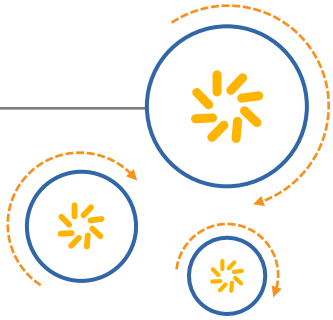
Qualcomm Technologies, Inc.



Batched Scan

Design Document

80-Y7938-2 Rev. C

March 31, 2017

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Revision history

Revision	Date	Description
A	April 2014	Initial release
B	August 2015	Added QCA61x4A to the list of supported chips.
C	March 2017	Updated to conform to QTI standards; no technical content was changed in this document revision.

Contents

1 Overview

This document describes the requirements, software architecture, and low-level design for the *batched scan* feature of WCN36XX and QCA61x4A on the Android platform. The document focuses on the usage information of batched scan and is intended for software developers working on the WLAN driver on the Linux (Android) platform.

2 Features of Batched Scan

Batched scan feature offloads scan from the application processor to the WLAN firmware for power optimization. Batched scan requires firmware to scan autonomously (without APSS wakeup) at a specified periodicity (X) and to batch a number of scan results (N). The periodicity and number of scan results to batch are specified by the framework/upper layers.

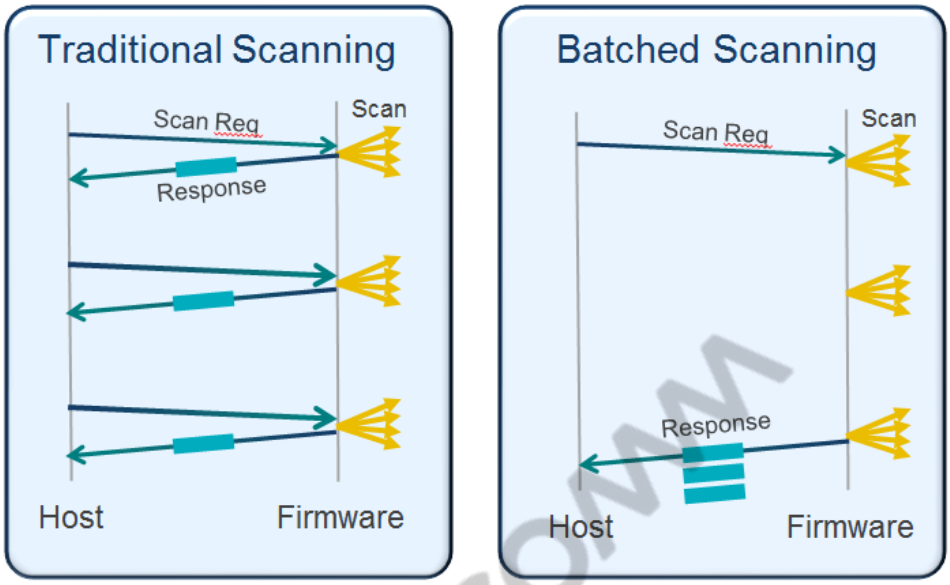
A batch scan is always a contiguous scan.

Using this feature, the application processor can:

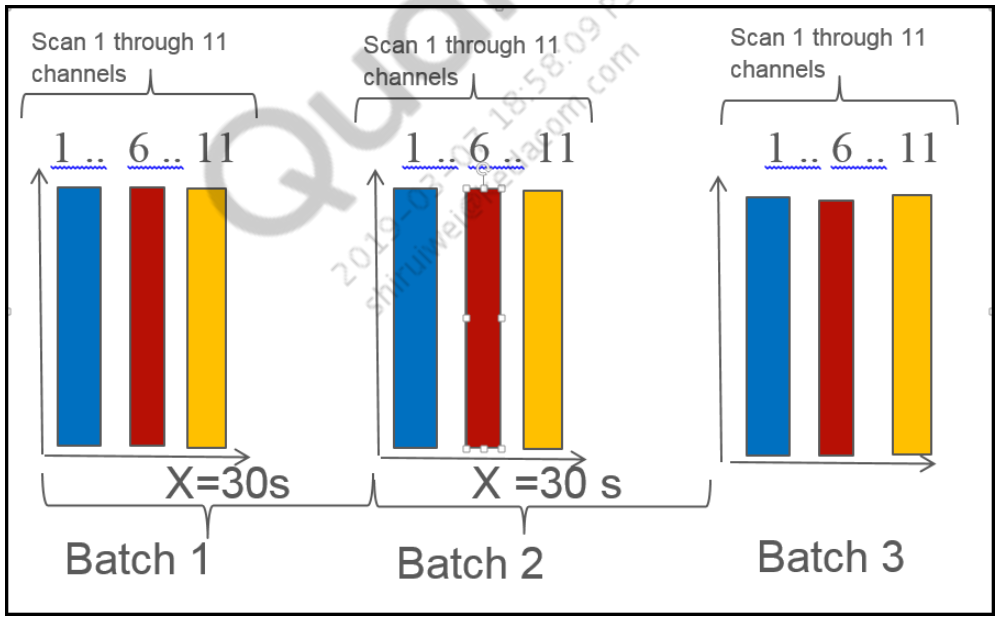
- poll scan results even when it is off
- the WLAN firmware sends scan results to the application processor at pre-determined intervals.

The primary consumer of this feature is the location scan and its corresponding framework that needs to wake the processor periodically.

In its current implementation, batched scan results are retrieved by the application framework. This means that the framework uses a pull approach.



Graphical representation of Batch Scan



1. The number of batch scans depends on the value of *mscan*, also called N. In the above drawing mscan = 3 and therefore three scan results will be cached.
2. The scanning frequency is determined by X. In the illustration above X = 30 sec. and therefore scan happens every 30 seconds

3 Indoor location

Real world application scenario

Wi-Fi scans for geo-positioning should be done periodically to accurately determine position, direction, and change. By offloading this scan to WLAN firmware, the scan can be done more frequently and at a pre-determined interval. This helps with precise indoor geo-fencing and navigation in places such as malls.

Use case:

As a customer enters a mall store a detailed map of the store appears on the customer's smart phone. As the customer walks through the store, the map shows the path, the current location and the phone app notifies the customer about special discounts and coupons.

4 WLAN changes

The WLAN driver supports the following batched scan APIs:

- DRIVER WLS_BATCHING VERSION
- DRIVER WLS_BATCHING_SET
- DRIVER WLS_BATCHING_GET
- DRIVER WLS_BATCHING_STOP
- These use HDD wpa_cli IOCTLS to trigger SET/GET/STOP for internal testing.

HDD API Description

- DRIVER WLS_BATCHING VERSION
  - Returns version number ×10 (for example, this document describes version 16.)
- DRIVER WLS_BATCHING SET
  - Arguments are space-separated.
  - SCANFREQ=XX Optional. Defaults to 30 seconds.
  - MSCAN=XX Required. Number of scans to attempt to batch.
  - BESTN=XX Best Network (RSSI). Defaults to 16.
  - CHANNEL=A Optional. Defaults to all channels (2.4 and 5GHZ). Note: A/a indicates "only 5 GHz " and B/b indicates "only 2.4GHz."
  - RTT=X Optional. Defaults to 0.
  - Returns the minimum of MSCAN or the maximum number of scans that the firmware can cache; Returns -1 on error.
  - The memory buffer to store scan cache is limited. It is a *ring buffer*.
  - Limitation: mscan×bestn ≤ 40
  - Boundary check conditions:
    - Firmware returns MSCAN=0 if the scan interval is less than five seconds.
    - MSCAN or BESTN is larger than batch scan cache can hold. The firmware currently supports 2 Kb (40 AP information).
    - For any subsequent SET command, the batch scan cache is flushed, parameters are reset, and the timer is rescheduled.
- DRIVER WLS_BATCHING GET
  - Returns newline-separated fields:

- scancount=X\n X is the number of scans in the current batch.

□ batch

- trunc\n Optional. Present if the current scan is truncated.
  - bssid=XX:XX:XX:XX:XX:XX\n
  - ssid=XXXX\n
  - freq=X\n (in megahertz)
  - level=XX\n
  - age=X\n (in milliseconds)
  - dist=X\n (in centimeters; -1 if not available)
  - error=X\n (-1 if not available)
  - ====\n End-of-AP marker.
  - ####\n End-of-scan marker.
  - \n End of results.