

# AN13375

## Coexistence Overview for AW611/IW611

Rev. 2.0 — 21 April 2025

Application note

### Document information

Information	Content
Keywords	AW611/IW611, Wi-Fi radio, Bluetooth radio, coexistence, real time arbitration, interference avoidance, traffic priority, rules, central hardware Packet Traffic Arbiter (PTA), local hardware arbiter, coexistence software, request/grant
Abstract	Provides an overview of coexistence between Wi-Fi and Bluetooth radios in combo wireless devices.



## 1 Scope

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This document provides an overview of coexistence between Wi-Fi and Bluetooth radios in AW611/IW611. NXP's coexistence solution provides real time arbitration between on-chip radios on a per-packet basis.

## 2 Coexistence architecture overview

The coexistence architecture has three major components:

- Central hardware Packet Traffic Arbiter (PTA): arbitrates between on-chip Wi-Fi and Bluetooth radios. Controls the front end components such as RF switches.
- Local hardware arbiter: arbitrates the packets between Bluetooth and Bluetooth Low Energy (LE).
- Coexistence software: configures PTA and works with Wi-Fi and Bluetooth firmware.

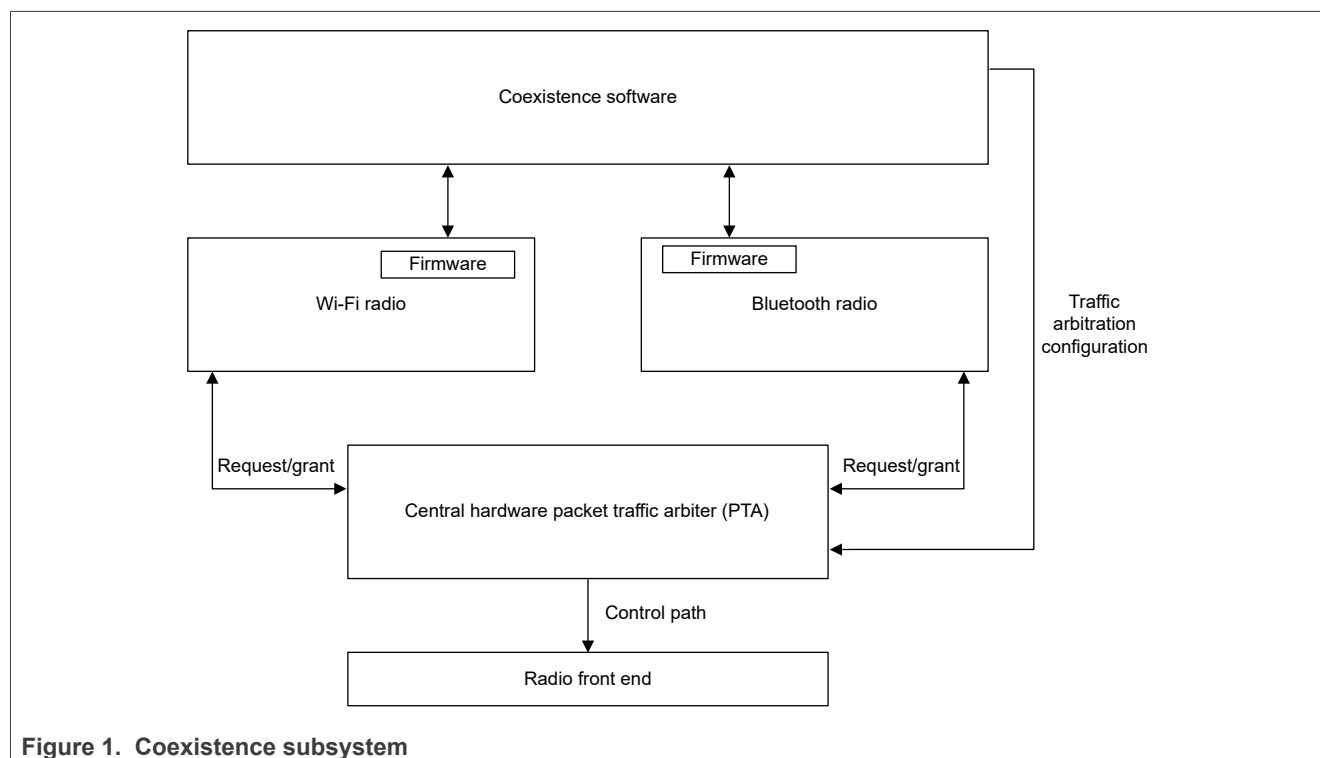


Figure 1. Coexistence subsystem

### 3 Coexistence mechanism

NXP's coexistence mechanism is a combination of interference avoidance and arbitration between Wi-Fi and Bluetooth/Bluetooth LE radios.

Interference avoidance is the coordination between the Wi-Fi and Bluetooth/Bluetooth LE radios in order to avoid over-lapping frequency usage. The coordination helps Bluetooth to adapt the AFH map and avoid hopping into the Wi-Fi channel, reducing the interference to each other.

