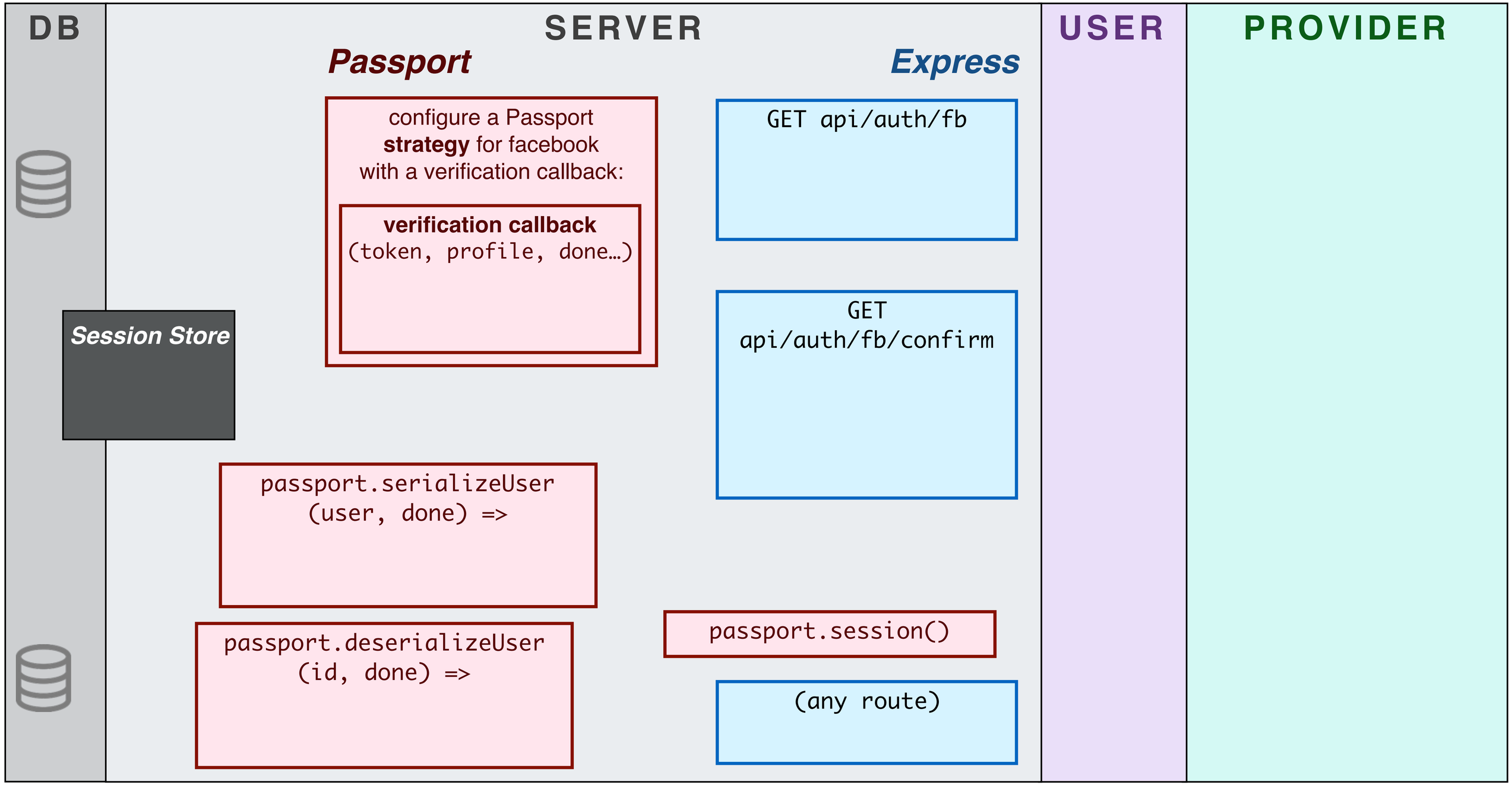
TL;DR

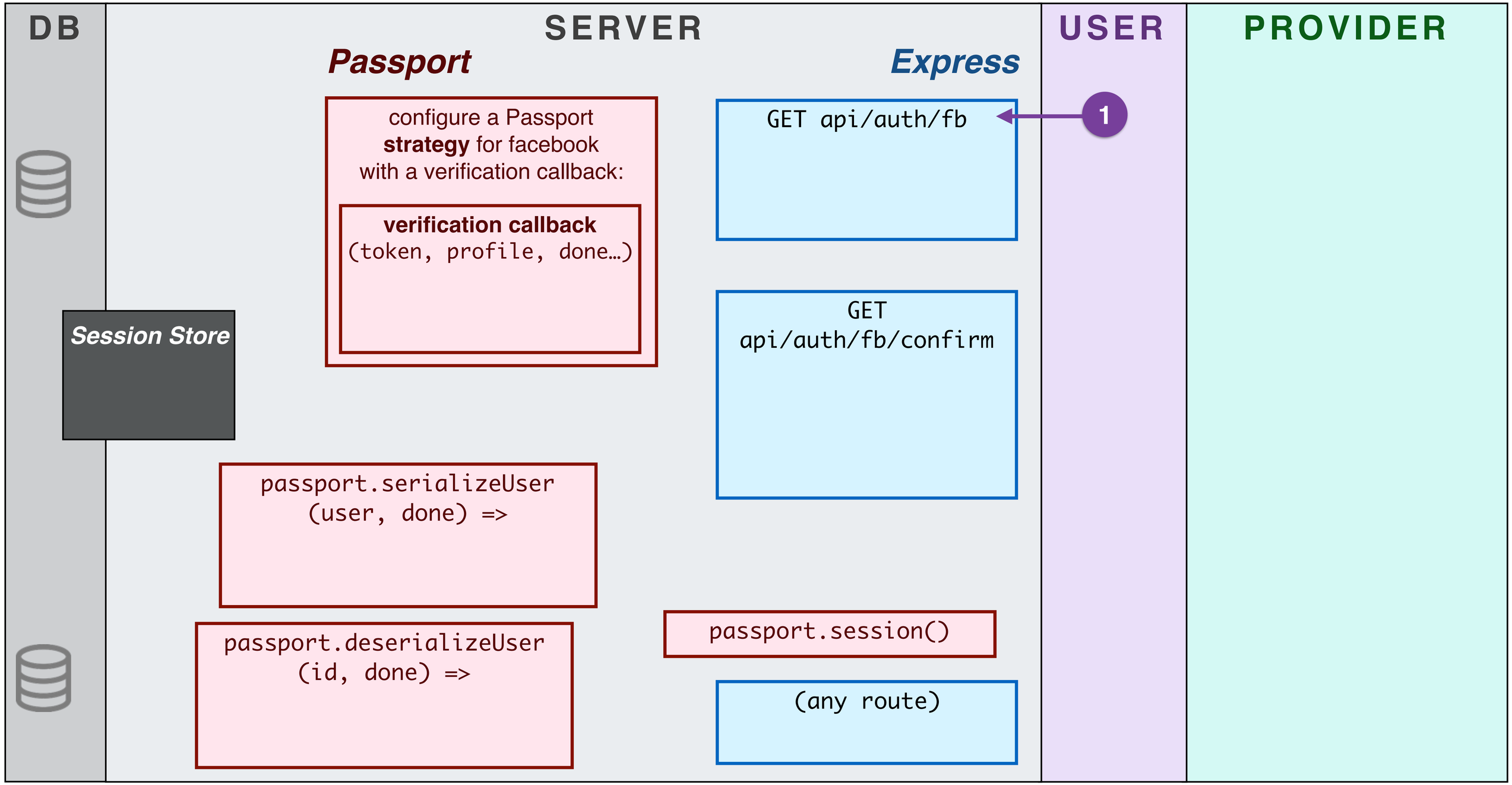
- Assuming you set everything up right:
- Client can log in by requesting GET /auth/fb or similar
- In routes you will now have req.user to check user info

PASSPORT INGREDIENTS

- **attach passport.session() middleware**
  - Only after express-session
- **Define how to minimally store & look up user using session**
  - passport.serializeUser / passport.deserializeUser
- **Must configure a Strategy**
  - Strategy needs a *verification callback* you write — longest part
- **passport.authenticate (in two different routes)**
  - Uses strategy
  - Slightly different call in each route


DB
SERVER
USER
PROVIDER
Passport
Express
Session Store


DB
SERVER
USER
PROVIDER
Passport
Express
configure a Passport
strategy for facebook
with a verification callback:
verification callback
(token, profile, done…)
GET api/auth/fb
GET
api/auth/fb/confirm
Session Store
passport.serializeUser
(user, done) =>
passport.deserializeUser
(id, done) =>
passport.session()
(any route)


DB
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USER
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GET api/auth/fb
1
Session Store
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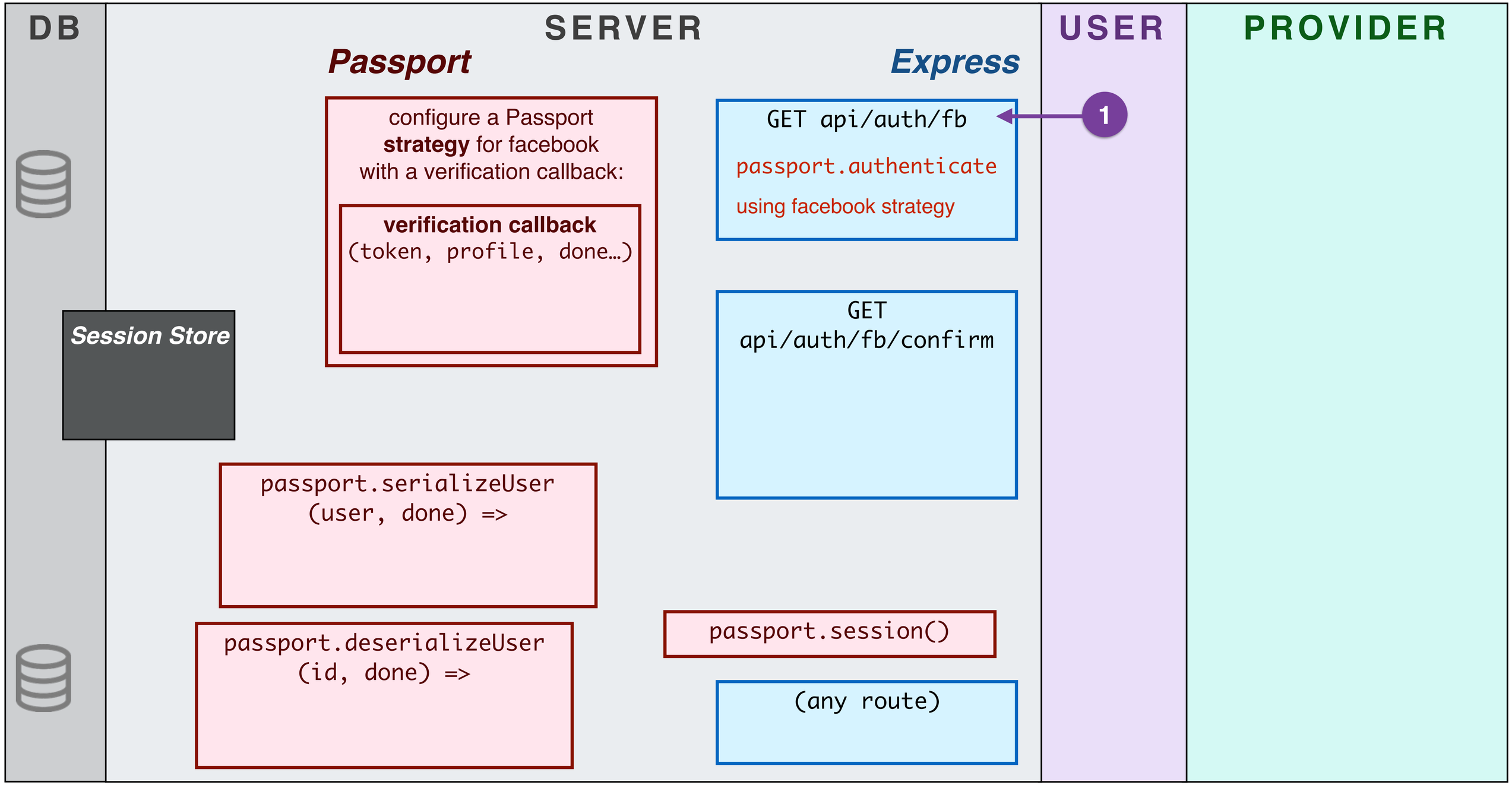
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GET api/auth/fb
passport.authenticate
