Intel® Wireless Gigabit v2.0

User Guide

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Revision 3.3

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Revision History

Revision	Description	Date
1.0	Initial release.	May 16, 2013
1.1	Alpha update	November 25, 2013
2.0	Beta update	April 9, 2014
2.1	Beta 1.5 update	June 30, 2014
2.2	Beta 2 update	September 11, 2014
2.3	Chapter 2.2 flashing dock instructions	October 23, 2014
3.0	PV version updates	November 26, 2014
3.1	Added 4.1.1. Maple Peak DisplayPort Bandwidth and other limitations	January 8, 2015
3.2	SW version 2.0	March 30, 2015
3.3	Added win10 user guide	August 5, 2015

§

1 Introduction

This chapter provides an overview of the Intel Wireless Gigabit (WiGig) solution, which comprises the Intel® Tri-Band Wireless-AC17265 (Client), Intel® Tri-Band Wireless-AC18265 (Client), the Intel® Wireless Gigabit Sink W13100 (Dock), and the Intel® Wireless Gigabit Antenna-M 10041R (Antenna).

1.1 Scope

This document familiarizes customers with the Intel WiGig software (SW) solution components and provides installation and configuration details.

1.2 References

Table 1–1 References

Reference	Document	Revision
1	*OEM Tool User Guide*	
2	*Wireless Gigabit EPS*	
3	*External Product Specification*	

1.3 Wireless docking

The main use of Intel WiGig at product launch is wireless docking in conjunction with the Maple Peak SNK.

Wireless docking generally occurs when the user is working 2–4 feet from the display(s). The user experiences the same kind of responsiveness as operating a workstation/desktop.

1.3.1 “Place to Dock, Snap to Go” experience

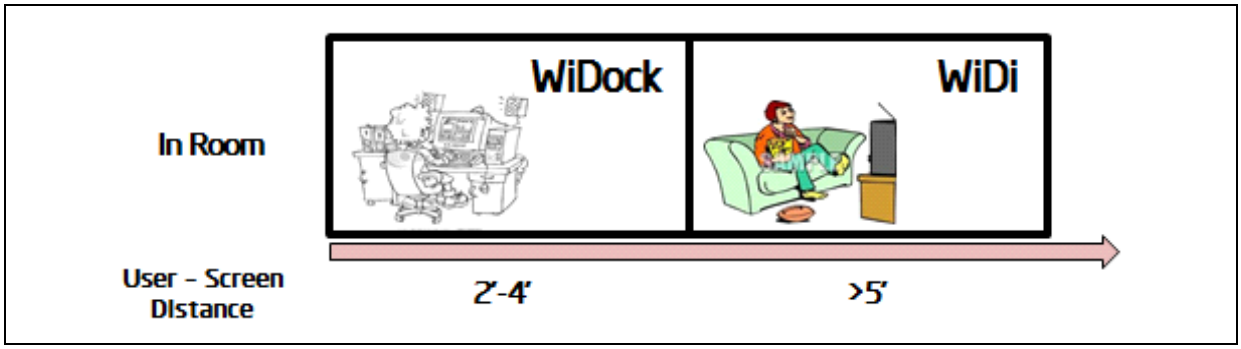
Wireless docking is designed to minimize user actions. After the initial WPS-based pairing, the typical user is able to auto-dock, meaning the device automatically connects to the dock and peripheral when in range of the dock. In other words, by the time the device is on the desk, it is already docked.

Undocking is as simple, allowing the user to grab the device and walk away.

1.3.2 Wireless Docking (WiDock) and Wireless Display (WiDi)

WiDock differs from other models, such as Miracast* or Intel® Wireless Display, in which the user is further from the screen (such as on the couch or in a conference room), and is focused on content consumption (watching a video, sharing a screen with others, gaming) rather than productivity or content creation.

Figure 1-1 Use models



1.3.3 Wireless peripheral

The wireless peripheral feature allows a device to interact with high-speed USB peripherals over WiGig. For example, a directly attached storage device equipped with Maple Peak SNK would allow a high-speed USB 3.0 connection with Intel WiGig equipped tablet or notebook.