In addition to interference avoidance, the central hardware PTA provides real-time arbitration between the Wi-Fi and Bluetooth/Bluetooth LE radios on a per-packet basis. This arbitration can be statically enabled/disabled. The individual radios post a request to the central hardware PTA to access the radio front end. The hardware PTA grants access to the individual radios based on the configured priorities and on the grant rules.

#### 3.1 Traffic priority

Wi-Fi traffic priority is assigned based on the frame type and subtype of the Wi-Fi packets. On AW611/IW611, the priority assignment based on traffic category is also implemented.

Bluetooth/Bluetooth LE traffic priority is assigned based on the chosen profiles or operations.

The firmware statically configures the priorities for the Wi-Fi, Bluetooth/Bluetooth LE traffic. The firmware also sets the arbitration rules in the central hardware PTA and local hardware arbiter.<sup>1</sup>

#### 3.2 Arbitration request to the central hardware PTA

The Wi-Fi subsystem asserts a request with traffic priority and traffic direction to the central hardware PTA arbiter in the following situations:

- An incoming 802.11 packet is detected
- Any 802.11 packet transmission
- A fixed latency packet is expected (ACK/block ACK)

The Bluetooth subsystem asserts a request to the central hardware PTA in order to transmit or receive. The request is accompanied with priority, traffic direction, and frequency information.

<sup>1</sup> Any change to the current settings requires a firmware update.

### 3.3 Central hardware PTA grant rules

The central hardware PTA grants access based on the relative priority of the incoming requests when traffic collisions occur. This situation is illustrated in the following example.

