Networking and Error Handling

Lecture 8

CIS 1951

Last time, in CIS 1951…

Sensors

- Delegate Pattern
- Observer Pattern
- Core Motion
- Core Location
- **Questions? Comments? Feedback?**

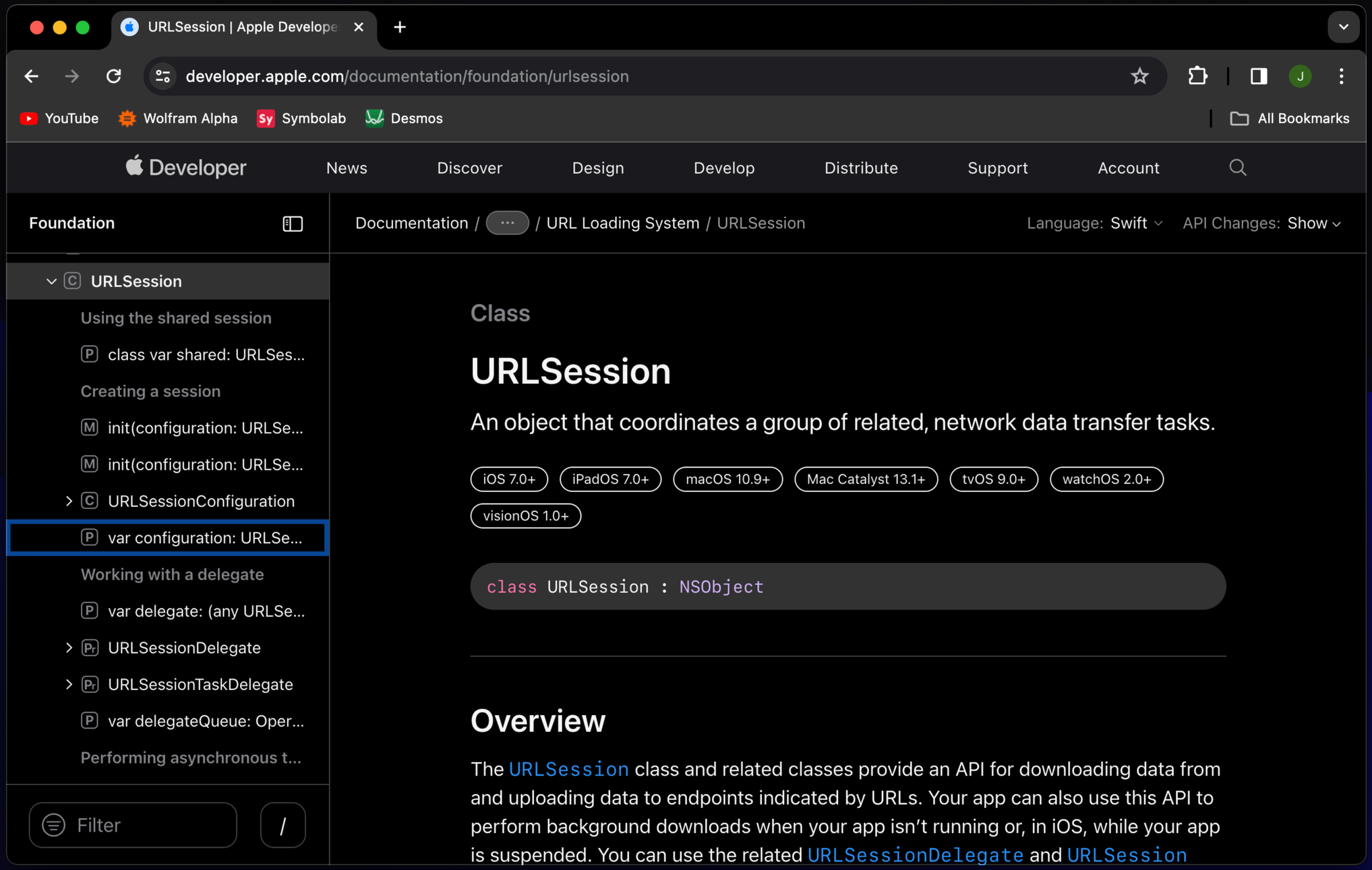
CIS 1951 as a whole

Lectures 1-6: The Basics

Lectures 7-10: Technologies

Lectures 11-13: Beyond Development

HTTP Requests


URLSession | Apple Developer
developer.apple.com/documentation/foundation/urlsession
YouTube
Wolfram Alpha
Symbolab
Desmos
All Bookmarks
Developer
News
Discover
Design
Develop
Distribute
Support
Account
Foundation
Documentation / ··· / URL Loading System / URLSession
Language: Swift
API Changes: Show
URLSession
Using the shared session
class var shared: URLSes...
Creating a session
init(configuration: URLSe...
init(configuration: URLSe...
URLSessionConfiguration
var configuration: URLSe...
Working with a delegate
var delegate: (any URLSe...
URLSessionDelegate
URLSessionTaskDelegate
var delegateQueue: Oper...
Performing asynchronous t...
Filter
/
Class
URLSession
An object that coordinates a group of related, network data transfer tasks.
iOS 7.0+
iPadOS 7.0+
macOS 10.9+
Mac Catalyst 13.1+
tvOS 9.0+
watchOS 2.0+
visionOS 1.0+
class URLSession : NSObject
Overview
The URLSession class and related classes provide an API for downloading data from and uploading data to endpoints indicated by URLs. Your app can also use this API to perform background downloads when your app isn't running or, in iOS, while your app is suspended. You can use the related URLSessionDelegate and URLSession