When connecting, many of the wireless docking capabilities would be applicable (excluding of course the display capabilities), allowing USB 3.0 like throughputs (>1 Gbps) for on-desk distances.

1.4 Key features

See the EPS document (Reference #3) in Table 1–1.

1.5 SW and HW deliverables

See the EPS document.

1.6 Notebook platform preparations for WiDock

- Operating system:
  - Microsoft Windows 7* 32/64, Microsoft Windows 8.1* U 64, Microsoft Windows 10*
- SW Pre-requisites *for OEM tools* (unnecessary with an operational stack):
  - VC++ 2010 Redistributable Package

1.7 Known limitations

See the EPS document.

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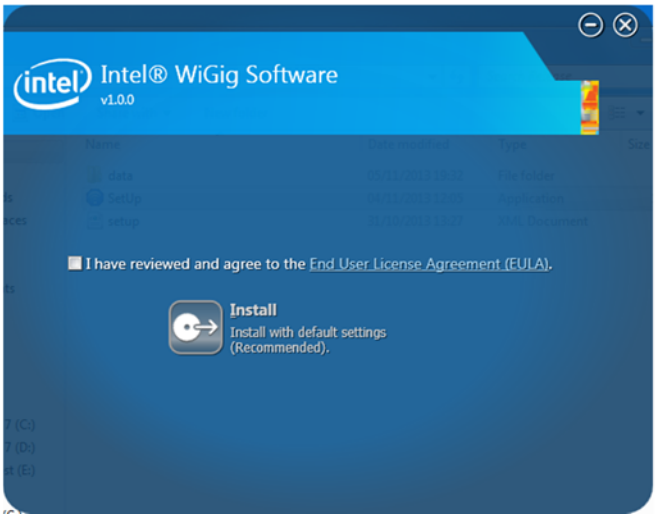
2 Software Install

2.1 NB-side installation

1. Go to G Layout\Win7Plus\ and run Setup.exe.

   Setup.exe installs the relevant installer for either a 32-bit platform or a 64-bit platform.

Figure 2-1 End User License Agreement screen

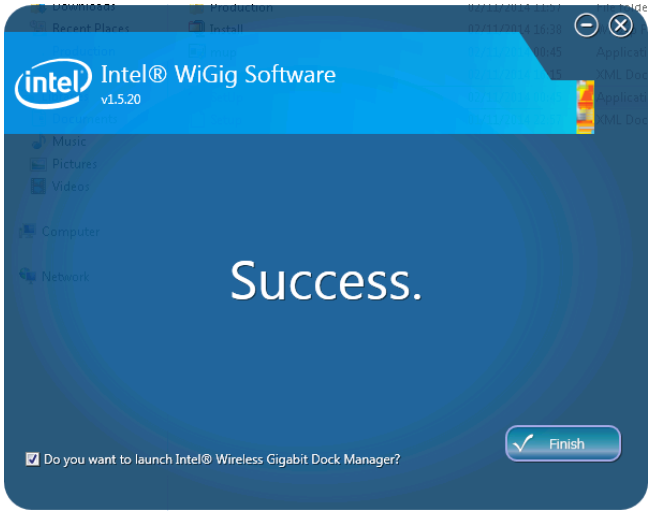


   Check *I have reviewed and agree to the EULA* and click *Install*. This will install the operational WiGig software for the NB.

2. When the application is successfully installed, check the *Do you want to launch Intel® Wireless Gigabit Dock Manager?* option. Click *Finish*.

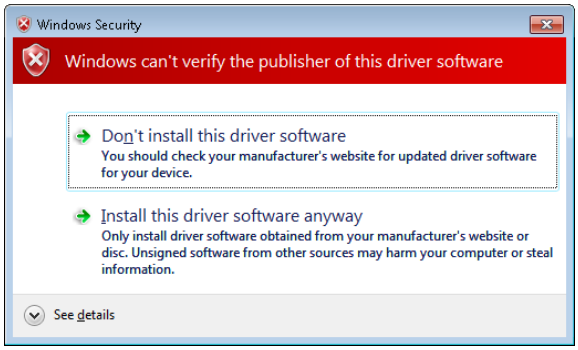
   You will be able to launch the Intel® Wireless Dock Manager application from the desktop shortcut later if you do not check this option.