#### Example of traffic interference

**Context:** A2DP streaming on Bluetooth radio and web browsing/email/file download on Wi-Fi radio.

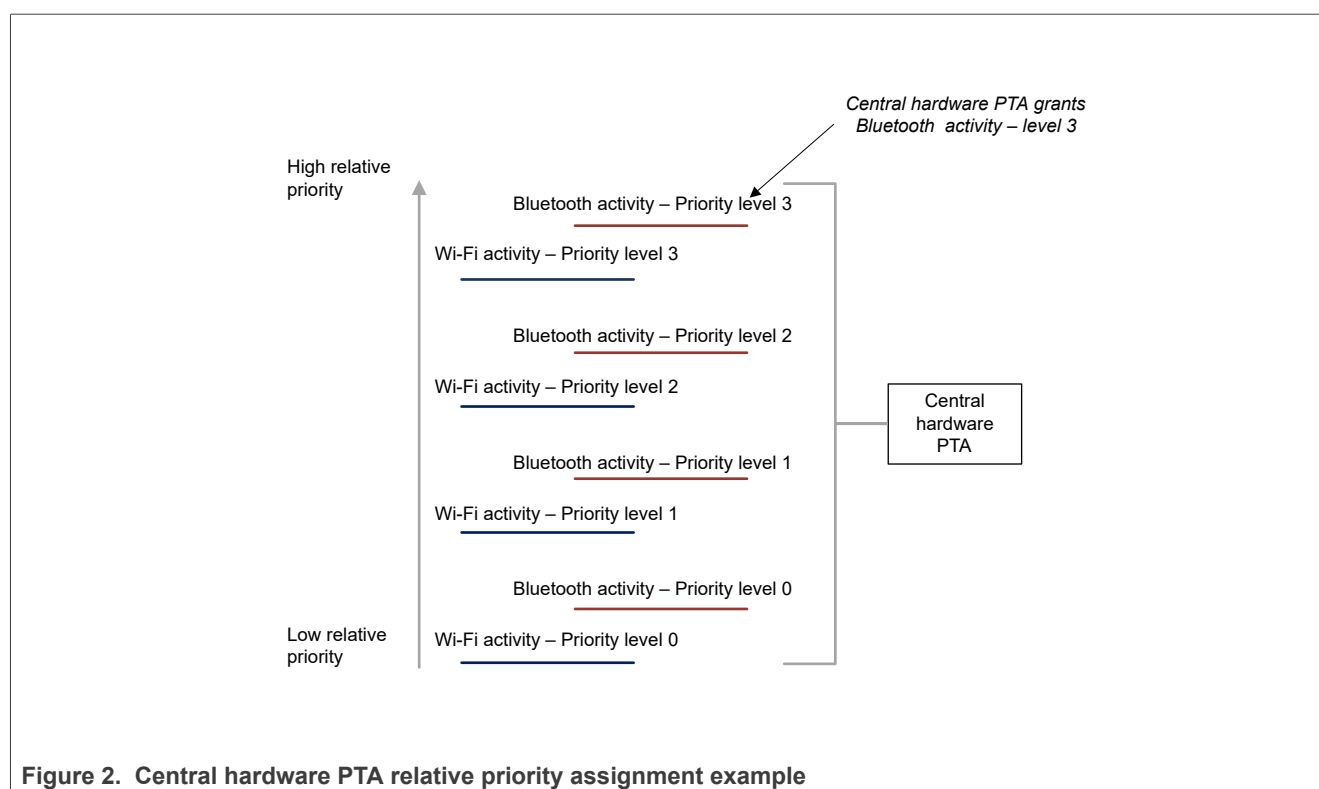
In this context, and as illustrated in [Figure 2](#);

- A2DP traffic is Bluetooth priority Level 3 within the Bluetooth controller
- Wi-Fi web-browsing traffic has priority level 1 within the Wi-Fi controller

**Relative priority assignment** - Based on the relative priority assignment in PTA, Bluetooth priority level 3 is higher compared to Wi-Fi priority level 1.

**Conflict resolution** - The central hardware PTA grants the traffic access to:

- A2DP and stops the Wi-Fi traffic that causes an interference/conflict
- Wi-Fi traffic when there is no interference/conflict with A2DP



## 4 Coexistence operating mode - Antenna configuration

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### 4.1 Shared antenna application

In a shared antenna application, one antenna is shared between the Wi-Fi and Bluetooth/Bluetooth LE radios. Access to the antenna is through an RF switch. Wi-Fi and Bluetooth do not have simultaneous access to the antenna. The central hardware PTA manages the arbitration between Wi-Fi and Bluetooth access to the antenna and controls the switch in real time.

### 4.2 Dedicated antenna application

In applications where Wi-Fi and Bluetooth each have a dedicated antenna, the central hardware PTA arbitrates between the Wi-Fi and Bluetooth/Bluetooth LE radios based on AW611/IW611 specification. The need for arbitration between Wi-Fi and Bluetooth depends on the antenna isolation, the target output powers, and the operating environments. The arbitration setup can be reviewed for each product implementation.

## 5 Revision history

Table 1. Revision history

Document ID	Release date	Description
AN13375 v.2.0	21 April 2025	<ul style="list-style-type: none"><li>Changed the document access to public.</li></ul>
AN13375 v.1.0	6 October 2021	<ul style="list-style-type: none"><li>Initial release</li></ul>

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