using facebook strategy
1
Session Store
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api/auth/fb/confirm
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(user, done) =>
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(id, done) =>
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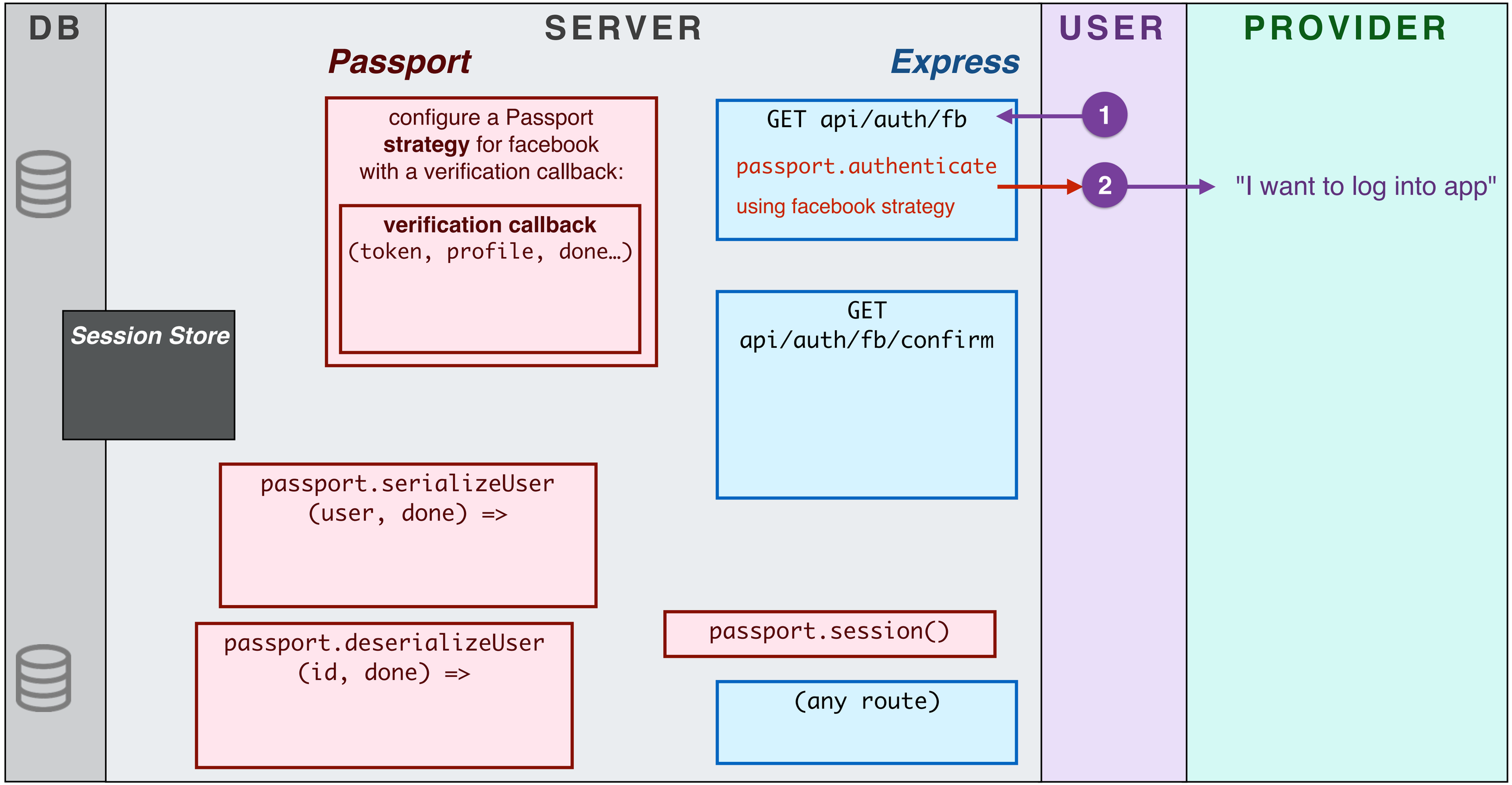
DB
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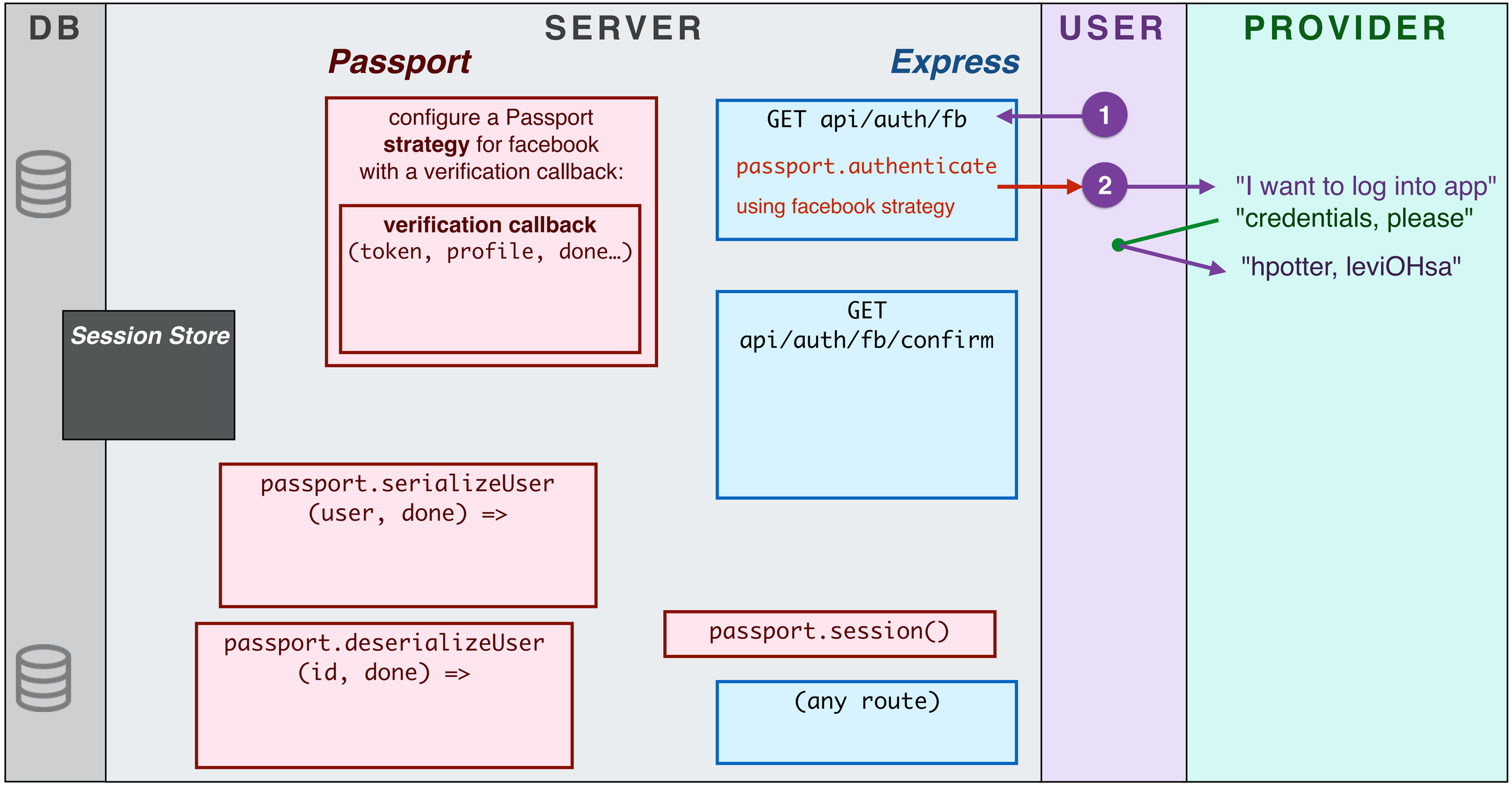
USER
PROVIDER
Passport
Express
configure a Passport strategy for facebook with a verification callback:
verification callback
(token, profile, done…)
GET api/auth/fb
passport.authenticate
using facebook strategy
1
2
"I want to log into app"
Session Store
GET
api/auth/fb/confirm
passport.serializeUser
(user, done) =>
passport.deserializeUser
(id, done) =>
passport.session()
(any route)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with a verification callback:
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GET api/auth/fb
passport.authenticate
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1
2
"I want to log into app"
"credentials, please"
"hpotter, leviOHsa"
Session Store
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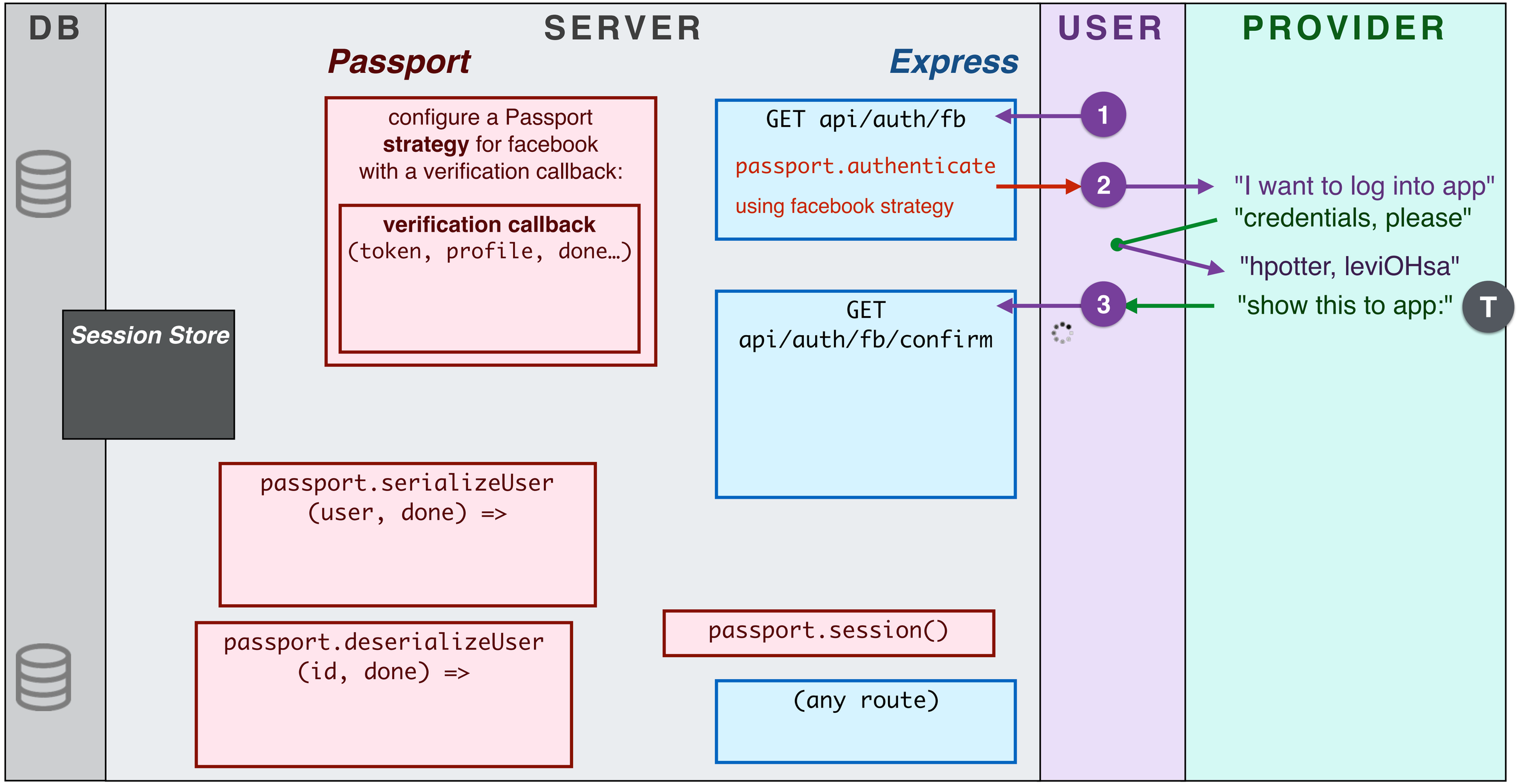
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with a verification callback:
verification callback
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passport.authenticate
