



# Intel® My WiFi Technology

Tech Brief



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Wi-Fi Personal Area Network refers only to WiFi-enabled devices connecting to the PC via the Intel® My WiFi Technology. Wi-Fi devices must be certified by the Wi-Fi Alliance for 802.11a/b/g and support Wi-Fi Protected Setup. Check with your PC manufacturer for more details.

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## Contents

1	Unwiring CE Devices with Wi-Fi.....	2
1.1	Extending Wi-Fi to Wi-Fi PAN with Intel’s My WiFi Technology .....	2
2	Intel® My WiFi Technology Overview .....	3
2.1	Intel Ultimate N WiFi Link 5300 and Intel WiFi Link 5100 Features.....	3
2.2	Innovative My WiFi Technology Architecture.....	4
2.2.1	Virtualizing Wi-Fi Radios .....	4
2.2.2	Intel MWT Software/Network Stack.....	5
2.2.3	Intel MWT GUI.....	5
2.3	Device Pairing and Security.....	6
2.3.1	WPS Pairing .....	6
2.3.2	Manual Pairing for Non-WPS Enabled Devices .....	7
2.3.3	Security .....	7
2.4	Modes of Operation .....	7
2.4.1	2.4GHz and 5GHz Support .....	7
2.4.2	Multi Channel Support.....	7
2.4.3	Concurrent Connectivity .....	7
3	Unleashing the Power of Wi-Fi PANs .....	7



## 1 Unwiring CE Devices with Wi-Fi

The increasing ubiquity of Wi-Fi networks is one of the leading factors that is driving an increased penetration of embedded Wi-Fi into consumer electronic (CE) devices. 110 million Wi-Fi enabled CE devices are forecasted to ship in 2008 and yearly shipments are forecasted to nearly double to more than 200 million by 2010. In 2012, the combined total shipments of Wi-Fi enabled CE devices and Wi-Fi enabled mobile handsets is forecasted to reach nearly one billion units<sup>1</sup>.

The adoption of Wi-Fi in CE devices enables new usage models for consumers and new revenue opportunities for manufacturers and service providers. CE manufacturers are embedding Wi-Fi in MP3 players for direct downloads of content and Internet radio broadcasts. Digital Camera manufacturers are embedding Wi-Fi in digital cameras as a way to compete against the conveniences of emailing and uploading photos that is offered by camera enabled mobile phones. Handset manufacturers are adding Wi-Fi to enable VoIP calls and to provide increased bandwidth for many of the features already offered over cellular connections. Wi-Fi is also being embedded in TVs, Digital Media Appliances, and digital Video Recorders as a means to download electronic program guide information, enable easy firmware updates, and provide direct access to Internet content, such as YouTube\*. CE device manufacturers are clearly recognizing the benefits Wi-Fi enabled CE devices and are delivering these devices to consumers in increasing numbers.

### 1.1 Extending Wi-Fi to Wi-Fi PAN with Intel's My WiFi Technology

The rapid growth of Wi-Fi enabled CE devices increases the value of a technology that enables direct wireless connection between these devices and a PC. Today, consumers face potentially daunting tasks trying to connect these devices to their PCs. Current embedded Wi-Fi solutions in PCs have a significant limitation when connecting directly to Wi-Fi enabled CE devices. The consumer must disassociate their computer from their WLAN connection and switch their Wi-Fi adapter into ad-hoc mode (IBSS). And then reconnect to the WLAN once they are finished with the direct connection to their CE devices.

Intel® Centrino 2® processor technology is poised once again to be at the center of the next giant step in Wi-Fi evolution with an industry-leading, integrated Wi-Fi Personal Area Network (Wi-Fi PAN) solution, named Intel® My WiFi Technology (MWT). Intel MWT enables a Wi-Fi PAN to operate concurrently with the WLAN with up to eight Wi-Fi enabled CE devices connected directly to the Consumer's PC. Intel MWT delivers compelling benefits for notebook OEMS, CE manufacturers, CE retailers, and consumers.

Intel MWT transforms an Intel® Centrino 2® processor technology notebook into a Wi-Fi PAN, which has a subset of soft AP functionality, for seamless connectivity between Wi-Fi enabled CE devices, the WLAN and the Internet. Intel MWT creates a Wi-Fi PAN without any additional cost while taking care of IP address assignments, security, QoS, and other services for CE devices. It leverages all the benefits of today's Wi-Fi capabilities including Wi-Fi Protected Setup\* (WPS), strong security (i.e. WPA2\* and 802.11i) and quality of service (QoS) features for today's streaming video and voice services.

