### **Research on UWB Implementation & Techniques**

Ultra-Wideband (UWB) technology is used for high-precision distance measurement and location tracking. It is widely used in indoor positioning, proximity sensing, and secure ranging applications.This research focuses on UWB implementation using Apple’s Nearby Interaction API, Qorvo UWB modules, and the DWM3001CDK development kit. It also explores how UWB can be integrated into a Flutter application using native iOS code.

### **Apple’s UWB API (Nearby Interaction Framework)**

#### Apple’s Nearby Interaction (NI) API enables precise distance measurement between UWB-enabled Apple devices. The API is supported on iPhones with U1 chips (iPhone 11 and later), allowing real-time proximity detection and spatial awareness.

#### **Implementation Steps**:

## Enable Nearby Interaction framework in Xcode and configure entitlements.

## Create an NISession in Swift to establish UWB communication.

## Exchange session tokens between devices.

## Retrieve and process UWB distance and angle data.

## Use Flutter’s MethodChannel to pass UWB data to the Flutter UI.

### **Qorvo UWB & DWM3001CDK Integration**

## To extend UWB beyond Apple’s ecosystem, developers can use Qorvo’s DWM3001CDK. It supports IEEE 802.15.4z UWB standard and can interact with Apple’s UWB-enabled devices.

#### **Integration Steps:**

## Set up DWM3001CDK with Qorvo’s SDK.

## Use BLE for discovery and switch to UWB for precise tracking.

## Process ranging data (ToF, AoA) and send it to an iOS device.

## Communicate with Flutter using a Swift bridge.

### **Flutter + Native iOS UWB Implementation**

## Since Flutter does not natively support UWB, it must interact with Apple’s UWB API using Swift and MethodChannel.

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#### **Steps for Flutter Integration:**

## Create a MethodChannel in Flutter (dart) to communicate with Swift.

## Implement Nearby Interaction API in Swift (NISession for UWB tracking).

## Pass UWB data from Swift to Flutter UI.

## Update the Flutter UI dynamically based on UWB position data.

## **References**

* [https://developer.apple.com/documentation/nearbyinteraction.](https://developer.apple.com/documentation/nearbyinteraction)
* <https://www.manualslib.com/manual/3565736/Qorvo-Dwm3001cdk.html#manual>
* https://github.com/Uberi/DWM3001C-starter-firmware/blob/main/Src/main.c