using facebook strategy
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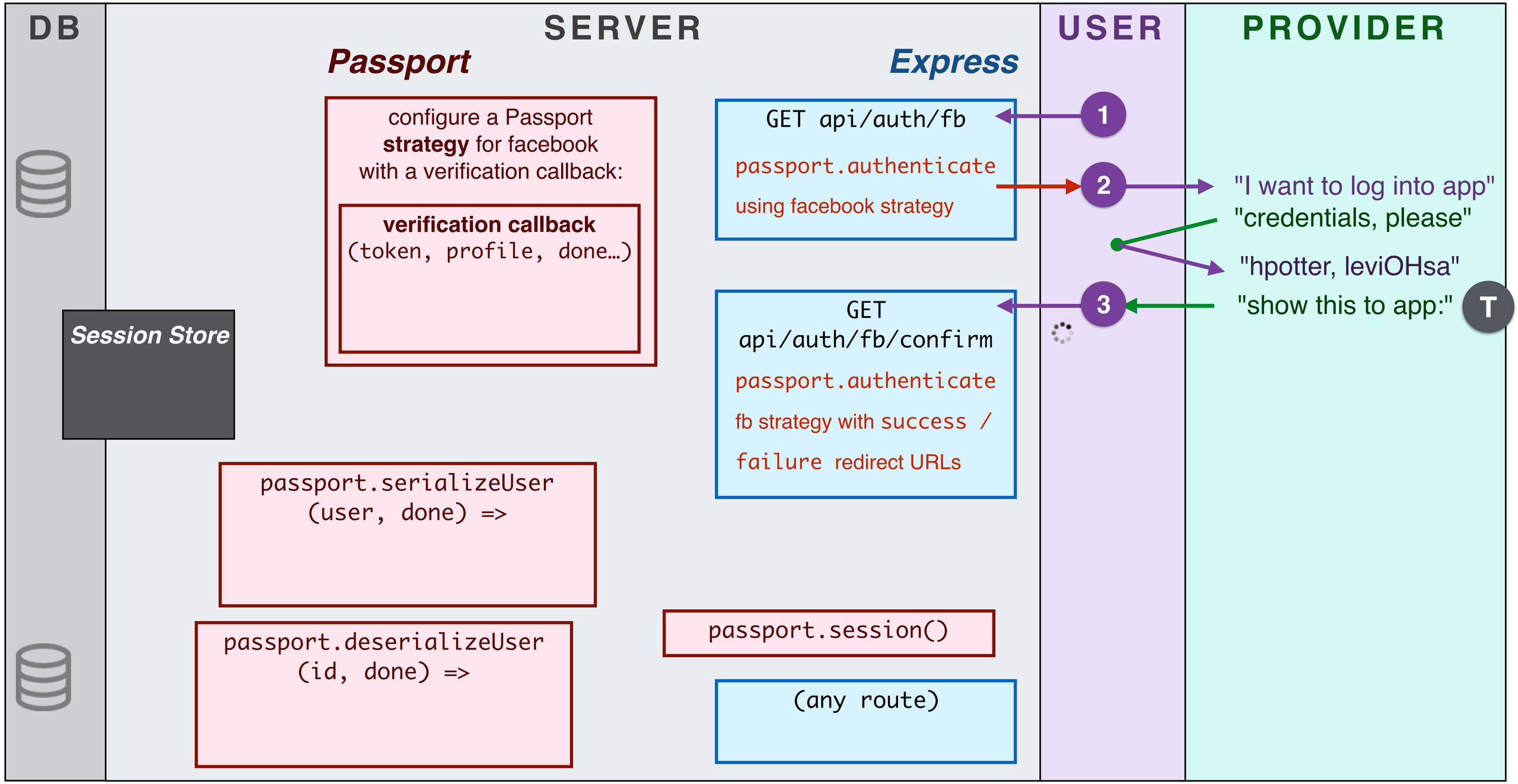
2
"I want to log into app"
"credentials, please"
"hpotter, leviOHsa"
"show this to app:"
T
3
GET
api/auth/fb/confirm
Session Store
passport.serializeUser
(user, done) =>
passport.deserializeUser
(id, done) =>
passport.session()
(any route)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Passport
Express
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verification callback
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passport.authenticate
using facebook strategy
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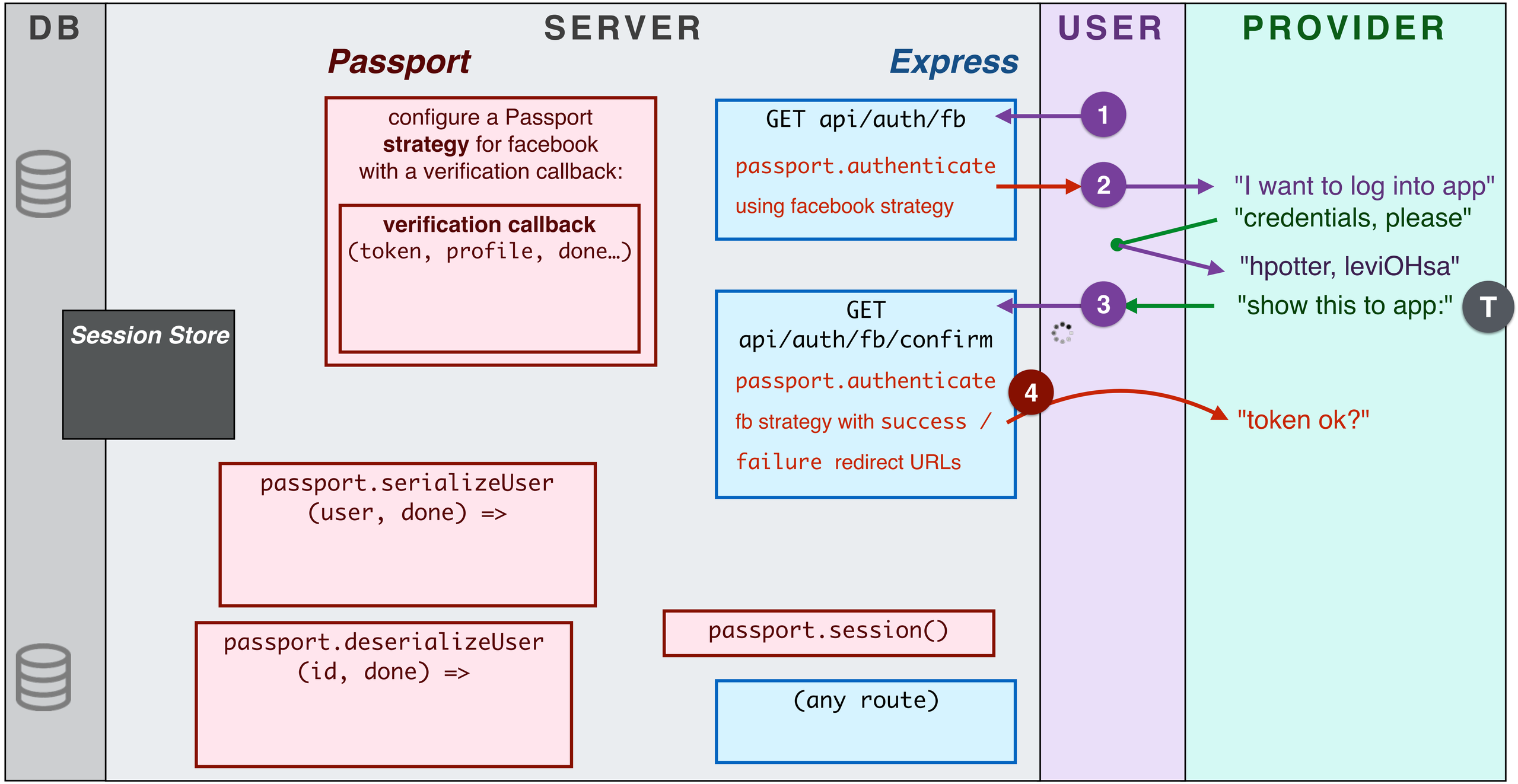
2
"I want to log into app"
"credentials, please"
"hpotter, leviOHsa"
3
"show this to app:"
T
Session Store
GET api/auth/fb/confirm
passport.authenticate
fb strategy with success / failure redirect URLs
passport.serializeUser
(user, done) =>
passport.deserializeUser
(id, done) =>
passport.session()
(any route)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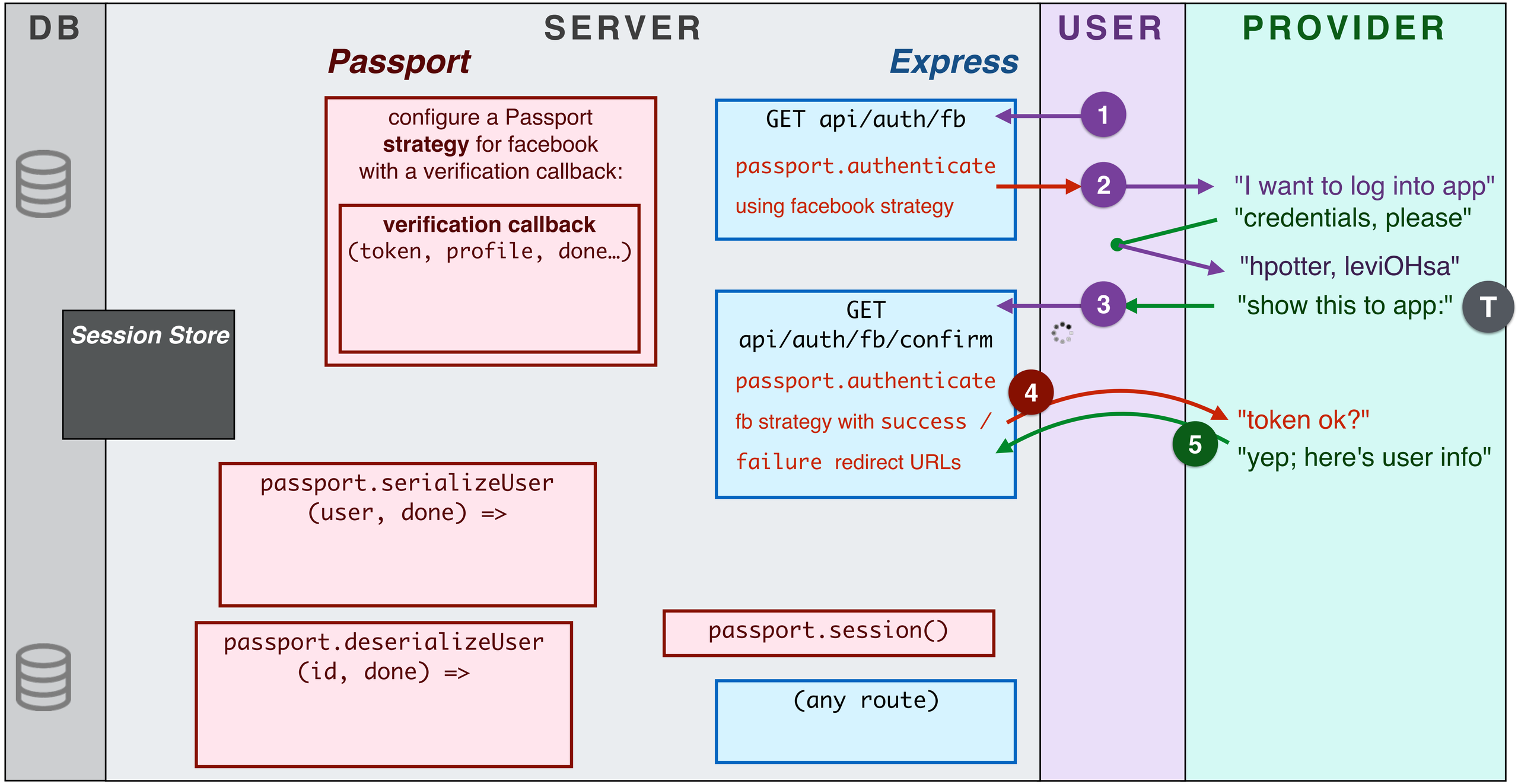
passport.authenticate
using facebook strategy
1
2
"I want to log into app"
"credentials, please"
"hpotter, leviOHsa"
"show this to app:"
T
3
GET api/auth/fb/confirm
passport.authenticate
fb strategy with success / failure redirect URLs
4
"token ok?"