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<sup>1</sup> Source: ABI Research Q3 2007



Many of today's off the shelf, Wi-Fi certified devices work with Intel MWT out-of-the-box to enable users to:

- Sync-and-Go with seamless bi-directional transfers
- Project PC multimedia content to a projector, TV, monitor, headset, or surround sound speakers
- Connect Wi-Fi PAN devices to the WLAN
- Explore shared file systems of connected devices and transfer files and directories
- Initiate and receive VoIP calls on connected Wi-Fi enabled handsets

**Note:** To deliver the best user experience, Wi-Fi enabled CE device manufacturers should deliver WPS and Wi-Fi Multimedia (WMM).

## 2 Intel® My WiFi Technology Overview

Intel MWT is an integrated silicon, firmware, and software (driver) solution that enables a single Wi-Fi adapter to function like two adapters for concurrent WLAN and Wi-Fi PAN connectivity. My WiFi technology will be supported on Intel® Ultimate N WiFi Link 5300 (Figure 1) and Intel® WiFi Link 5100, the latest Intel Wi-Fi cards for notebooks.

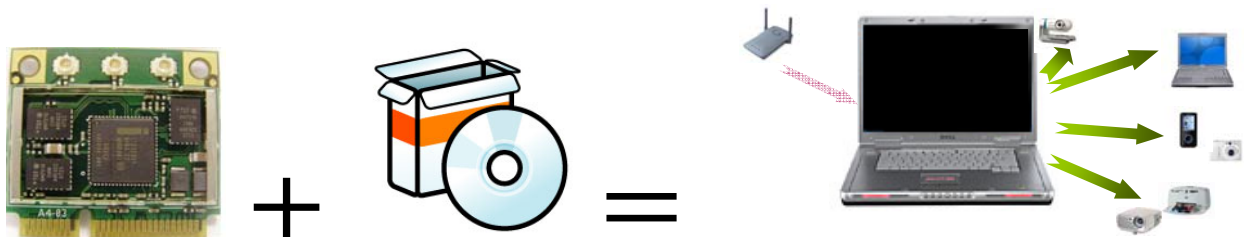
### 2.1 Intel Ultimate N WiFi Link 5300 and Intel WiFi Link 5100 Features

- 5300: MIMO 3x3 ABGN MC/HMC
- 5100: MIMO 1x2 ABGN MC/HMC
- 802.11a/b/g/d/e/i/h/n
- Platform Noise Cancellation Technology
- Frequency Range – 2.4 to 2.4 GHz and 5.1 – 5.8 GHz
- Channel Bandwidth – 20 MHz and 40 MHz (including CCK)
- Data Rates [Mbps] –
  - o 1, 2, 5.5 and 11 Mbps (CCK)
  - o 5100/5300: 6, 9, 12, 18, 24, 36, 48, 54, 300
  - o 5300 only: 300, 360, 405, 450Mbps (OFDM)
- Wireless Intel® Active Management Technology 4.0 (Intel® WAMT) Manageability (Clink)
- Intel® My WiFi Technology (Wi-Fi PAN)
- PCI Express Mini Card (MC)
- Half MiniCard (HMC) form factor

**Figure 1: Intel Ultimate N WiFi Link 5300 Half MiniCard**

## 2.2 Innovative My WiFi Technology Architecture

The Intel MWT architecture is a combination of patented Intel hardware and software (see Figure 2) that allows a Wi-Fi radio to simultaneously function as both a standard client on a Wireless LAN (STA) as well – Light AP with specific Wi-Fi PAN capabilities – for connecting and managing Wi-Fi enabled CE devices.

**Figure 2: Intel MWT architecture is an innovative, integrated hardware and software solution**

### 2.2.1 Virtualizing Wi-Fi Radios

The Intel MWT solution is possible by virtualizing a single Wi-Fi radio to function like two physical adapters. Through silicon, firmware and the Wi-Fi driver, the operating system sees two virtual Media Access Controls (MACs). One interface performs as the standard client WLAN (STA) adapter and the other performs as the Wi-Fi PAN adapter. Wi-Fi devices see two MACs and the operating system sees two network interfaces (two links over one physical interface). By virtualizing the Wi-Fi radio, the Intel® Centrino 2® processor technology notebook is able to have concurrency between the WLAN and the Wi-Fi PAN using two different modes. The first method is priority-based within the same channel. The second mode intelligently splits time to permit each time slot to behave as a different MAC towards the wireless medium and the software stack.

