

**FREE SAMPLE**

# **Integrating SwiftUI into UIKit Apps**

**Natalia Panferova**

**2024**

# Introduction

Thank you for downloading a free sample of “Integrating SwiftUI into UIKit Apps”. The sample includes the second subchapter of Chapter 2 - SwiftUI in a separate view controller, and shows how to set up Hosting Controller in storyboards to present a SwiftUI view within a UIKit app. To learn more about the book and to get the complete copy with 7 chapters (each with multiple subchapters), a PDF, an EPUB and 7 full projects with code illustrating various ways to use SwiftUI in existing UIKit projects, you can visit our website: [books.nilcoalescing.com/integrating-swiftui](https://books.nilcoalescing.com/integrating-swiftui).

To get the most out of the subchapter provided in the free sample, you can follow along with the code examples where we will be adding filtering functionality to a UIKit app called Puppy Training. In the sample bundle you can find the PuppyTraining-starter project that contains the initial setup and the PuppyTraining-final project with the integrated SwiftUI part. In case you don't have the complete free sample bundle yet, you can get it from the subchapter page: [books.nilcoalescing.com/integrating-swiftui/swiftui-in-a-view-controller/hosting-controller-in-storyboards](https://books.nilcoalescing.com/integrating-swiftui/swiftui-in-a-view-controller/hosting-controller-in-storyboards). The projects have been updated for Xcode 16 and are set to target iOS 17 by default.

The subchapter provided in the free sample already assumes that you have a good understanding of SwiftUI fundamentals. The complete book includes an entire chapter just covering the essentials of the SwiftUI framework that would bring you up to speed in case you haven't worked with SwiftUI before or need a refresher.

The content of the free sample and the code in the projects is copyright Nil Coalescing Limited. The free sample is licensed under the Creative Commons Attribution 4.0 International: [creativecommons.org/licenses/by/4.0](https://creativecommons.org/licenses/by/4.0). You can use and share the material in the free sample, but you are required to give an attribution. The app icons for the projects in the sample were made using an SVG taken from [iconmonstr.com](https://iconmonstr.com).

If you have any questions about the “Integrating SwiftUI into UIKit Apps” book, feel free to reach out to [support@nilcoalescing.com](mailto:support@nilcoalescing.com).

# SwiftUI in a separate view controller

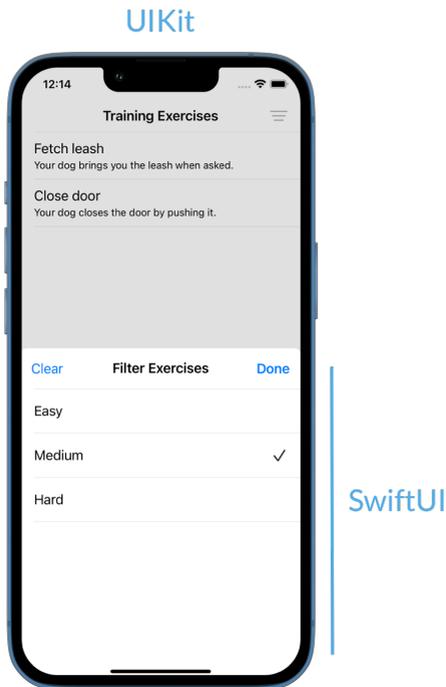
## Presenting UIHostingController programmatically

*This subchapter is not included in the free sample.*

## Setting up Hosting Controller in storyboards

When working with storyboards in UIKit, we can use a Hosting Controller from the object library to present a SwiftUI view hierarchy. The controller created in the storyboard can be prepared for presentation inside the storyboard segue action.

We will add a filter view built in SwiftUI to our sample Puppy Training app where users can filter the exercises based on the difficulty level. The filter will be presented in a bottom sheet using a storyboard segue.



*Screenshot of the sample puppy training app showing the main collection view built in UIKit and a filter view built in SwiftUI and presented in a bottom sheet*

## Prepare the filter state data model

We'll start by defining the data model for the filter in a separate file called `ExerciseFilterState.swift`. The view controller in UIKit will own the data model and pass it to the SwiftUI filter view to modify the selection. So that the change in selection can be reflected in both the filter list and the collection view, the object encapsulating it has to be marked with `@Observable` macro from the Observation framework.

```
import Observation

@Observable
class ExerciseFilterState {
    var selection: Exercise.Difficulty?
}
```

The `ExercisesViewController` defined inside the `ExercisesViewController.swift` file will store an instance of the `ExerciseFilterState` and later pass it to the SwiftUI view. We are going to assign the object to a private property on the view controller.

```
class ExercisesViewController: UIViewController,
    UICollectionViewDelegate {

    private let filterState = ExerciseFilterState()

    ...
}
```