Session Store
passport.serializeUser
(user, done) =>
passport.deserializeUser
(id, done) =>
passport.session()
(any route)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"hpotter, leviOHsa"
"show this to app:"
T
3
GET api/auth/fb/confirm
passport.authenticate
fb strategy with success / failure redirect URLs
4
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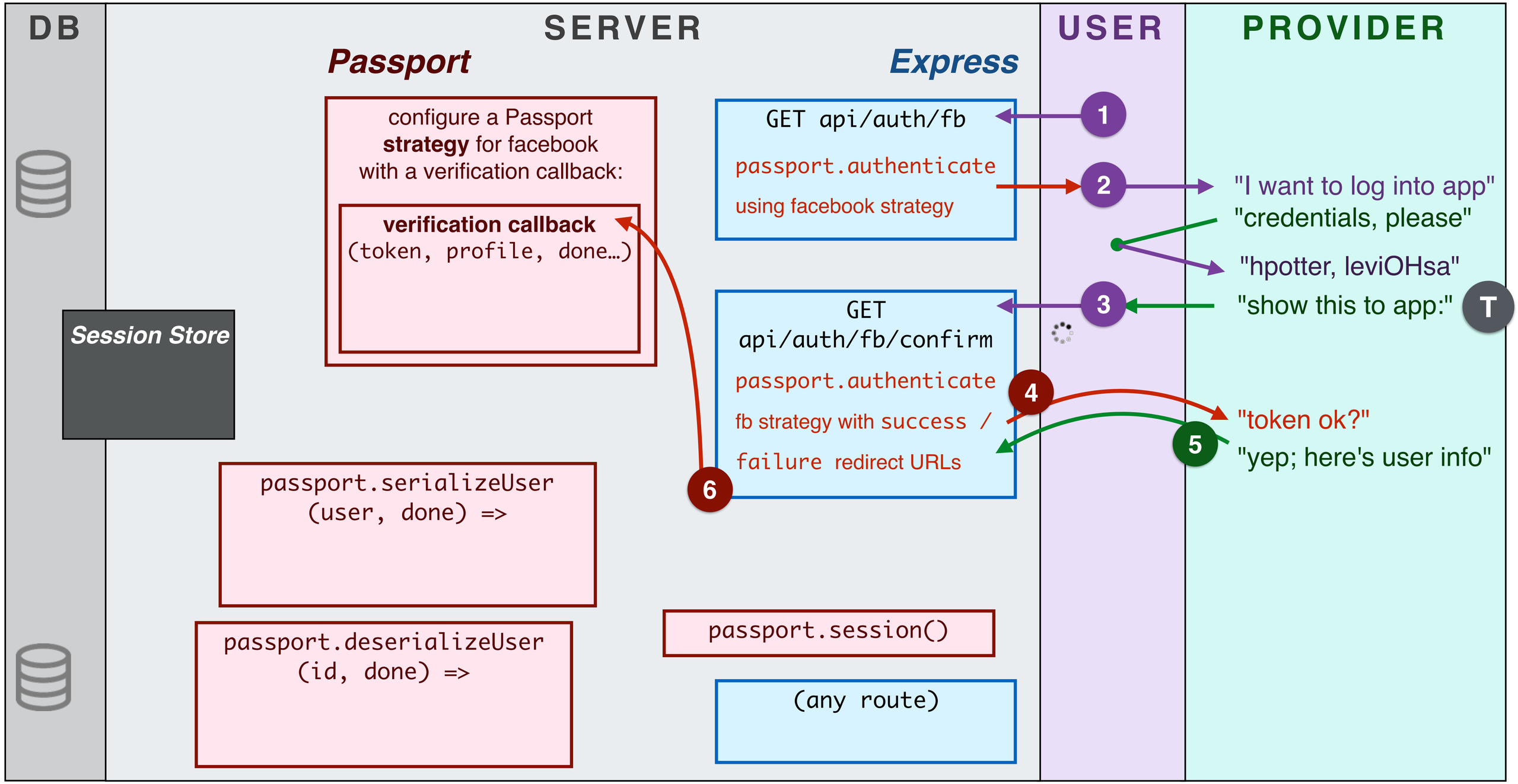
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with a verification callback:
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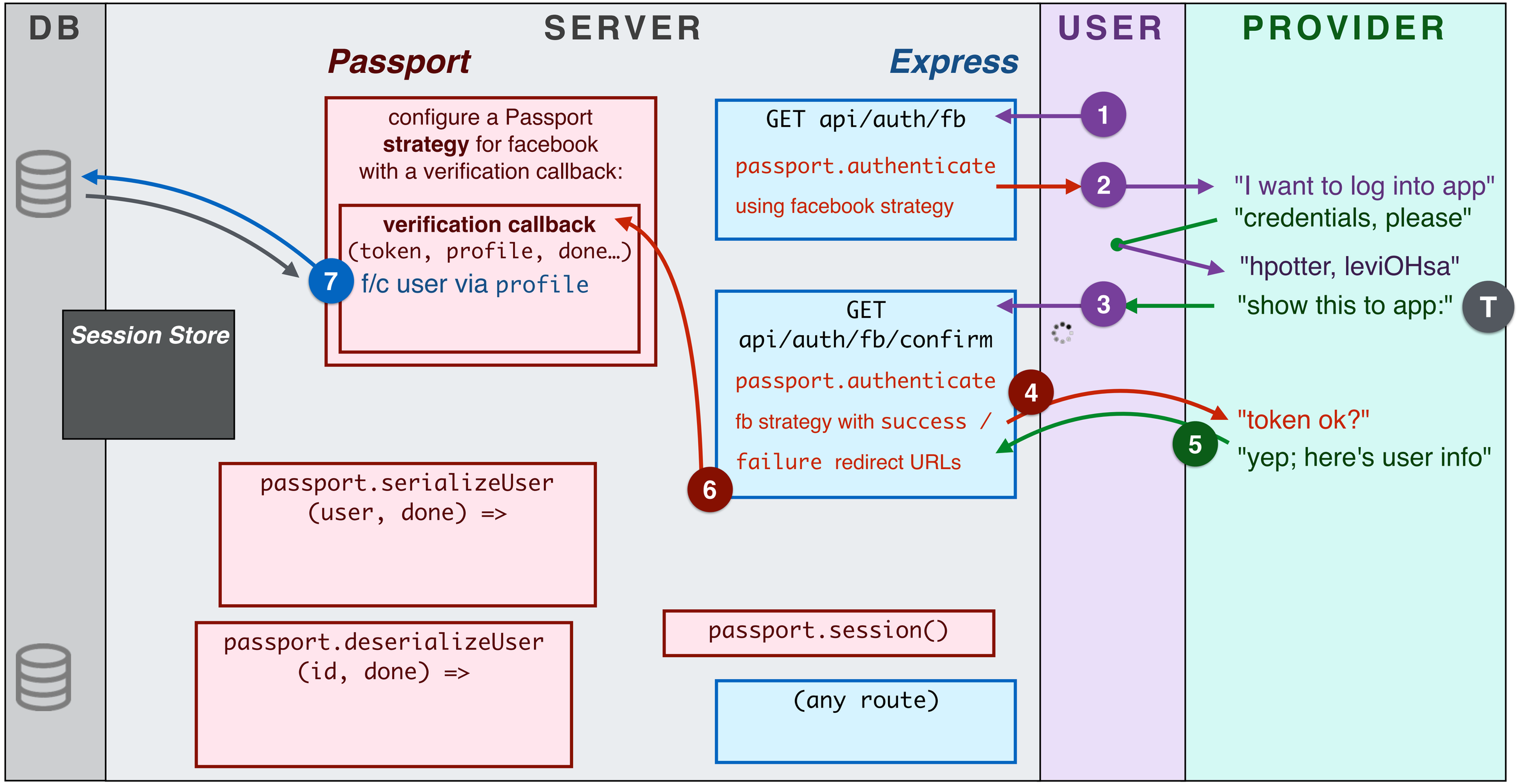