Intel MWT's virtual radios require no extra hardware for concurrent connectivity and allow firewall and IP routing between the WLAN and Wi-Fi PAN. A user can associate any Wi-Fi device to an Intel MWT Wi-Fi PAN, by associating it in a similar fashion to making a WLAN AP connection.

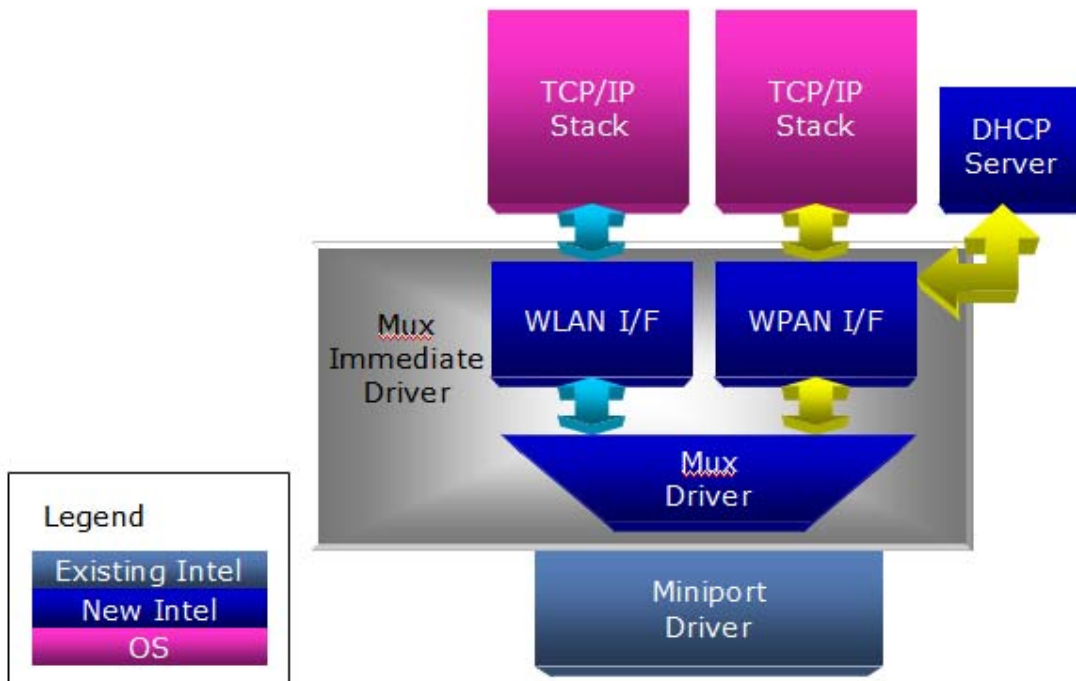
**Figure 3: Intel MWT virtual radios enable a notebook to support concurrent WLAN and Wi-Fi PAN connectivity**



