📚 Documentation: SOLID Analysis of `LoadResource` Code

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1. 🔍 Code Overview

This code defines a clean, modular architecture for asynchronously loading resources. It separates:

- 🚀 Loading logic (`LoadResourcePresentationAdapter`)
- 🎨 UI state and presentation (`LoadResourcePresenter` or `LoadResourceViewModel`)
- 🔗 Communication between components via the `LoadResourceDelegate` protocol

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2. 🧩 SOLID Principles Breakdown

S — Single Responsibility Principle (SRP)

Rule: A class should have one and only one reason to change.

- `LoadResourcePresentationAdapter` is solely responsible for coordinating loading and preventing concurrent calls.
- `LoadResourcePresenter` and `LoadResourceViewModel` manage the presentation state for the UI.
- The `LoadResourceDelegate` protocol defines the notification contract.

✅ **Benefit:** Clear separation of concerns, easy to maintain and test.

O — Open/Closed Principle (OCP)

Rule: Open for extension, closed for modification.

- The code is designed for easy extension (e.g., different views, mappers, resource types) without altering existing components.
- The injected mapper enables behavior customization.

✅ **Benefit:** Highly extensible design.

L — Liskov Substitution Principle (LSP)

Rule: Subtypes must be replaceable for their base types without breaking the app.

- All implementations of `LoadResourceDelegate` follow the expected contract.
- The system works seamlessly with any conforming View, ViewModel, or Presenter.

✅ **Benefit:** Flexibility and interchangeable components.

I — Interface Segregation Principle (ISP)

Rule: Interfaces should be minimal and client-specific.

- The `LoadResourceDelegate` protocol only defines what's needed for resource loading feedback.

✅ **Benefit:** Clean, targeted protocol with no unnecessary methods.

D — Dependency Inversion Principle (DIP)

Rule: Depend on abstractions, not concrete implementations.

- `LoadResourcePresentationAdapter` depends on abstract `Loader` and `LoadResourceDelegate` types.
- Concrete implementations are injected at runtime.

✅ **Benefit:** Decoupled design and high testability.

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3. 🌟 Design Advantages

- 🧱 **High modularity** – well-separated responsibilities.
- 🎛️ **Flexible** – easily swap UI components or backends.
- 🧪 **Testable** – all components are easily mockable.
- 🧪 **Super easy to test** – since everything is driven by interfaces and has no side effects.
- 🚀 **Safe async coordination** – via Swift `Task`.
- 🔒 **Concurrency protection** – using `isLoading` inside the adapter.
- 💡 **SwiftUI friendly** – thanks to `@Observable` ViewModel.

4. ⚠️ Potential Drawbacks

- 🧠 **Requires good architectural understanding** to extend correctly.
- ⏳ **No built-in cancellation or retry logic** in the adapter.
- 💥 **Only basic protection against concurrent calls** (via a simple flag).

5. 🤔 Who manages `isLoading` ?

Component	Responsibility
`LoadResourcePresentationAdapter`	🔒 Prevents concurrent loading (internal `isLoading` , not UI-bound)
`LoadResourcePresenter` / `ViewModel`	👁️ Controls what's displayed to the user (loading state, errors, etc.)

📌 **Conclusion:**
The adapter doesn't manage what the user sees.
It only **protects the integrity of the loading process**.
The Presenter or ViewModel is in charge of updating the UI state.