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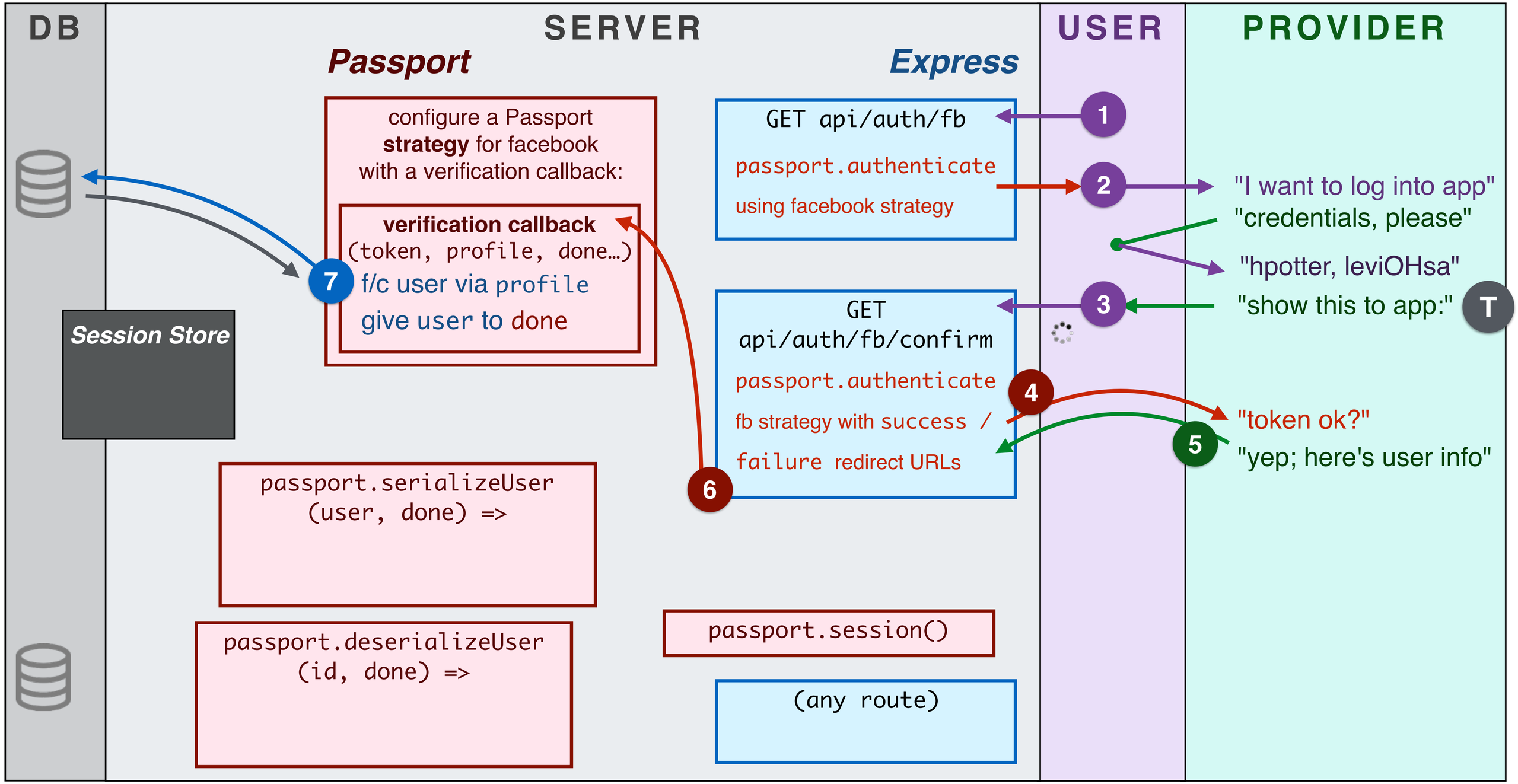
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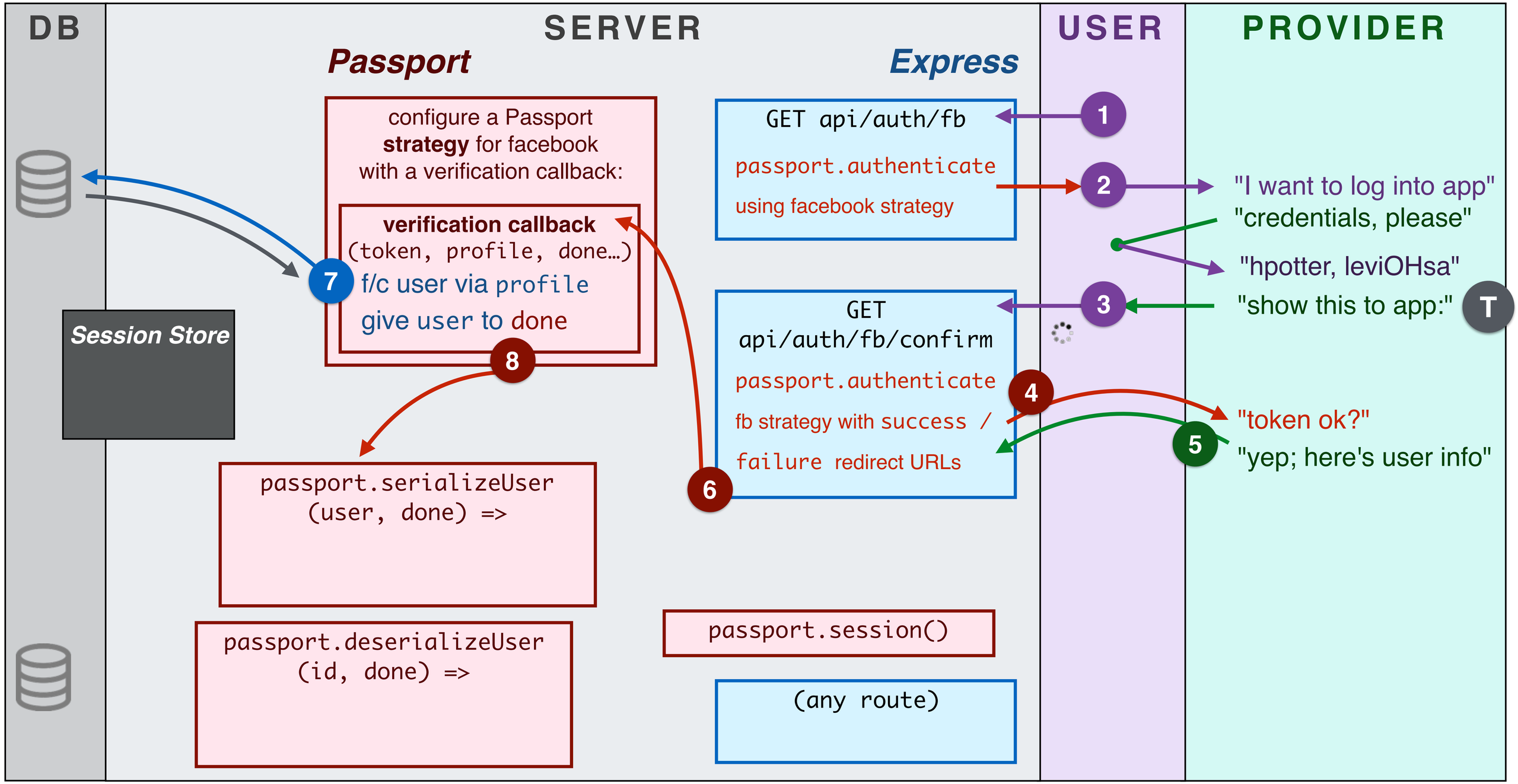
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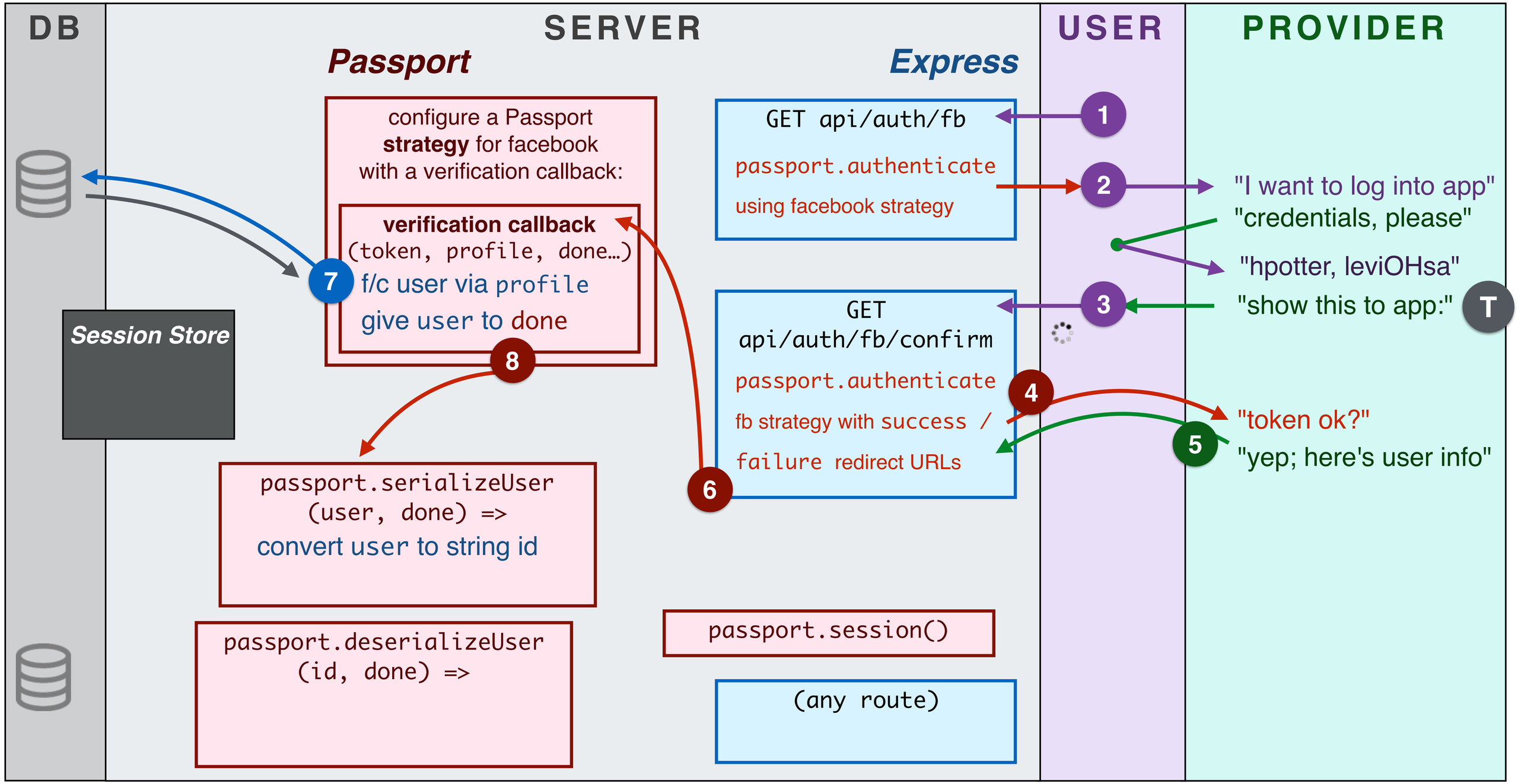
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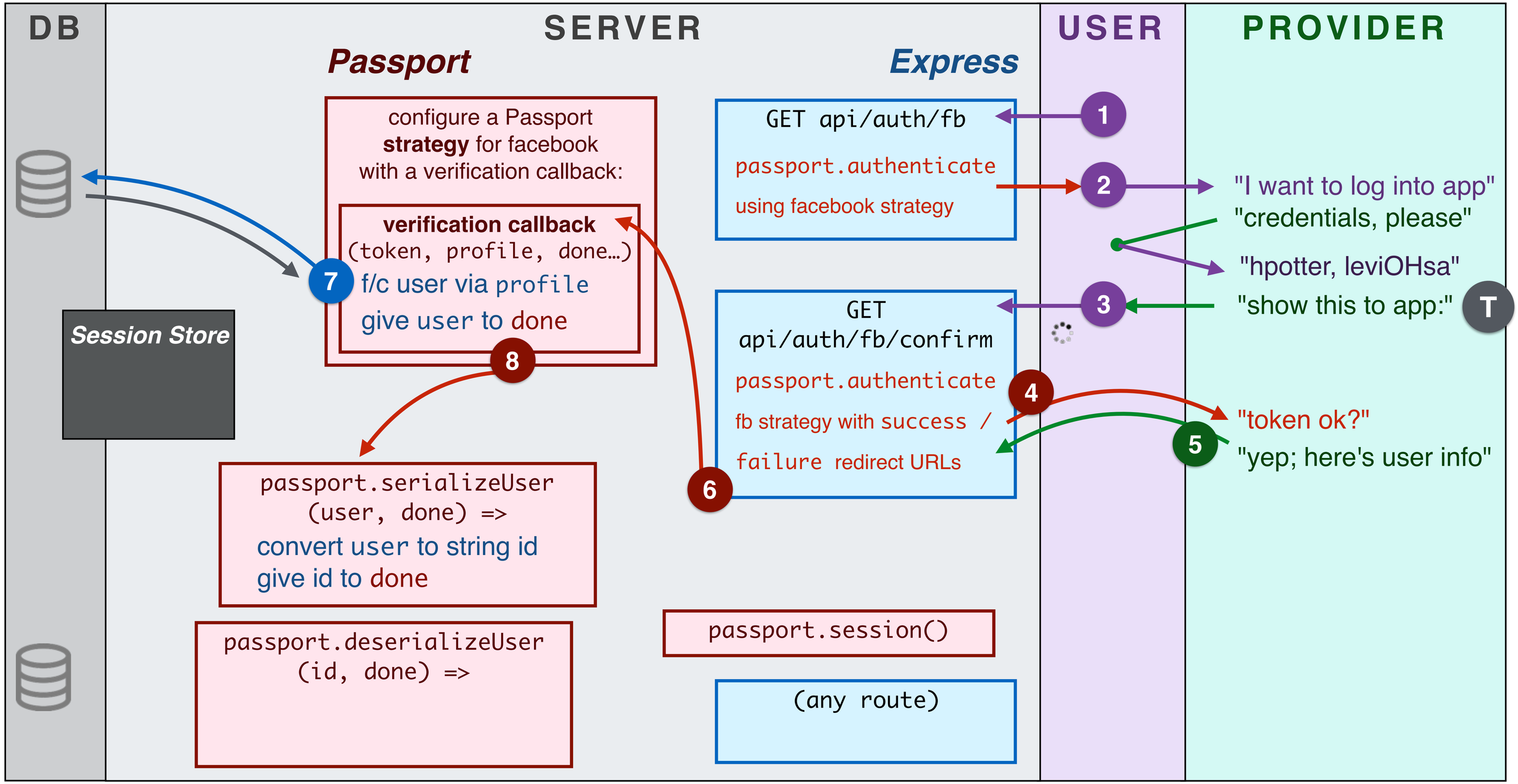
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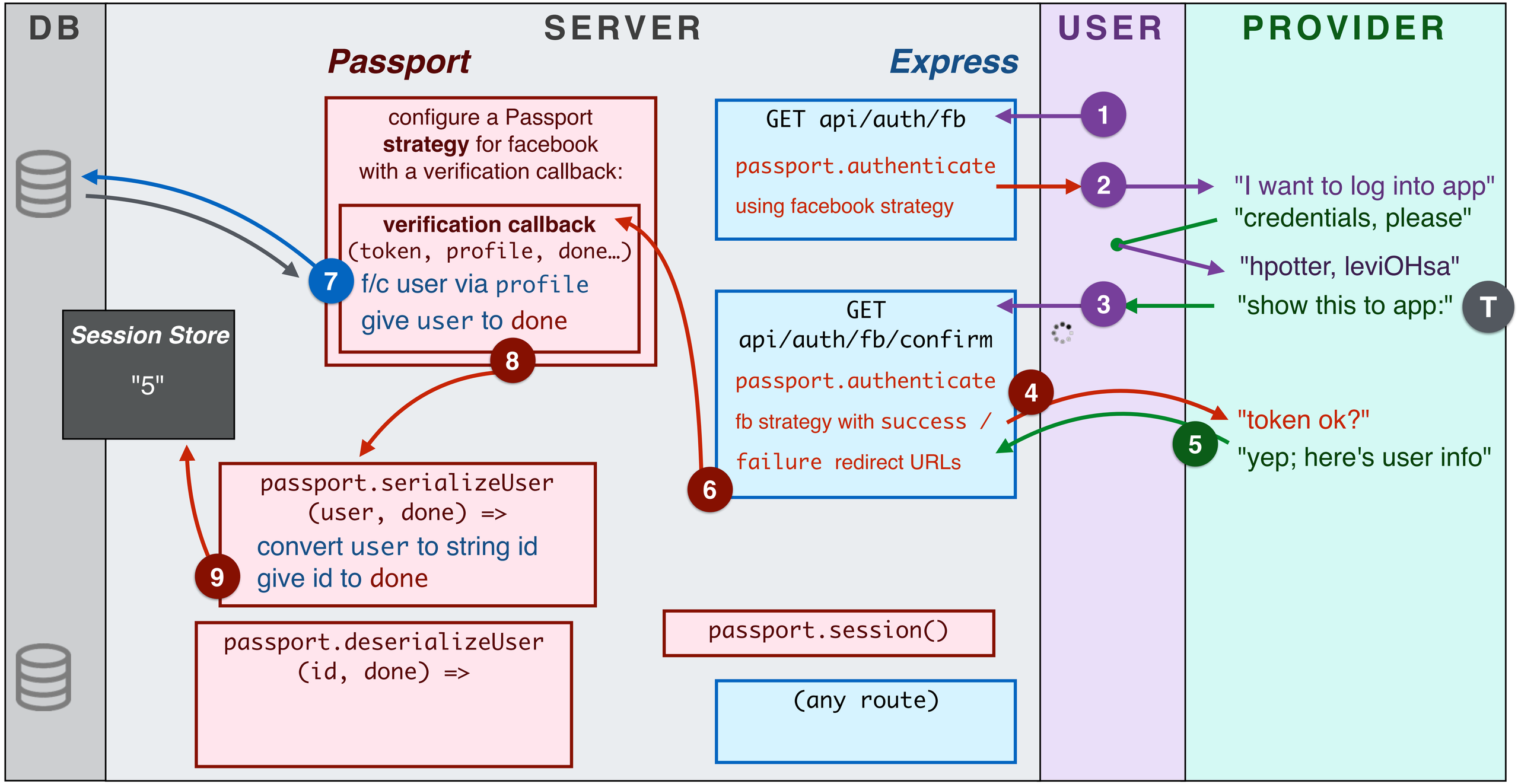
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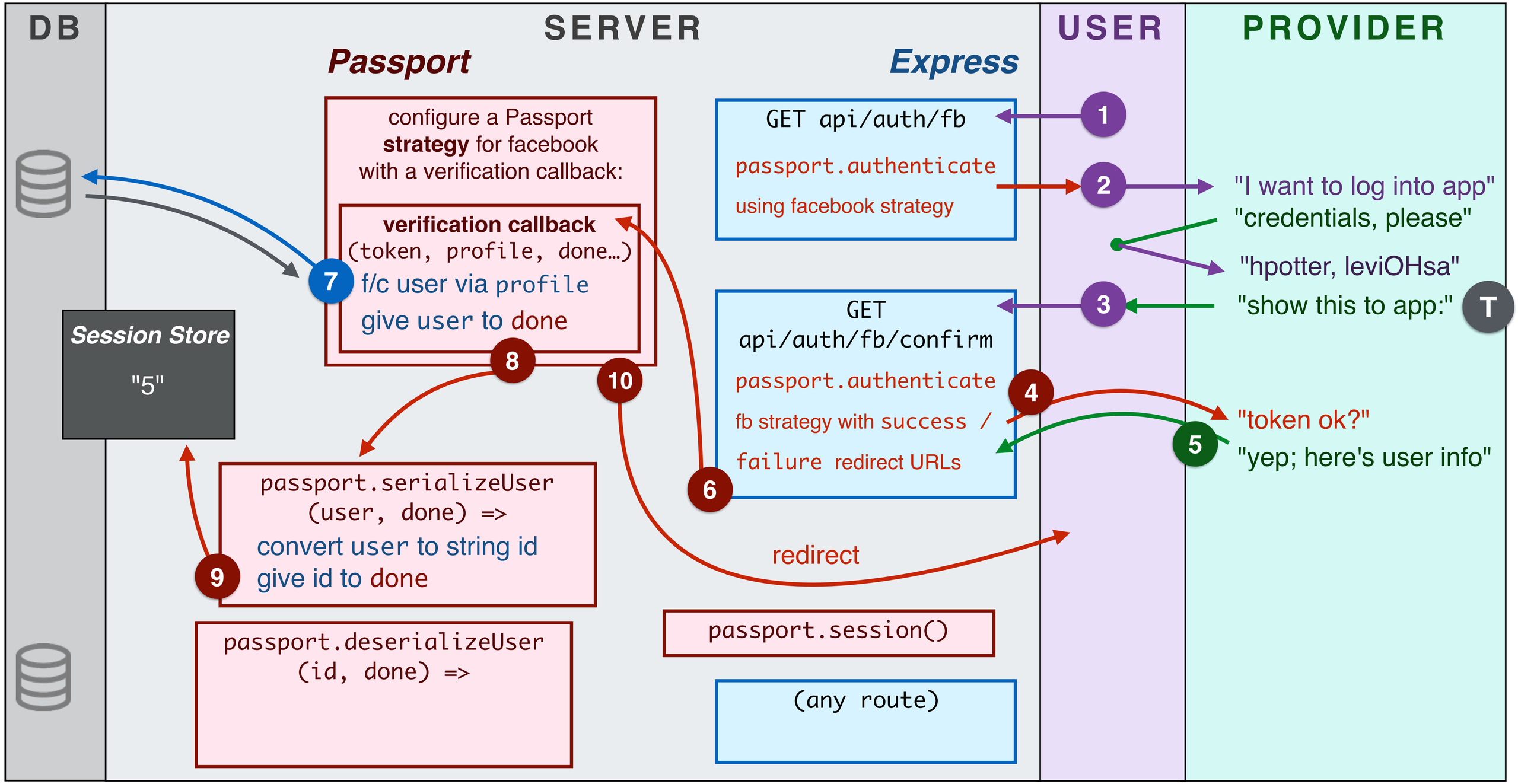