1 Make a URLRequest

```
func makeNetworkRequest() {
    let url = URL(string: "https://demo.com")!
    var request = URLRequest(url: url)
    // ...
}
```

2 Use URLSession.shared to make request

```
func makeNetworkRequest() async throws {
    let url = URL(string: "https://demo.com")!
    var request = URLRequest(url: url)

    let (data, response) = try await URLSession.shared.data(for: request)
    // ...
}
```

3 Handle errors

```
func makeNetworkRequest() async throws {
    let url = URL(string: "https://demo.com")!
    var request = URLRequest(url: url)

    let (data, response) = try await URLSession.shared.data(for: request)

    guard let httpResponse = response as? HTTPURLResponse,
        httpResponse.statusCode >= 200, httpResponse.statusCode <= 299 else {
        throw NetworkError.networkError
    }
    // ...
}
```

3 Do something with the response data!

```
func makeNetworkRequest() async throws {
    let url = URL(string: "https://demo.com")!
    var request = URLRequest(url: url)

    let (data, response) = try await URLSession.shared.data(for: request)

    guard let httpResponse = response as? HTTPURLResponse,
        httpResponse.statusCode >= 200, httpResponse.statusCode <= 299 else {
        throw NetworkError.networkError
    }

    print(data)
}
```


let url = URL(string:
"https://demo.com")!
var request =
URLRequest(url: url)
// ...
let url = URL(string:
“https://demo.com”)!
var request = URLRequest(url: url)
let (data, response) =
try await
URLSession.shared.data(for:
request)
// ...
print(data)
21 bytes
print(data)
21 bytes

Returned data has type Data!

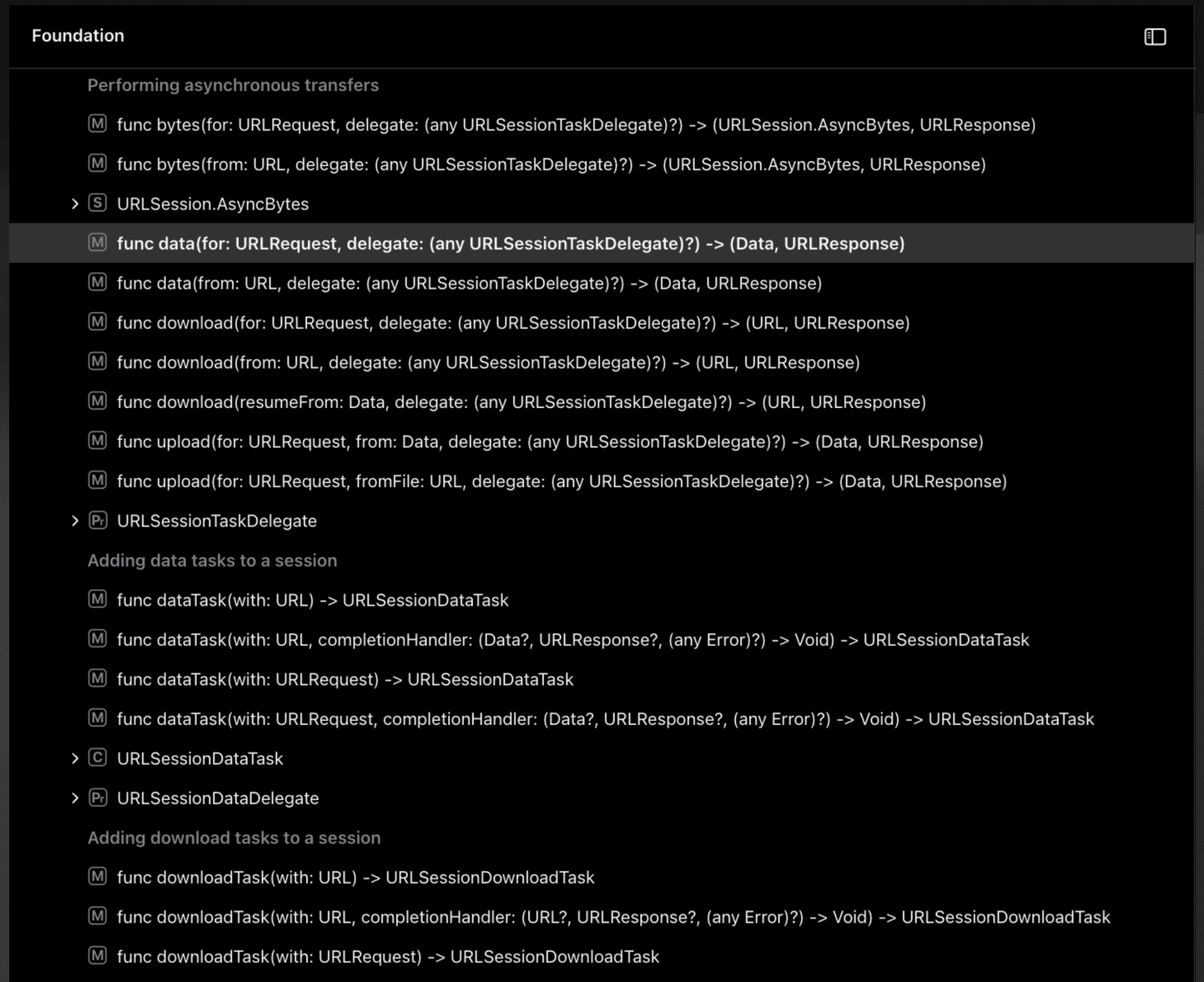
- This is NOT a string
- Basically just a list of bytes