### 2.2.2 Intel MWT Software/Network Stack

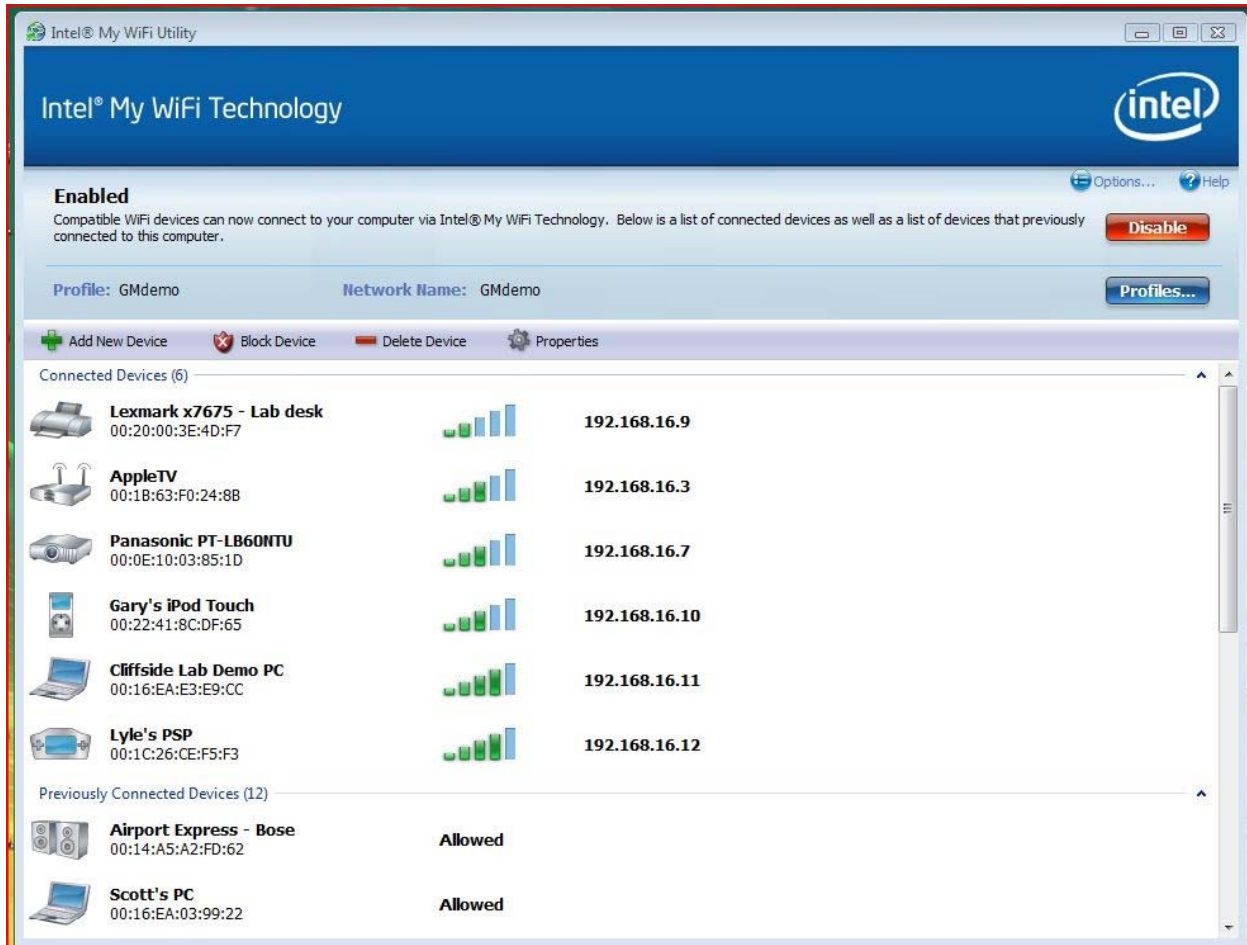
Intel MWT uses an extensible software architecture that allows the operating system to think the notebook has two Wi-Fi radio's performing similar but different functions. Each virtual Wi-Fi radio is assigned a TCP/IP stack. Intel MWT communicates to standards based 802.11 Wi-Fi devices enabling most of the base functionality of the WLAN and Wi-Fi PAN driver to be shared. As a result, both interfaces use the same Miniport driver (see Figure 4).

**Figure 4: The Intel MWT extensible software architecture**



### 2.2.3 Intel MWT GUI

Because Intel MWT is a Wi-Fi PAN and can communicate to any existing Wi-Fi device, the software stack is easily extensible to GUI frameworks that are Wi-Fi centric. Figure 5 shows a GUI interface example that sits on top of the Intel MWT software stack.

**Figure 5: GUI application in Microsoft Windows Vista\* identifies available Wi-Fi PAN**

## 2.3 Device Pairing and Security

Because Intel MWT is Wi-Fi based, it supports connections to thousands of devices from manufacturers that are 802.11 compliant. Intel MWT supports the Wi-Fi Protected Setup\* (WPS) specification created by the Wi-Fi Alliance to simplify and standardize configuration of Wi-Fi security and addition of Wi-Fi devices to Wi-Fi networks. WPS enabled devices are quickly, seamlessly and securely connected to the Intel MWT Wi-Fi PAN. Intel MWT also supports device pairing for non-WPS enabled Wi-Fi devices.