To make sure that the `List` view in the filter sheet can iterate over the difficulty levels, we'll make the `Exercise.Difficulty` enum conform to `CaseIterable`. The exercise model can be found in the `Exercise.swift` file in the `Data` folder.

```

struct Exercise: Hashable {
    enum Difficulty: CaseIterable {
        case easy
        case medium
        case hard

        var description: String {
            switch self {
            case .easy: return "easy"
            case .medium: return "medium"
            case .hard: return "hard"
            }
        }
    }
}
...
}

```

## Build the filter view in SwiftUI

Next, we'll build the SwiftUI view we want to present. We are going to define the list of the exercise difficulty levels in a separate component and then embed it into a container with the navigation bar title and controls.

We'll create a new file called `DifficultyFilterList.swift` using the SwiftUI View template. The view will receive a binding to an optional `Exercise.Difficulty` to mark the selection. Each difficulty level will be presented in a `List` row. The currently selected level for the filter will be marked with a checkmark symbol image.

The user will be able to select the difficulty in the filter by tapping on a row. To make sure that the tap gesture is activated when the user taps anywhere in the row and not just on the text or the image, we'll apply the `contentShape(.interaction, Rectangle())` modifier.

```

struct DifficultyFilterList: View {
    @Binding var selection: Exercise.Difficulty?

    var body: some View {
        List(Exercise.Difficulty.allCases, id: \.self) { level in
            HStack {
                Text(level.description.capitalized)
                Spacer()

                if selection == level {
                    Image(systemName: "checkmark")
                }
            }
            .padding(.vertical, 8)
            .contentShape(.interaction, Rectangle())
            .onTapGesture {
                selection = level
            }
            .accessibilityElement(children: .combine)
            .accessibilityAddTraits(.isButton)
        }
        .listStyle(.plain)
    }
}

```

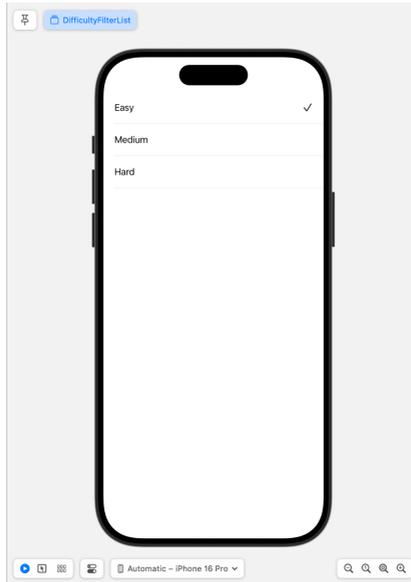
To be able to preview the `DifficultyFilterList` view in the canvas, we have to slightly modify the preview. The `DifficultyFilterList` has to accept a binding to a difficulty level, so we will create a `@Previewable @State` selection variable inside the preview and pass it to `DifficultyFilterList` to modify. This way we can interact with our preview and test how selection behaves.

```

#Preview {
    @Previewable @State var selection: Exercise.Difficulty? = .easy

    DifficultyFilterList(
        selection: $selection
    )
}

```



*Screenshot of Xcode preview showing the `DifficultyFilterList` view*

Now we can define the filter view itself. We'll create another file called `ExerciseFilterView.swift` also with the SwiftUI View template. The `ExerciseFilterView` will receive the `ExerciseFilterState` object from UIKit, so we'll add a `filterState` property to the view struct. The property has to be marked with the `@Bindable` wrapper, because we need to get a binding to its selection property.

The `DifficultyFilterList` that we created earlier will be wrapped into a `NavigationStack`. Since in this case the navigation bar comes from the SwiftUI layer, we can set it up using SwiftUI APIs. We can add the title using the `navigationTitle()` modifier, set its display mode to `inline` and add some navigation bar buttons. When we add buttons using the `toolbar()` modifier in SwiftUI, they go into the navigation bar by default.

```

struct ExerciseFilterView: View {
    @Bindable var filterState: ExerciseFilterState
    @Environment(\.dismiss) private var dismiss

    var body: some View {
        NavigationStack {
            DifficultyFilterList(selection: $filterState.selection)
                .navigationTitle("Filter Exercises")
                .navigationBarTitleDisplayMode(.inline)
                .toolbar {
                    ToolbarItem(placement: .confirmationAction) {
                        Button("Done") {
                            dismiss()
                        }
                    }

                    ToolbarItem(placement: .cancellationAction) {
                        Button("Clear") {
                            filterState.selection = nil
                            dismiss()
                        }
                    }
                }
        }
    }
}