Figure 2-2 Success screen



3. During the first installation, the device driver is installed. If the Windows Security message shown in Figure 2-3 appears, choose *Install this driver software anyway* to continue the installation.

Figure 2-3 Windows security message



Note: To avoid this window, run the certificate file *(iCert.spc)* from the Certificates layout.

- Run *setup.exe –q* from a command line to run the installer in silent mode.

§

3 WiGig Application User Manual for Win 7/8/8.1

3.1 User manual

The Intel® Wireless Dock Manager is a dedicated application that runs on the client and allows the user to find, connect to, and configure docks.

LEDs on the dock, and an OSD (On Screen Display) on the monitor connected to the dock, provide further feedback about the dock status, and assist the user in performing actions.

The activity button on the dock is used in some of the flows (like pairing and connection/disconnection).

3.1.1 Launching the Intel® Wireless Dock Manager

The Intel® Wireless Dock Manager starts automatically with Windows.

To invoke the Intel® Wireless Dock Manager interface, double-click the icon on the desktop, labeled *Intel® Wireless Dock Manager*.

Alternatively, double-click the WiGig tray icon , or right-click and choose *View available docks*.

A dedicated tray icon can initiate the Intel® Wireless Dock Manager and indicate the relevant status as shown in Figure 3-1:

- **Connected:** The NB is connected to a dock
- **Disconnected:** The NB is not connected to a dock
- **Error:** Error while connecting or weak connection (hover to see the error reason)

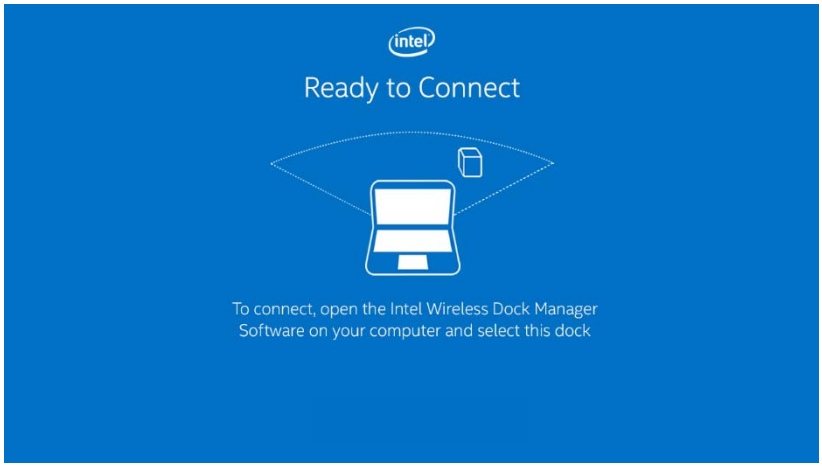
Figure 3-1 Tray icon indications

Note: The Intel® Wireless Dock Manager application keeps running from the system tray even if you click the *X* (close window) icon on the application.

3.1.2 Making the first connection

1. Turn on the power on your dock. When the dock is ready to accept connections, the external monitor will light up and show the welcome OSD screen in Figure 3-2.

Figure 3-2 Welcome OSD screen



2. This screen remains until the connection is made. After a few minutes of inactivity, the monitor turns off to conserve power. Press the dock activity button to wake up the monitor and continue with the connection.
3. Enable WiGig on your client. WiGig comes disabled out-of-the-box to conserve battery life until the first time WiGig is needed. When the Wireless Dock Manager is launched for the first time, the Welcome screen appears.

Figure 3-3 Welcome screen

4. Choose *Yes* to enable WiGig. Shortly after, WiGig will start scanning for docks in your vicinity. You will see a screen similar to Figure 3-4.