### 2.3.1 WPS Pairing

Intel MWT supports pairing to devices that are WPS compliant, simplifying the setup, configuration and security of out of the box devices to be connected to a MWT Wi-Fi PAN. For WPS device setups, Intel MWT supports WPS Push Button and Personal Identification Number (PIN) configuration. In push button configuration, the user simply pushes a physical or virtual button on each device and lets the two negotiate a secure connection. In a PIN configuration, a PIN is provided for each device that joins the Intel MWT Wi-Fi PAN. Typically, a fixed label or sticker is attached to the device with the PIN or the PIN can be generated dynamically by the device. The PIN is used to ensure that the user is pairing the correct device to the Intel MWT Wi-Fi PAN and to avoid unintended or malicious attempts by others to add devices.



### 2.3.2 Manual Pairing for Non-WPS Enabled Devices

Intel MWT also supports the manual device pairing with non-WPS Wi-Fi devices. Intel MWT simplifies the manual pairing by displaying all the information the user would need to enter manually to connect the legacy device to the Intel MWT Wi-Fi PAN. Manual Configuration information includes: Wi-Fi PAN SSID, Security Type, Authentication Type, Data Encryption level and Encryption Key.

### 2.3.3 Security

Intel MWT supports the latest wireless security specifications such as WPA2 and 802.11i as well as a variety of other security options including WEP and WPA. And Intel MWT's integrated WPS support makes it easy for users to securely attach Wi-Fi devices to the Intel MWT Wi-Fi PAN.

## 2.4 Modes of Operation

Intel MWT supports a variety of operational modes that maximizes the interoperability of Wi-Fi devices and provides different levels of connectivity. Utilizing the flexibility and feature set of Intel Ultimate N WiFi Link 5300 and Intel WiFi Link 5100, Intel MWT supports multiple bands and concurrent connections to WLAN and Wi-Fi PAN connected devices. Intel MWT also supports PC to PC connections. A laptop can connect to a My WiFi Technology PAN to enable the PC to PC connection.

### 2.4.1 2.4GHz and 5GHz Support

Intel MWT fully supports the 2.4 GHz band for 802.11 b/g and partially supports the 5GHz band for 802.11a devices. By offering support for both the 2.4GHz and 5GHz bands, Intel MWT maximizes the number of devices that can connect to a Intel MWT embedded notebook as well as support future devices that will take advantage of the 5GHz spectrum.

Initially, Intel MWT will operate in single band mode where the Wi-Fi device connected to the Intel MWT Wi-Fi PAN must use the same channel as the WLAN interface. The Intel MWT software stack will handle the Wi-Fi device association to its Wi-Fi PAN on the same channel. For example, if the Intel MWT notebook is connected to an AP on Channel 1 in the 2.4GHz spectrum, the Wi-Fi device connected to the Wi-Fi PAN will also connect on Channel 1 in the 2.4GHz spectrum.

### 2.4.2 Multi Channel Support

Intel MWT's future roadmap includes allowing the WLAN to be in a different channel or band, and the Wi-Fi PAN to be in a different channel or band. For example, the WLAN would operate in the 5.2GHz channel, and the Wi-Fi PAN would operate in the 2.4GHz.

### 2.4.3 Concurrent Connectivity

A powerful feature of Intel MWT is the ability to connect to a WLAN while at the same time connect to a variety of Wi-Fi PAN devices. Notebook users can easily be connected to the Internet via an AP, while simultaneously transferring photos from their Wi-Fi cameras via the Intel MWT Wi-Fi PAN. Intel MWT accomplishes this concurrency using intelligent radio time slicing, permitting multiple devices to share the wireless medium.

## 3 Unleashing the Power of Wi-Fi PANs

Intel's MWT will transform how consumers harness and manage the explosion of Wi-Fi enabled CE devices. Intel® Centrino 2® processor technology with Intel MWT creates an industry-leading, Wi-Fi Personal Area Network solution for seamless connectivity between Wi-Fi enabled CE devices, the WLAN, and the Internet – without configuring an access point (AP). At the heart of Intel MWT is an innovative, integrated silicon and software architecture that virtualizes a single Wi-Fi radio to support a WLAN and Wi-Fi PAN network interface. Intel's My WiFi Technology will unleash the power of Wi-Fi PAN with all the latest Wi-Fi capabilities and seamless out-of-the-box connectivity for Wi-Fi certified CE devices.