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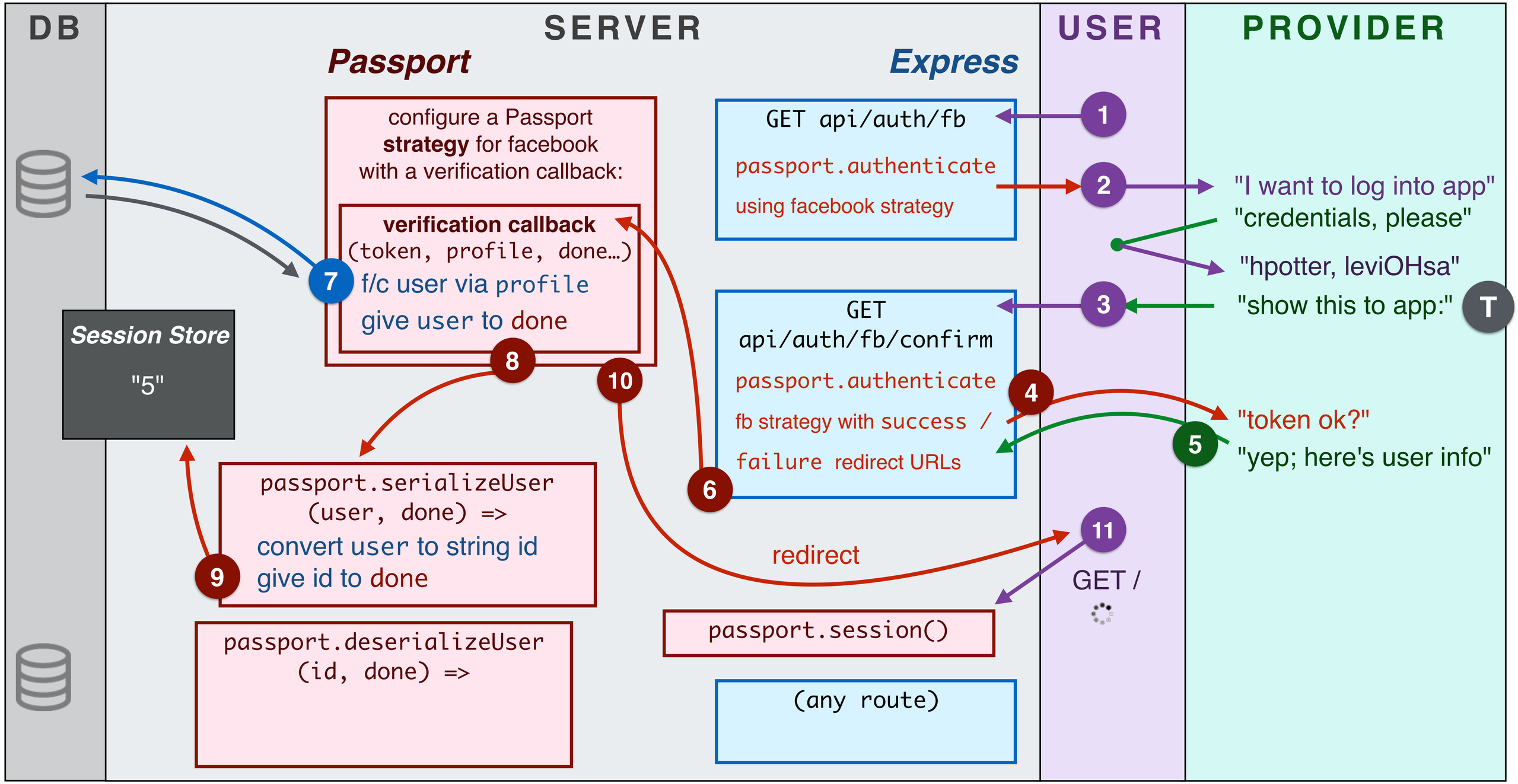
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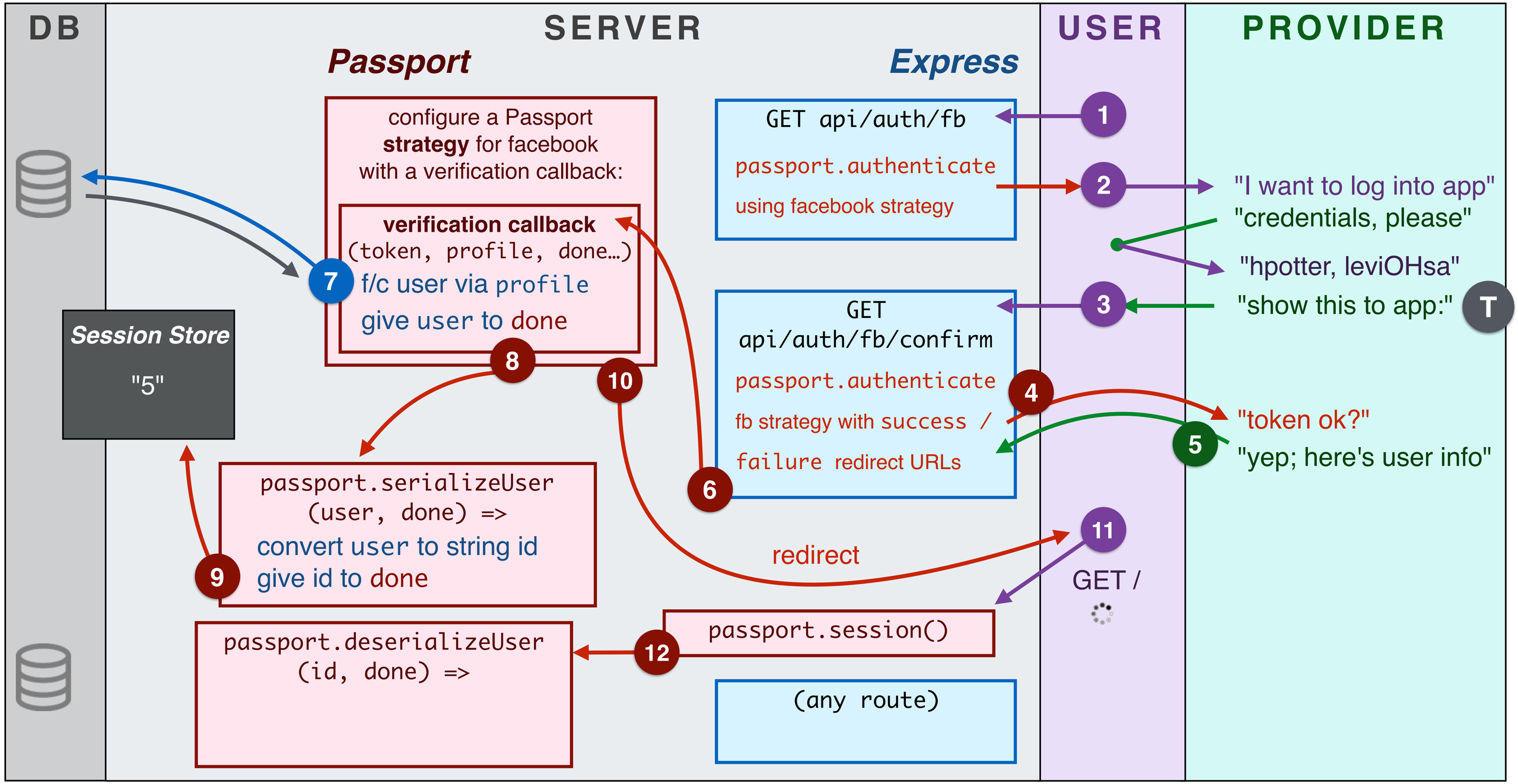
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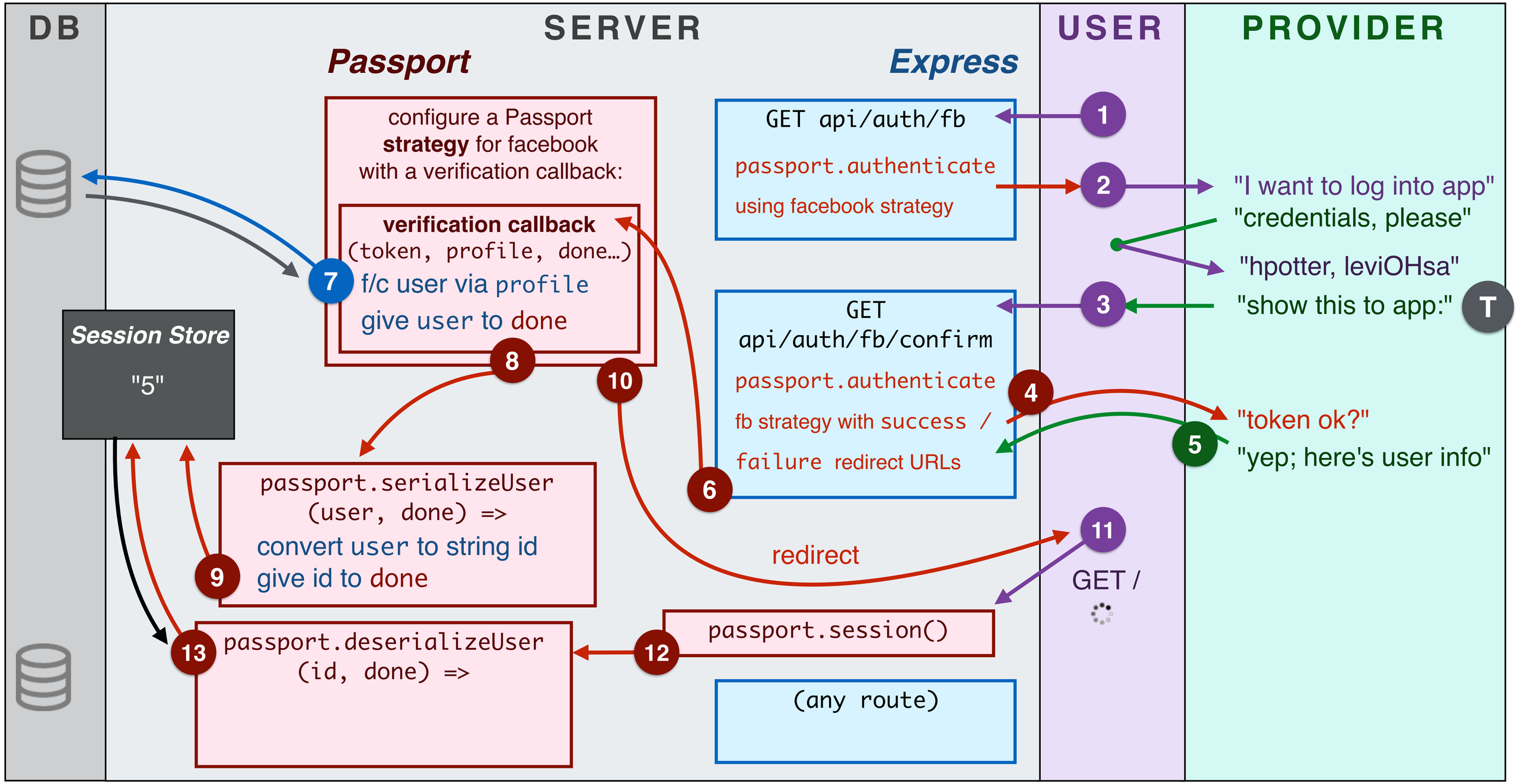
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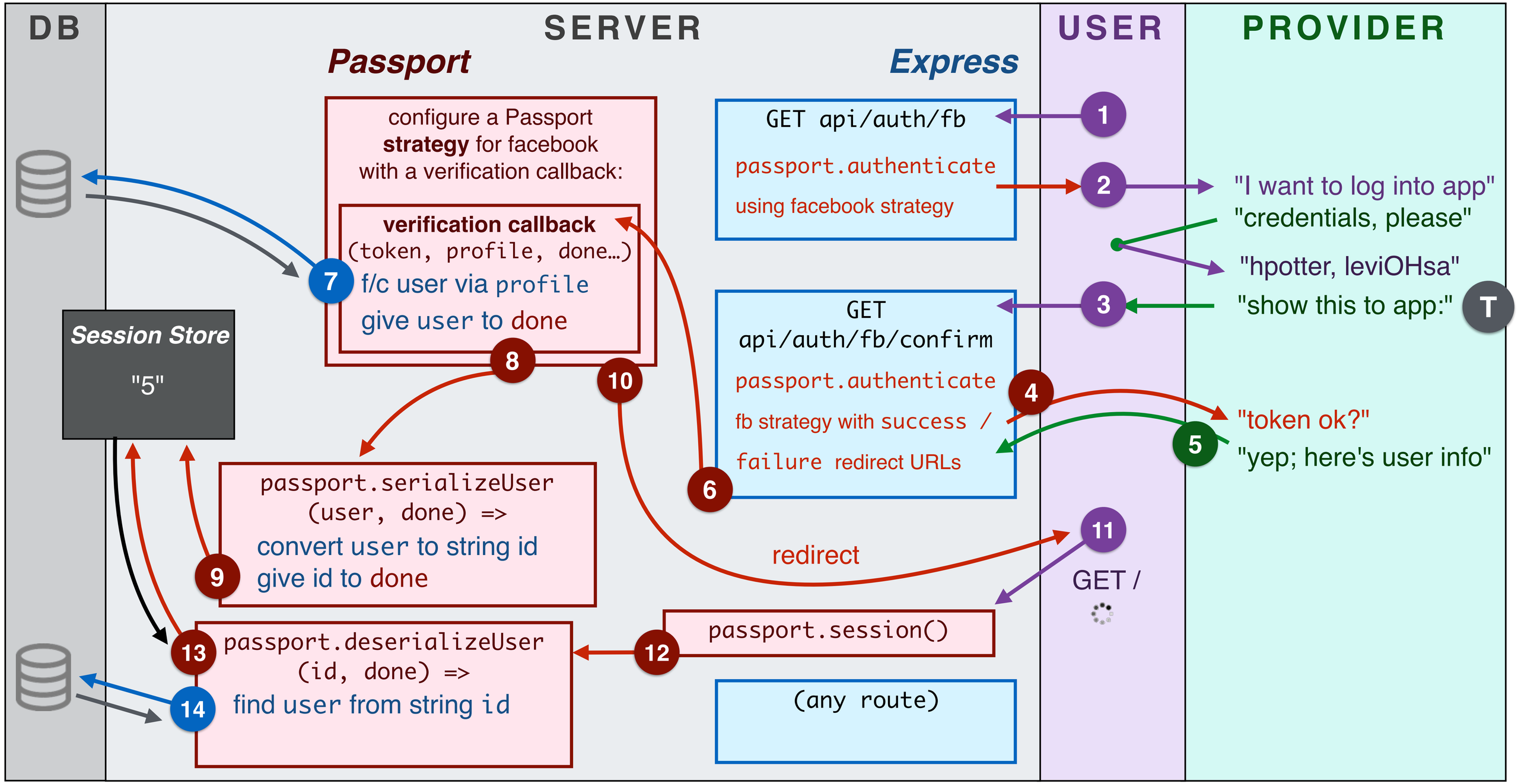
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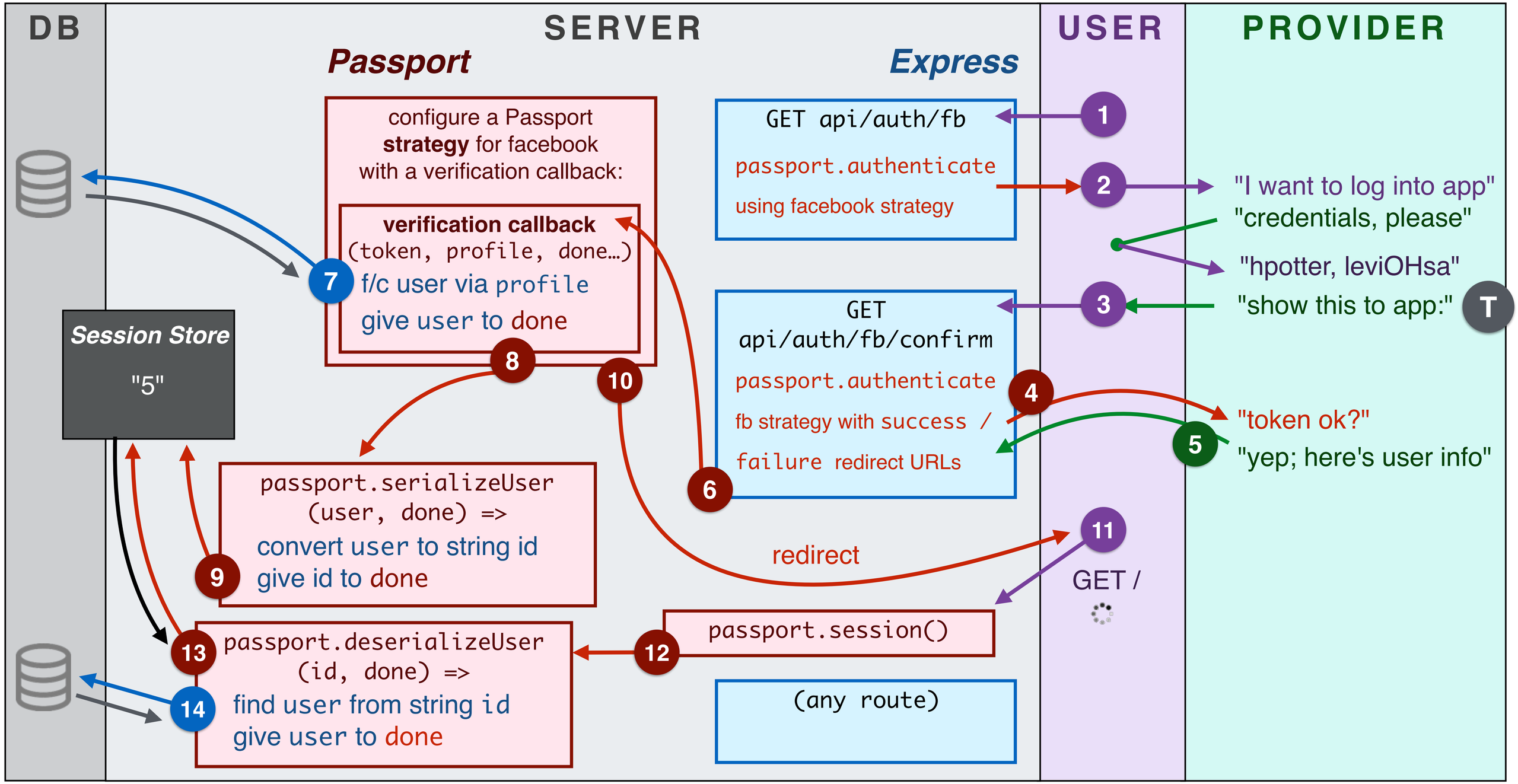
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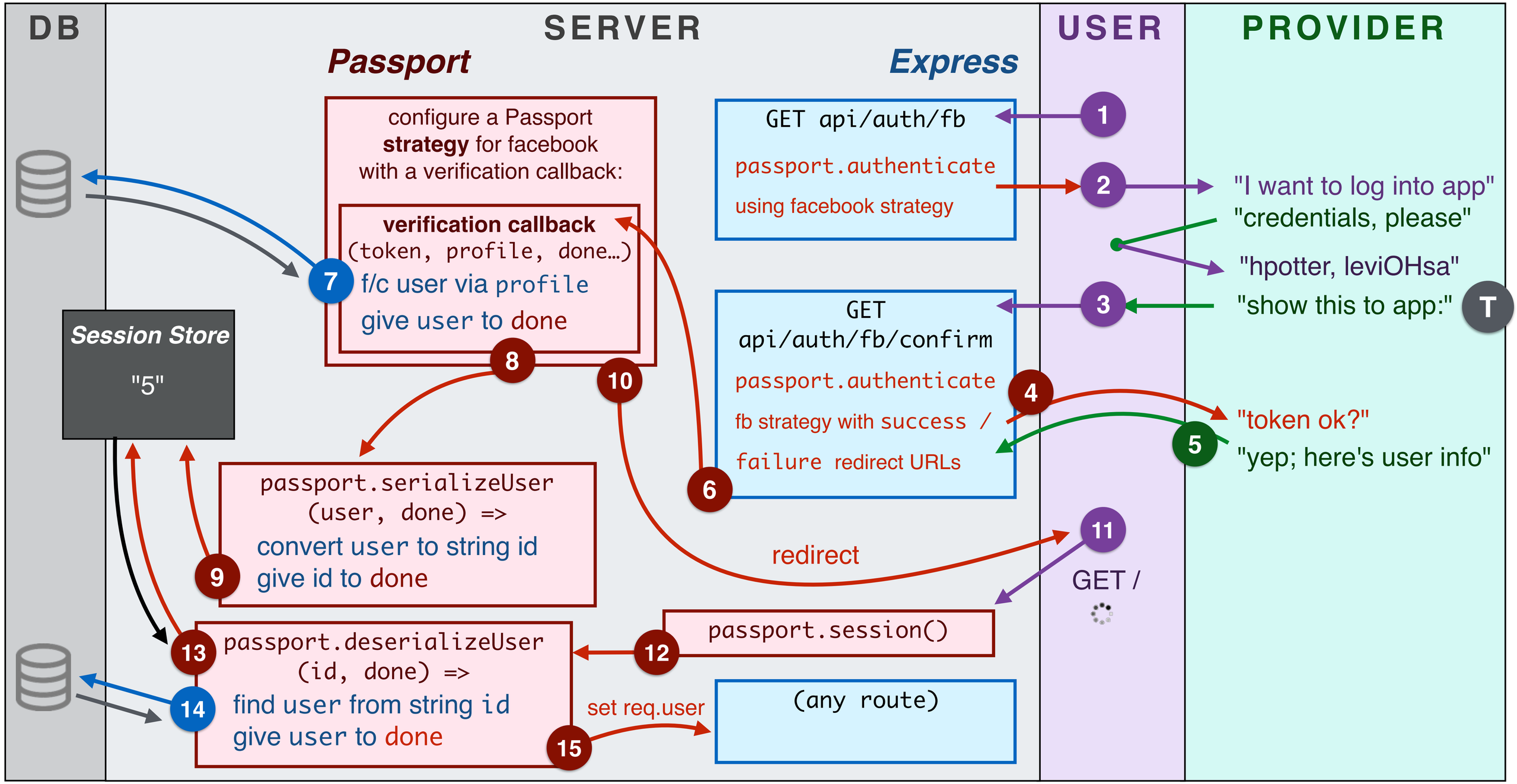