```

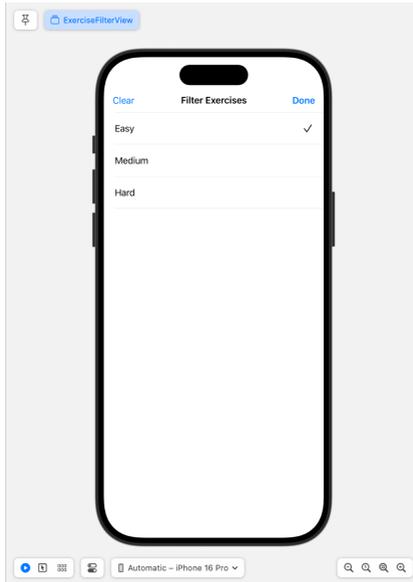
Note that we can dismiss the sheet from within the SwiftUI view using a SwiftUI API too. The `dismiss` action is injected into the environment by the framework and can be used to dismiss modals or pop views from the navigation stack.

To preview `ExerciseFilterView` in the canvas we simply need to pass it an `ExerciseFilterState` object instance.

```

#Preview {
    ExerciseFilterView(
        filterState: ExerciseFilterState()
    )
}

```



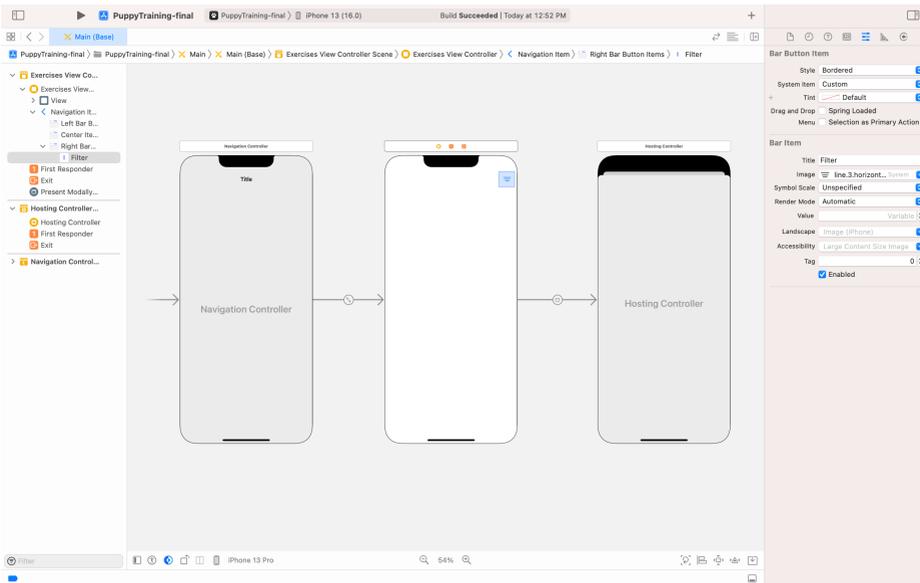
*Screenshot of Xcode preview showing the ExerciseFilterView view*

## **Add a Hosting Controller in the storyboard**

After we defined our SwiftUI view, we need to add a Hosting Controller to present the SwiftUI hierarchy from the UIKit layer of the app. We are going to do that in the `Main.storyboard` file.

First, we'll add a Bar Button Item to the `ExercisesViewController` in the storyboard that will trigger the sheet presentation. We'll call it `Filter` and set the `line.3.horizontal.decrease` symbol as the image.

Then we'll drag a Hosting Controller from the object library to the canvas and add a `Present Modally` segue from the filter button to the Hosting Controller.



*Screenshot of Xcode showing the Main.storyboard file with a Hosting Controller in the canvas*

We still need to set our `ExerciseFilterView` as the root view of the `Hosting Controller` we just added. We can do that in the segue action method. We'll open the `ExercisesViewController.swift` in the assistant editor and control-drag from the segue to an area inside the controller. Using the popup that appears, we'll create a Segue Action and call it `showFilter`. Inside this action we can prepare the `Hosting Controller` for presentation.