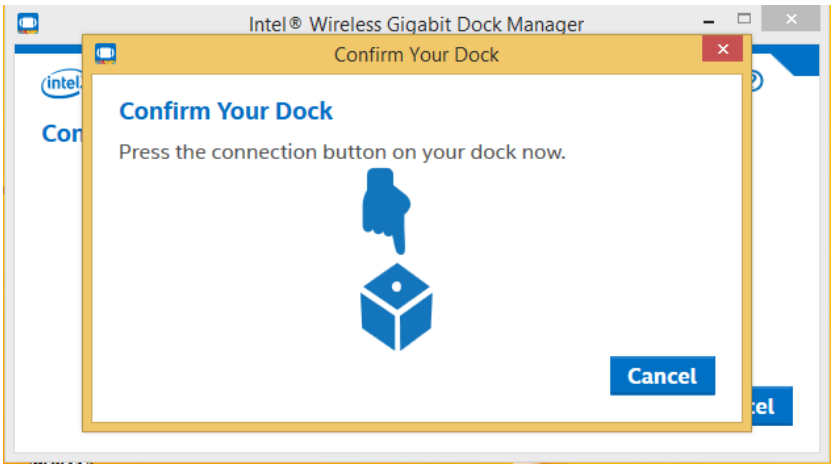
Figure 3-4 Dock select

5. Choose the dock you wish to connect to by clicking it.

Note: Since this is the first time you are connecting to this dock, you will need to pair with it. Pairing creates a set of authentication keys that uniquely identify your client and dock pair, and allow them to communicate in a secured, encrypted manner over-the-air.

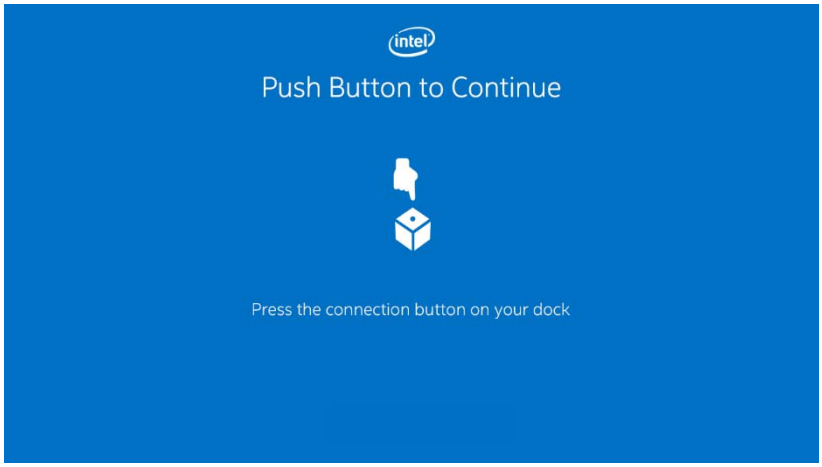
6. Press the connection button on your dock to confirm it, as indicated in Figure 3-5.

Figure 3-5 Dock confirmation screen



7. A corresponding OSD will appear on the external monitor, as shown in Figure 3-6.

Figure 3-6 OSD screen



8. Press the activity button on the dock to complete the pairing process. The *Connected* screen appears shortly after, as shown in Figure 3-7.

Figure 3-7 Dock Connected screen

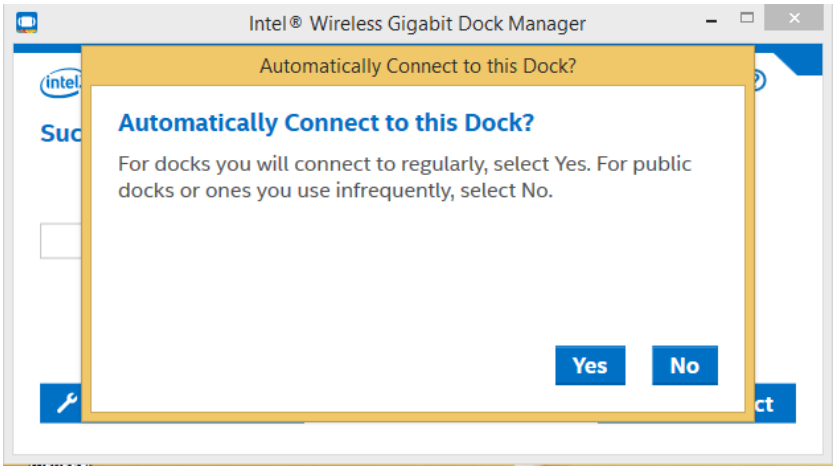
Note: A successful connection is also indicated by the dock LED (if available), and the external monitor and USB devices being connected and enumerated on your client (you will hear the Window's gling-gling hot-plug audio cues).