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give user to done
set req.user
(any route)
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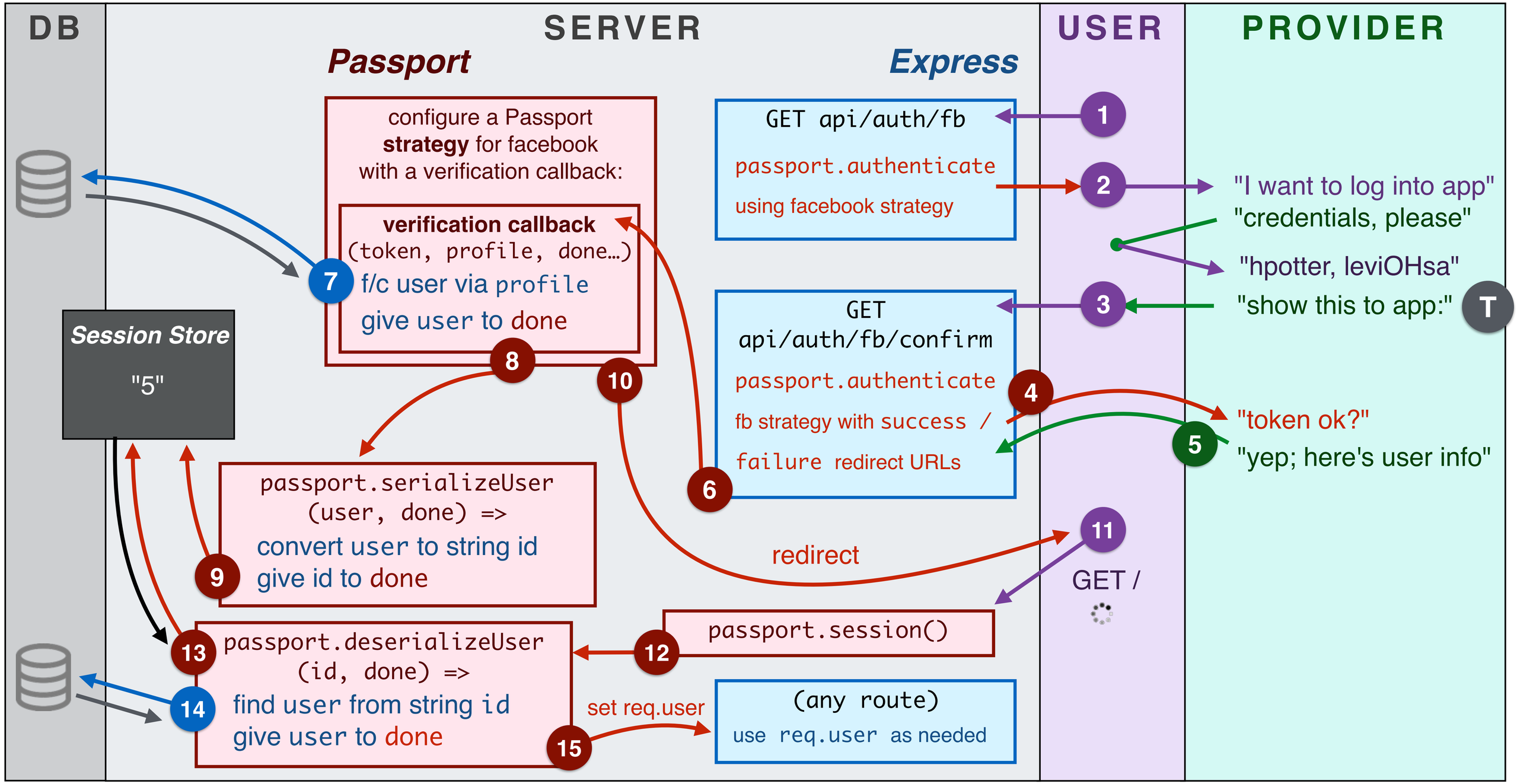
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give user to done
set req.user
(any route)
use req.user as needed
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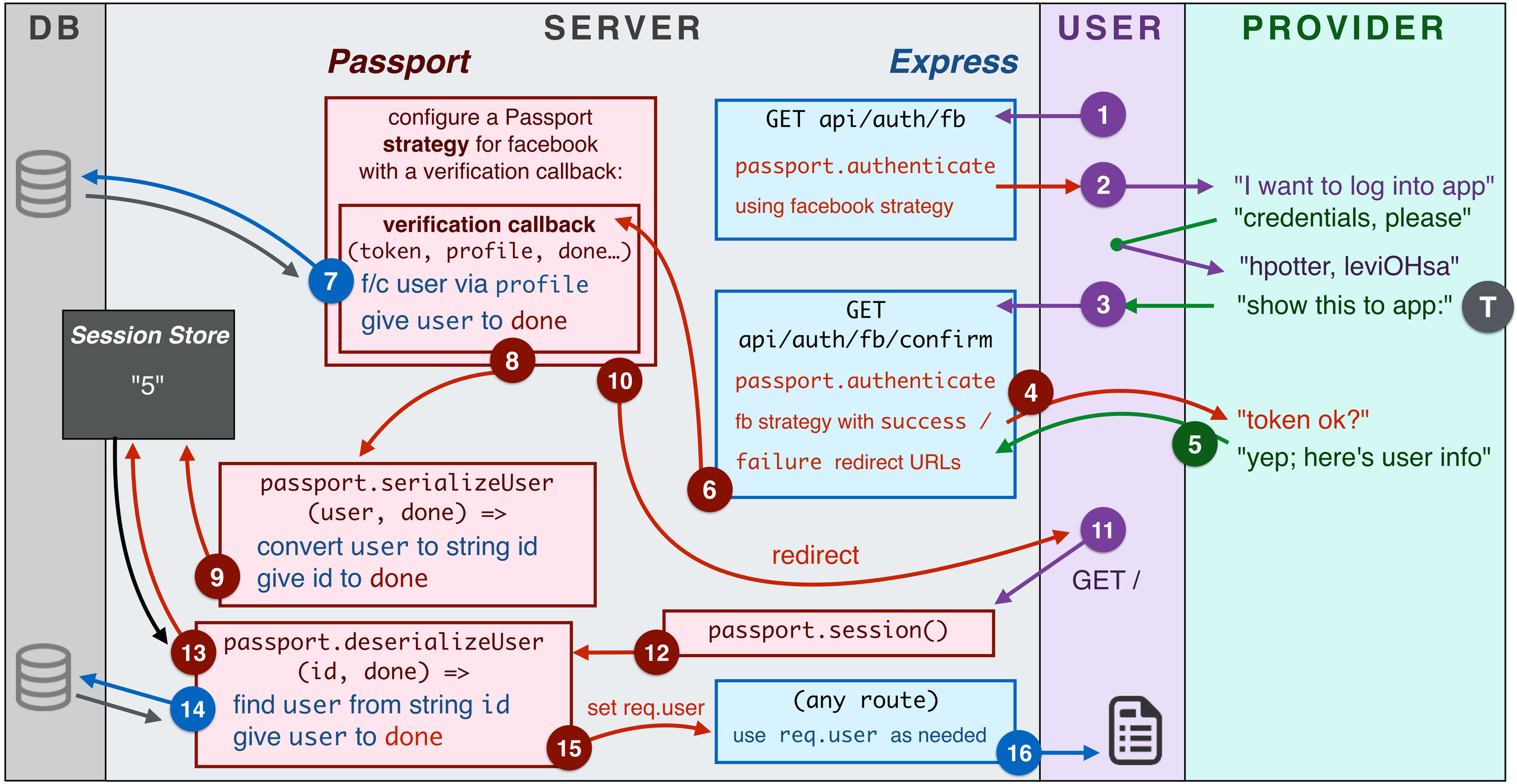
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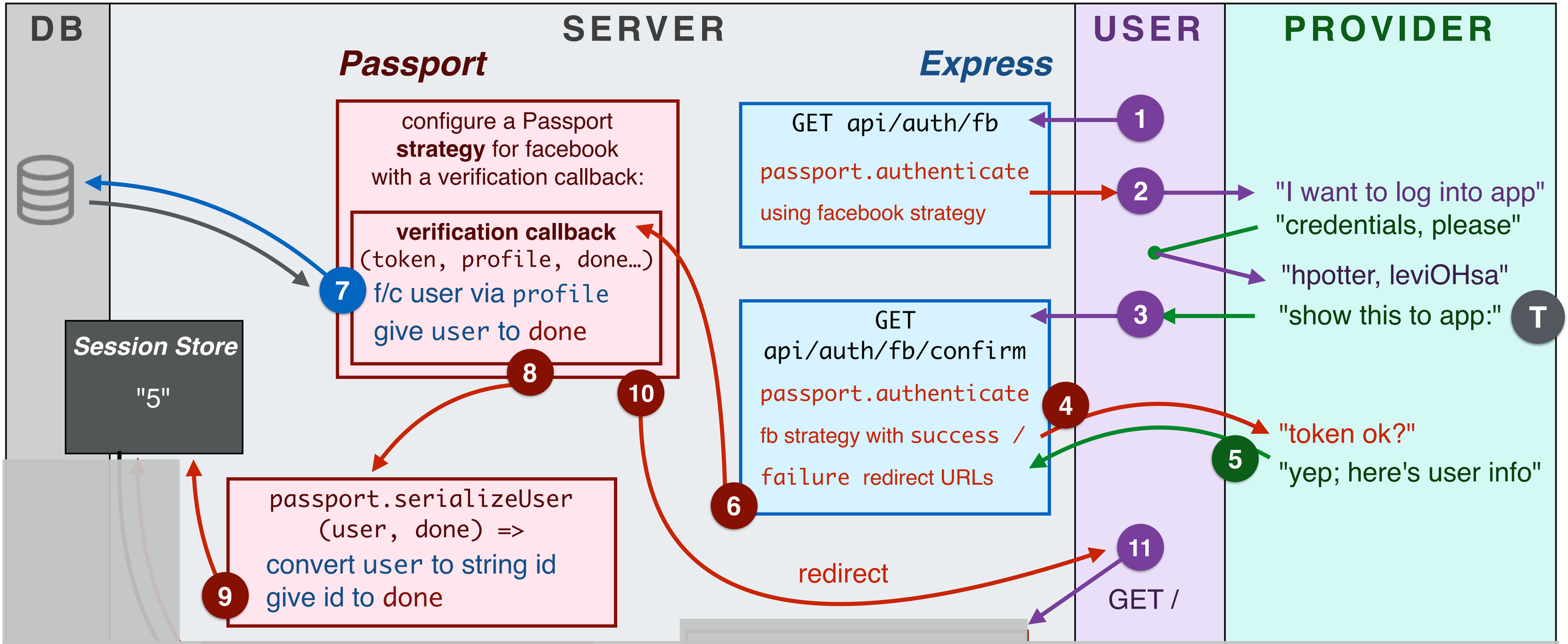
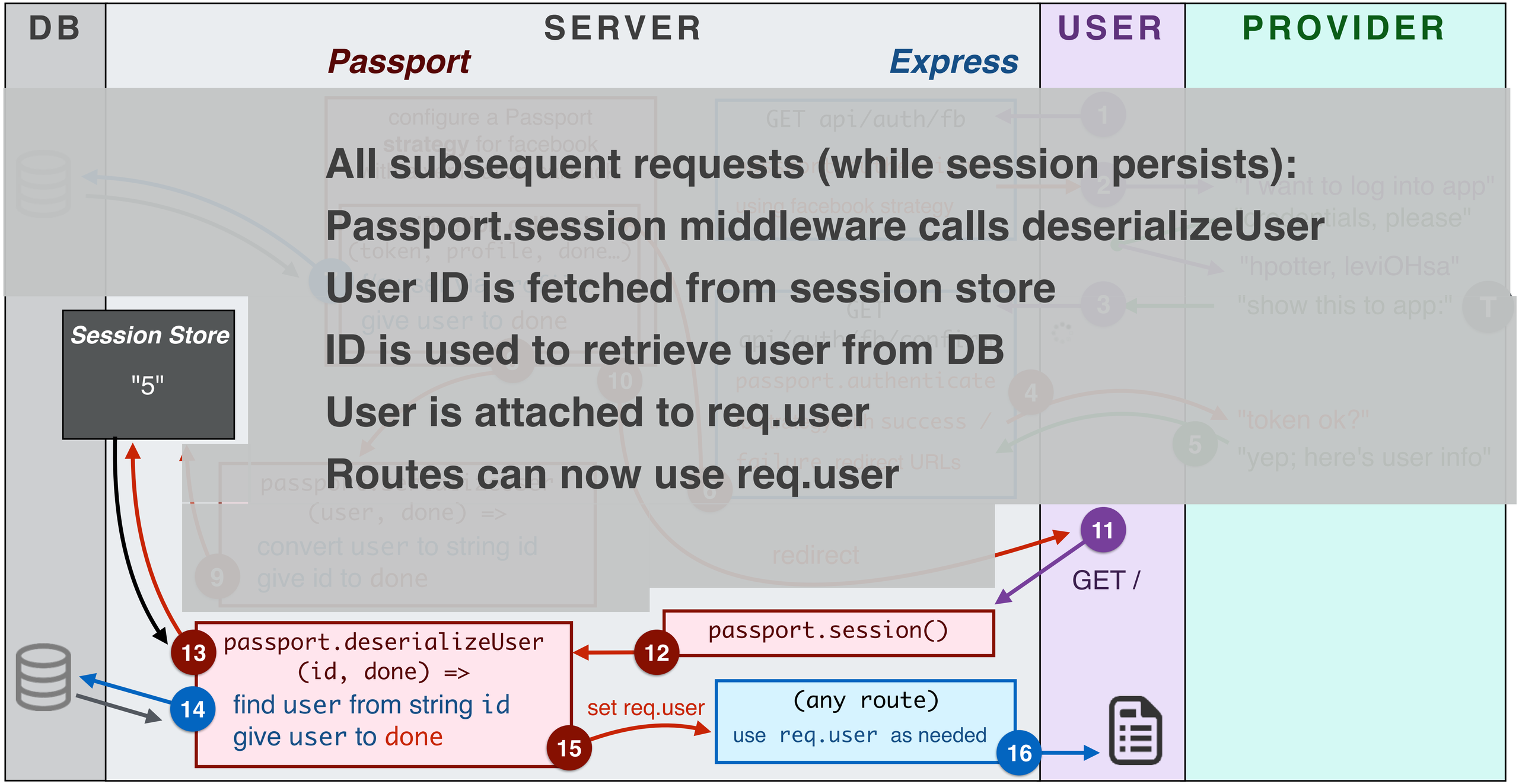