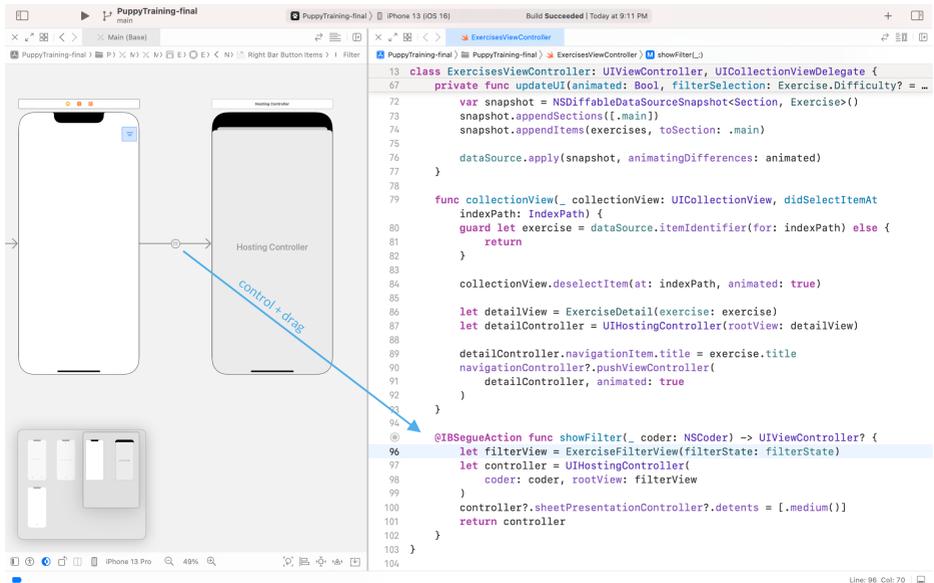
We will create an instance of the `ExerciseFilterView` and pass it the `filterState` stored in the view controller. Then we will initialize a `UIHostingController` with the coder passed to the action and the `SwiftUI` view. Once the controller is created, we can customize it the way we would a regular `UIViewController`. Here we are going to set a medium detent on its `sheetPresentationController` property so that the filter sheet only covers half of the screen.

```

class ExercisesViewController: UIViewController,
    UICollectionViewDelegate {
    ...

    @IBSegueAction func showFilter(
        _ coder: NSCoder
    ) -> UIViewController? {
        let filterView = ExerciseFilterView(
            filterState: filterState
        )
        let controller = UIHostingController(
            coder: coder, rootView: filterView
        )
        controller?.sheetPresentationController?.detents = [
            .medium()
        ]
        return controller
    }
}

```



*Screenshot of Xcode with the storyboard and the ExercisesViewController open in assistant editor*

If we run the app now and press the filter button the sheet will appear as expected. The SwiftUI side already works correctly and tapping on a difficulty level will add a checkmark to the row. But the UIKit part is not set up to react to the changes in the filter state yet.

## Update UIKit layer from SwiftUI

The last thing left to do for the filter to function is to update the collection view to reflect the selection. We need to change the `updateUI()` method defined in the `ExercisesViewController` to read the `selection` property from the filter state. It will use the selection value to filter the exercises provided by the `ExercisesController` and update the data source with a new snapshot. We will also wrap the access of the `selection` property into `withObservationTracking()`. This will ensure that we get a callback every time the value changes. We can trigger our UI update inside the callback.

```
class ExercisesViewController: UIViewController,
    UICollectionViewDelegate {
    ...

    private func updateUI(animated: Bool) {
        let filterSelection = withObservationTracking {
            filterState.selection
        } onChange: { [weak self] in
            DispatchQueue.main.async { [weak self] in
                self?.updateUI(animated: true)
            }
        }

        let exercises = exercisesController.exercises
            .filter { exercise in
                filterSelection
                    .map { $0 == exercise.difficulty } ?? true
            }

        var snapshot = NSDiffableDataSourceSnapshot<
            Section, Exercise
        >()

        snapshot.appendSections([.main])
        snapshot.appendItems(exercises, toSection: .main)

        dataSource.apply(snapshot, animatingDifferences: animated)
    }
}
```

Note that the `onChange` callback in `withObservationTracking()` is only called once for the next change, so each time we update our UI we use this function to read the current value and re-register for the next update.

Now the UIKit controller and the SwiftUI filter view are fully connected and

the changes in the filter are properly reflected in the collection view.

Any properties of the observable object that are read within the first closure of `withObservationTracking()` are tracked. If you need to read multiple properties within your application, I would recommend to pack them into a tuple, so that you can get a single callback if any of them are updated.

## Further reading links

---

- Observable macro - <https://developer.apple.com/documentation/observation/observable%28%29>
- Bindable property wrapper - <https://developer.apple.com/documentation/swiftui/bindable>
- Previewable macro - <https://developer.apple.com/documentation/SwiftUI/Previewable%28%29>
- DismissAction - <https://developer.apple.com/documentation/SwiftUI/DismissAction>
- `withObservationTracking()` - [https://developer.apple.com/documentation/observation/withobservationtracking%28\\_%3Aonchange%3A%29](https://developer.apple.com/documentation/observation/withobservationtracking%28_%3Aonchange%3A%29)

## Subclassing UIHostingController

*This subchapter is not included in the free sample.*