To see string **representation**:

```
String(data: data, encoding: .utf8)
```

There are a LOT of ways to use URLSession

…that we won’t have time to cover



Session Management

URLSession.shared keeps track of cookies and other session related information

Use as needed & check out documentation!

Error Handling

try, try!, and try?

```
let (data, response) = try await URLSession.shared.data(for: request)
```

Error thrown is propagated

```
let (data, response) = try! await URLSession.shared.data(for: request)
```

Will crash if error is thrown

```
let (data, response) = try? await URLSession.shared.data(for: request)
```

Will return optional of result, nil if error is thrown

Do-Catch

```
do {
    let (data, response) = try await URLSession.shared.data(for: request)
} catch let error {
    print(error)
}
```

Do-Catch

```
do {
    let (data, response) = try await URLSession.shared.data(for: request)
} catch let error {
    print(error)
}
```

What does this do?

```
if let (data, response) = try? await URLSession.shared.data(for: request) {
    // ...
}
```

Doing **Useful** things with Data:

Encodable & Decodable

Detour: JSON


```
{
    "orders": [
        {
            "orderno": "748745375",
            "date": "June 30, 2088 1:54:23 AM",
            "trackingno": "TN0039291",
            "custid": "11045",
            "customers": [
                {
                    "custid": "11045",
                    "fname": "Sue",
                    "lname": "Hatfield",
                    "address": "1409 Silver Street",
                    "city": "Ashland",
                    "state": "NE",
                    "zip": "68003"
                }
            ]
        }
    ]
}
```

Receiving Data in requests

1 Make struct matching expected JSON response

```
struct Post: Identifiable, Hashable, Decodable {
    let id: UUID
    let author: String
    let content: String
    let createdAt: Date
}
```

2 Use JSONDecoder to decode data

```
let decoder = JSONDecoder()
let post = try decoder.decode(Post.self, from: data)
```

or

```
var decoder = JSONDecoder()
decoder.dateDecodingStrategy = .iso8601
decoder.keyDecodingStrategy = .convertFromSnakeCase
let post = try decoder.decode(Post.self, from: data)
```

Thats it!

Thats it!

But what if we want specialized decoding instructions…???

Specialized Decoding

```
struct Post: Identifiable, Hashable, Decodable {
    let id: UUID
    let author: String
    let content: String?
    let createdAt: Date

    enum CodingKeys: String, CodingKey {
        case id
        case author = "creator"
        case content
    }

    init(from decoder: Decoder) throws {
        let container = try decoder.container(keyedBy: CodingKeys.self)

        self.id = try container.decode(UUID.self, forKey: .id)
        self.author = try container.decode(String.self, forKey: .author)
        self.content = try container.decodeIfPresent(String.self, forKey: .content)
        self.createdAt = Date()
    }
}
```

Sending Data in requests

1 Make struct conform to Encodable

```
struct Post: Identifiable, Hashable, Encodable {
    let id: UUID
    let author: String
    let content: String
    let createdAt: Date
}
```

2 Use JSONEncoder to encode data

```
let post: Post = ...
let encoder = JSONEncoder()
let encodedData = try encoder.encode(post)
```

or

```
let post: Post = ...
let encoder = JSONEncoder()
encoder.dateEncodingStrategy = .iso8601
encoder.keyEncodingStrategy = .convertToSnakeCase
let encodedData = try encoder.encode(post)
```

What is the type of encodedData?

```
let encodedData = try encoder.encode(post)
```

What is the type of encodedData?

```
let encodedData = try encoder.encode(post)
```

Hint: JSONDecoder decodes from type Data

Sending JSON data in network request

```
var request = URLRequest(url: url)
request.httpMethod = "POST"
request.addValue("application/json", forHTTPHeaderField: "Content-Type")
request.httpBody = try JSONEncoder().encode(post)
```

Codable = Decodable & Encodable

```
struct Post: Identifiable, Hashable, Codable {
    let id: UUID
    let author: String
    let content: String
    let createdAt: Date
}
```

Coding time!

https://github.com/cis1951/lec8-code