Initial login request: use passport.authenticate in routes. Token / profile will be passed into verification callback. Find / create user in DB based on profile info. Passport stores ID in session for easy future lookup, then tells client to redirect to the "success" URL.



All subsequent requests (while session persists):

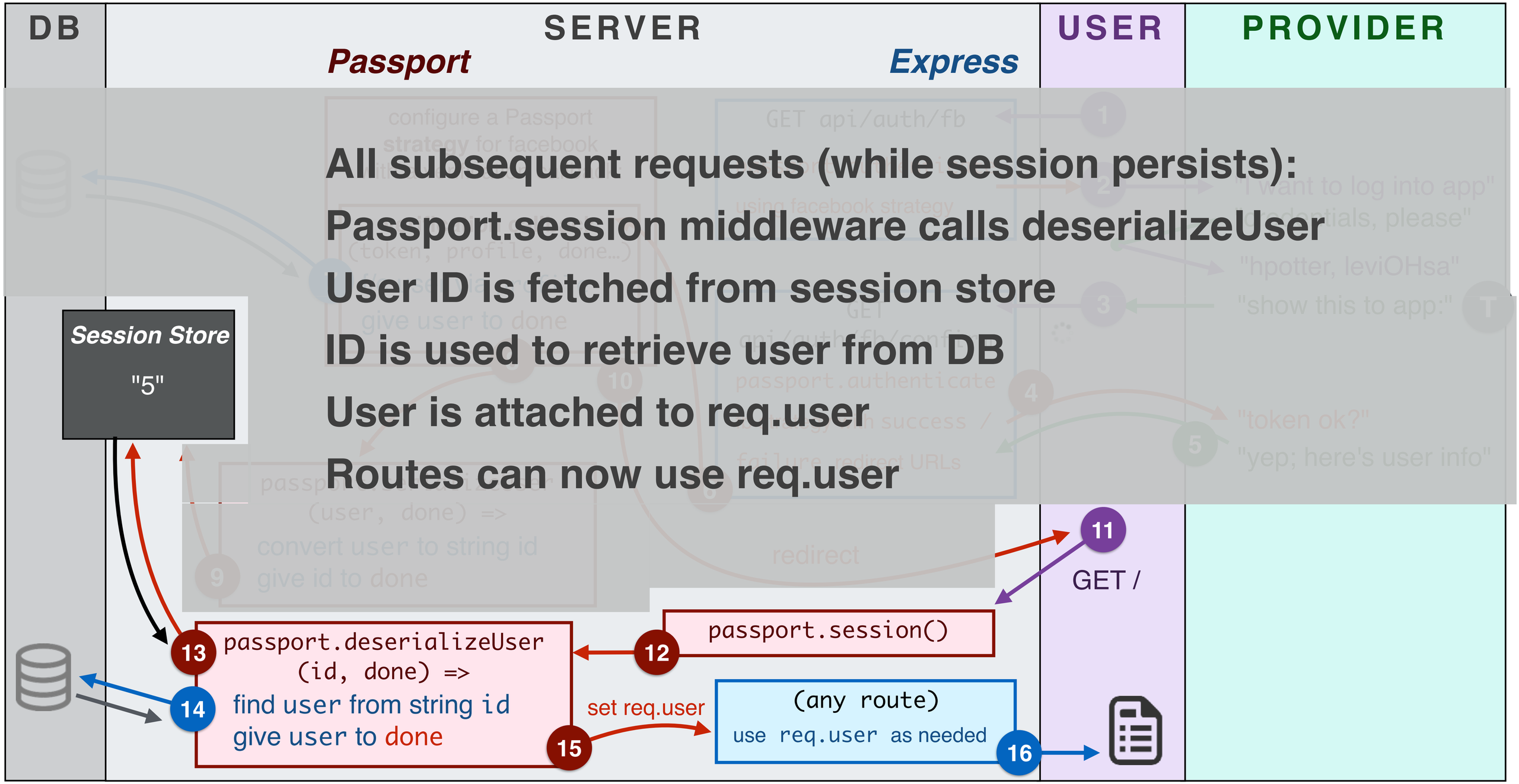
Passport.session middleware calls deserializeUser

User ID is fetched from session store

ID is used to retrieve user from DB

User is attached to req.user

Routes can now use req.user



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AUTHER™