Congratulations! You have made your first wireless docking connection.

3.1.3 Automatic connection default

While connecting to the dock for the first time, you will see the message to set the dock to be automatically connected or not, as shown in Figure 3-8.

Figure 3-8 Automatically Connect to this Dock



For docks you connect to regularly, select *Yes*. For public docks or ones you use rarely, select *No*.

3.1.4 Automatic connections

If a dock is set to connect automatically, WiGig will attempt to automatically connect to this dock once in range. To this end, WiGig keeps scanning in the background, while consuming very little power.

To connect, simply place your client (assumed to be in S0) near the dock. Within several seconds, WiGig will discover the dock and will connect to it automatically. You do not have to invoke the Wireless Dock Manager, open the lid or take any action, just wait until the external screen comes up and USB devices are enumerated, and you can start working.

When successfully connected to a dock, the dock LED changes color (color is specific to dock vendor).

Note: For the connection to be fully completed automatically, as described above, the client needs to be powered on and active (such as in S0). If the client is in S3, WiGig will automatically discover the dock, and then you can use the dock button to wake up the client and complete the docking procedure. See Section 3.1.6 for more details. Ability to wake up the client from the dock is vendor specific and is configured in the BIOS.

You can disable auto-connect by changing the toggle on the main Wireless Dock Manager screen while connected, as shown in Figure 3-9.

Figure 3-9 Disabling the auto-connect setting

You can only change a dock between automatic and manual connection when you are actively connected to the dock.

Once auto-connect is disabled, the client will no longer connect automatically and you will have to manually select the dock from the client, as described in Section 3.1.5.

3.1.5 Manually connecting to a dock

To manually connect to a dock, choose the dock from the list of docks by clicking on it, as shown in Figure 3-10.

Figure 3-10 Manual dock connection

Docks that you have already paired with in the past will appear with a dark background color. Docks that you have never paired with will appear with a light background color.

The list is being refreshed automatically, as WiGig keeps scanning in the background.

Another method to connect to a dock is via the tray icon. If there is only a single paired dock in range (that is, a dock you have already paired with in the past), you can right-click the tray icon and choose *Connect to <dock name>*. Right-clicking when there is more than one paired dock in range, or no paired docks, will give you the option to open the Wireless Dock Manager (View available docks), where you can choose your desired dock from the list.

When successfully connected to a dock, the dock LED changes color (color is specific to dock vendor).

3.1.6 Automatic connection in S3 (depends on BIOS configuration)

When getting in range with a paired dock that is set to auto-connect, and the client is sleeping (S3), the WiGig radio will discover the dock and establish a low power link to it, known as low-power connected. This mode may be indicated by the LED changing color.

While in this mode, the system is kept in its low power state (S3), and WiGig will wait for an indication from the dock side to wake up the system and complete the connection procedure. This can be achieved by pressing the activity button on the dock. When the button is pressed, the client is moved to S0, and the connection completes automatically.

Once fully connected, the dock LED may change color.

3.1.7 Automatic connection in connected standby

When getting in range with a paired dock that is set to auto-connect, and the client is *connected standby* low-power mode, the WiGig radio will automatically connect to the dock. The devices connected to the dock will be connected and enumerated on the client, however the external monitor will not come up and the system will remain in connected standby.

To take the system out of connected standby, and light up the screen, press the activity button on the dock, or alternatively click the mouse or press the keyboard.