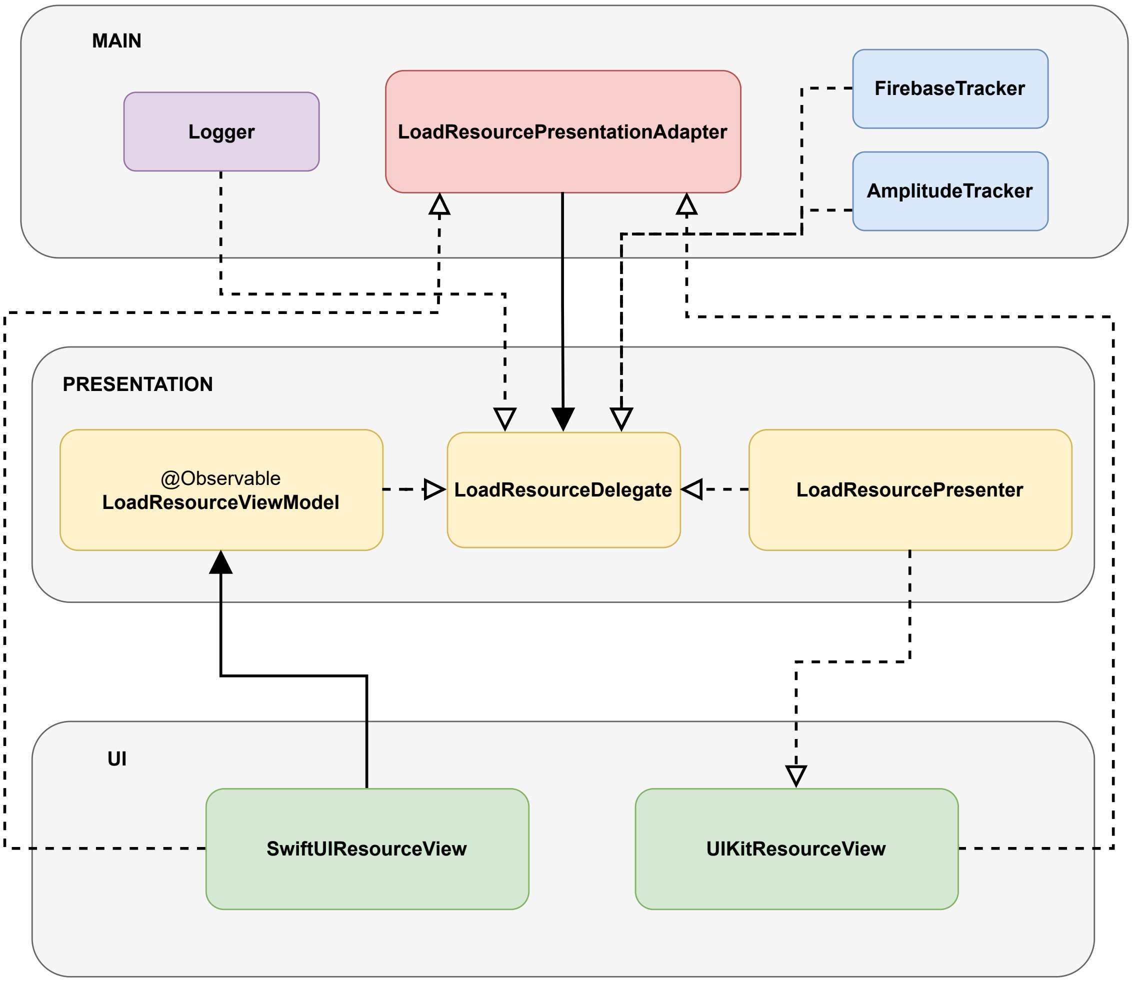
✅ No UI elements or frameworks are coupled to the loading logic, making this pattern perfectly portable across platforms like iOS, macOS, watchOS, or even server-side Swift.

💡 This decoupling enables you to swap or reuse presentation logic without rewriting the business or networking layer. Great for shared architecture in multi-platform apps!

6. 📊 SOLID Summary Table

SOLID Principle	Respected	Notes
Single Responsibility	✅	Each class has a clear, focused purpose
Open/Closed	✅	System can be extended with minimal changes
Liskov Substitution	✅	Delegates are fully swappable
Interface Segregation	✅	Protocol is minimal and precise
Dependency Inversion	✅	Core logic depends on abstractions

Diagram:



Project GitHub here

```
public protocol LoadResourceDelegate {
    associatedtype Item

    func didStartLoading()
    func didFinishLoading(with error: Error)
    func didFinishLoading(with item: Item)
}
```

```
public final class LoadResourcePresentationAdapter<L: Loader, Delegate: L
    private let loader: L
    private let delegate: Delegate

    private var isLoading = false

    public init(loader: L, delegate: Delegate) {
        self.loader = loader
        self.delegate = delegate
    }

    public func load() {
        guard !isLoading else { return }

        delegate.didStartLoading()
        isLoading = true

        Task {
            defer { isLoading = false }

            do {
                let item = try await loader.load()
                delegate.didFinishLoading(with: item)
            } catch {
                delegate.didFinishLoading(with: error)
            }
        }
    }
}
```

```
@Observable
final public class LoadResourceViewModel<Resource, PresentationModel>: Lo
    public typealias Item = Resource

    public var isLoading = false
    public var errorMessage: String? = nil
    public var item: PresentationModel? = nil

    public let mapper: (Resource) throws -> PresentationModel

    public init(mapper: @escaping (Resource) throws -> PresentationModel
        self.mapper = mapper
    }

    public func didStartLoading() {
        isLoading = true
        errorMessage = nil
    }

    public func didFinishLoading(with resource: Resource) {
        do {
            item = try mapper(resource)
            isLoading = false
        } catch {
            didFinishLoading(with: error)
        }
    }

    public func didFinishLoading(with error: Error) {
        isLoading = false
        errorMessage = SharedStringsHelper.loadError
    }
}
```

```swift
public protocol ResourceView {
    associatedtype ResourcePresentationModel

    func display(errorMessage: String?)
    func display(isLoading: Bool)
    func display(presentationModel: ResourcePresentationModel)
}

public final class LoadResourcePresenter<Resource, View: ResourceView>:
    public typealias Item = Resource

    private let view: View
    private let mapper: (Resource) throws -> View.ResourcePresentationMo

    public init(view: View, mapper: @escaping (Resource) throws -> View.
        self.view = view
        self.mapper = mapper
    }

    public func didStartLoading() {
        view.display(errorMessage: nil)
        view.display(isLoading: true)
    }

    public func didFinishLoading(with resource: Resource) {
        do {
            view.display(presentationModel: try mapper(resource))
            view.display(isLoading: false)
        } catch {
            didFinishLoading(with: error)
        }
    }

    public func didFinishLoading(with error: Error) {
        view.display(errorMessage: SharedStringsHelper.loadError)
        view.display(isLoading: false)
    }
}
```