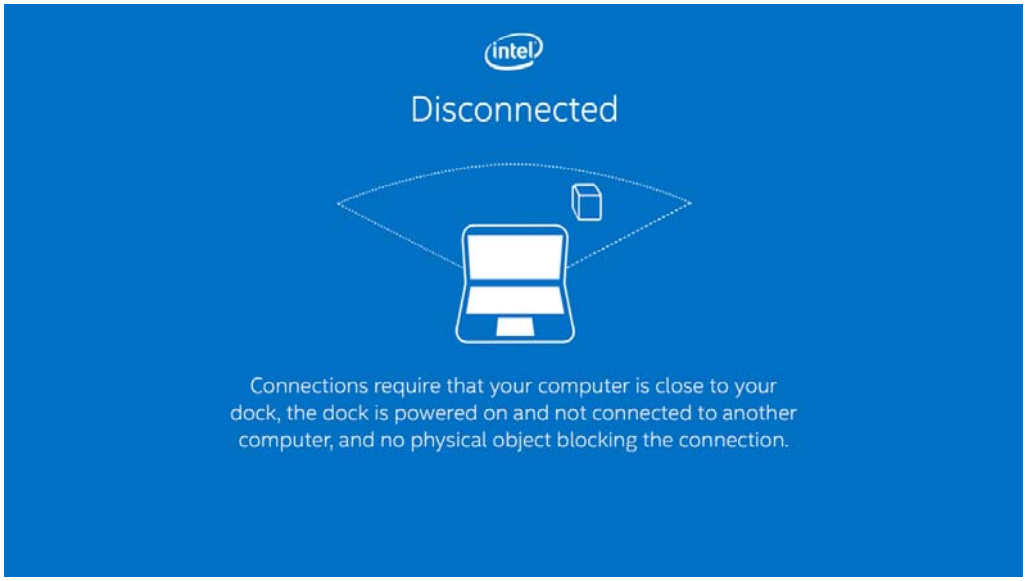
3.1.8 Disconnecting from the dock

There are several methods in which you can disconnect an active connection:

1. First, you can simply take your client and walk out of range from the dock. WiGig will eventually lose the link, and the dock will be disconnected. Once disconnected, WiGig automatically starts scanning again to discover auto-connect docks in range.

   This method is also known as *auto-disconnect*. In this case, the OSD will display the screen pictured in Figure 3-11 after disconnecting.

Figure 3-11 Dock disconnection screen



Note: Disconnecting by getting out of range (auto-disconnect) is experienced by the system as a USB surprise-removal event. While Windows has become better and better over the years with handling surprise removals, there is still always a chance of data loss/corruption when surprise-removing USB Mass Storage devices connected to the dock (other devices, such as HID, USB LAN, USB audio, etc., do not suffer). If this is a concern, for example, if you have a Mass Storage device connected to your dock, and you have just recently finished accessing this device, it may be advisable to safely remove this USB device (right-click on the USB icon in the system tray), or to disconnect WiGig manually, as described below. In any case, it is advised to act in a similar manner to undocking from a wired dock, as the same issues are present there as well.

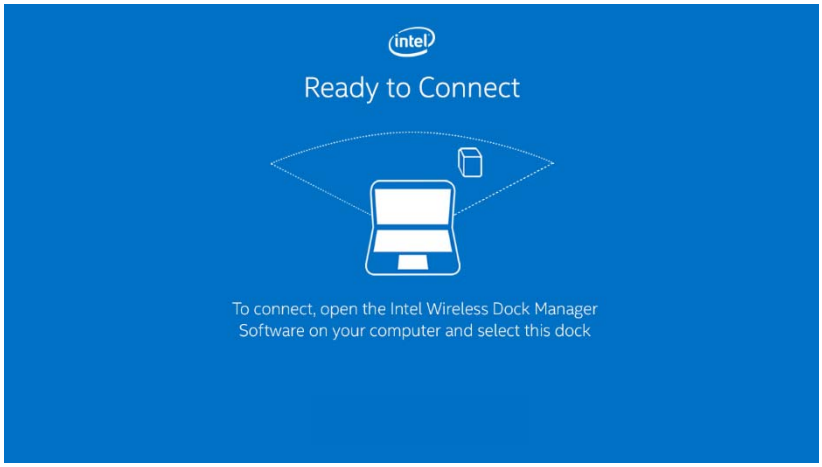
2. To manually disconnect, invoke the Wireless Dock Manager and click the *Disconnect* button on the main screen. Alternatively, you can right-click the tray icon and choose *Disconnect from <dock name>*.

Figure 3-12 Manual disconnect option

3. Another method to manually disconnect is to press down and hold the activity button on the dock for more than four seconds. This method is especially useful for closed-lid operations, or if you are trying to manually disconnect a system where you cannot access the Wireless Dock Manager (like when the system is locked and you do not know the password).

   Once disconnected, the dock LED changes color (color is specific to dock vendor), and the OSD shows the *Ready to Connect screen*, as shown in Figure 3-13.

Figure 3-13 Ready to connect screen

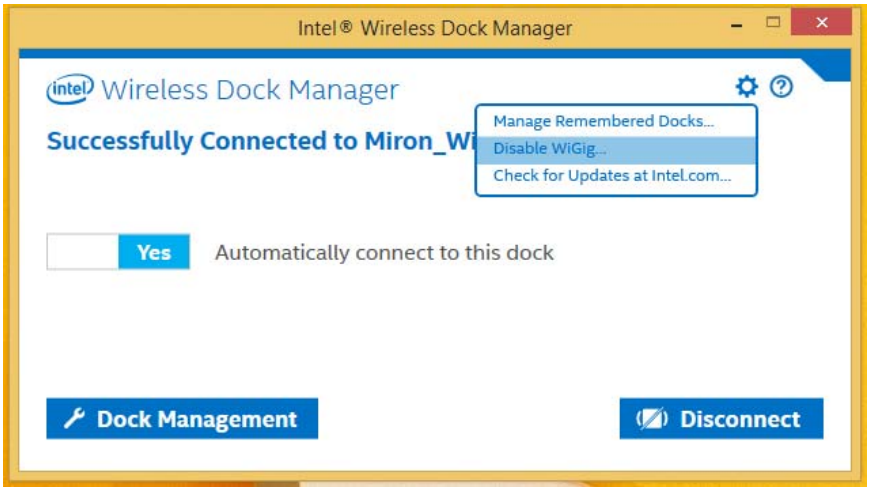


Note: Manually disconnecting from a dock that is set to connect automatically will temporarily disable auto-connect to this dock. This is to prevent the connection from being recovered immediately. To re-enable automatic connections to this dock, the client needs to get out of range and then return, or to do an Sx cycle (S0→S3→S0).

3.1.9 Disabling and enabling WiGig

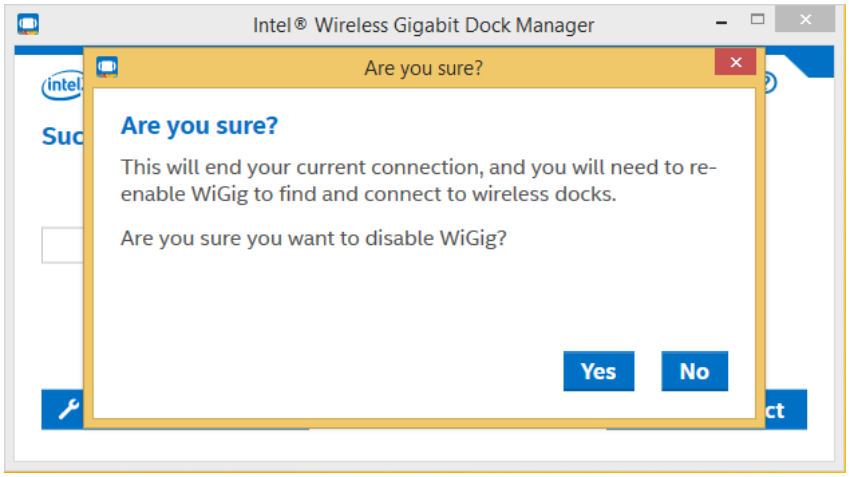
1. To disable WiGig, click on the gear icon in the upper right of the main Wireless Dock Manager screen, shown in Figure 3-14. A popup-menu will come up.

Figure 3-14 Disable WiGig using the gear icon



2. Choose the first menu option *Disable WiGig*. A warning will show up, similar to the one in Figure 3-15 (depending on whether you are currently connected or not).

Figure 3-15 Disable WiGig warning screen



3. Choose *Yes* to disable WiGig.
4. When WiGig is disabled, you cannot find and connect to wireless docks; the screen shown in Figure 3-16 comes up. Disabling minimizes the power consumption of the WiGig radio in the client.

Figure 3-16 WiGig disable confirmation screen

5. To enable WiGig, press the *Enable WiGig* button.

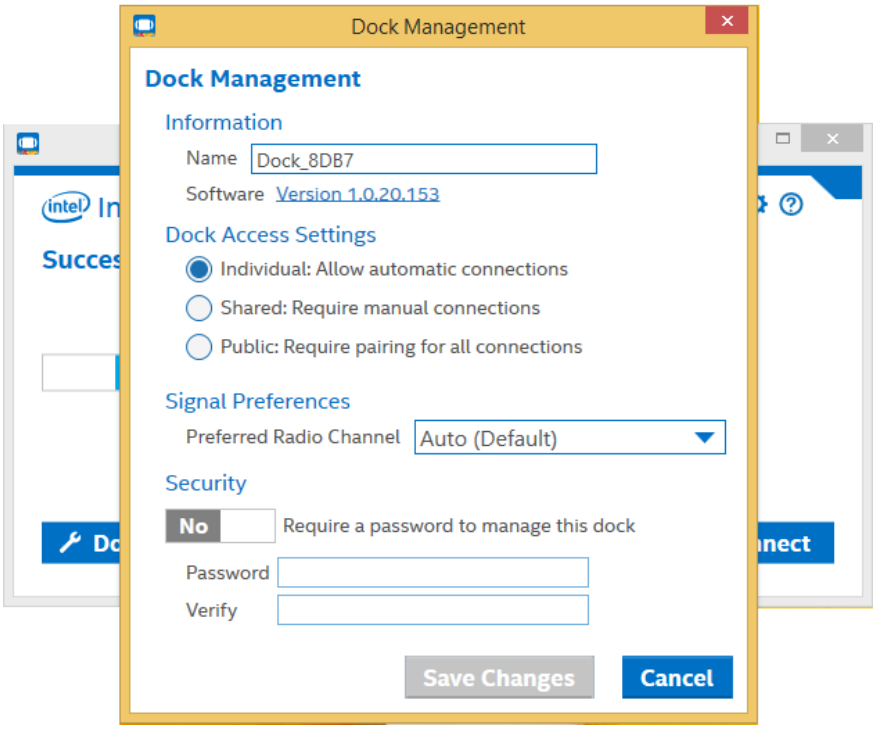
3.2 Changing dock settings

1. To access the dock settings, click the *Dock Management* button on the main Wireless Dock Manager screen while connected to a dock, as shown in Figure 3-17.

Figure 3-17 Dock management button

2. This will open up the Dock Management screen, as shown in Figure 3-18.

Figure 3-18 Dock management screen



3. In Dock Management, you can configure the following settings:
   - **Information**

- **Name:** This field determines how will the dock be called and presented in the scan list in the Wireless Dock Manager. This field accepts only Latin letters, digits, and a few special characters such as space and underscore.

Note: The factory setting for dock name is a prefix *Dock* and an automatic suffix of the last four nibbles of the MAC address of the dock. This helps users to distinguish between similar docks whose names have not been customized. Once the user changes the dock name, the last four nibbles of the MAC address are no longer appended to it. To re-enable this behavior, the dock must be reset to the factory defaults by pressing the recovery button on the dock for ten seconds.

- **Software:** This shows the version of the currently installed software. Clicking this item will allow you to manually update your dock software, as described in Section **Error! Reference source not found.**. Also, when an update is available for your dock, it will show up next to the version number. Click the *Update Available* link to start the software update procedure.

– **Dock Access Settings**
  - **Individual:** Allows automatic connections. This setting enables the auto-connect toggle on connected clients, as described in Section 3.1.3. This is the only setting with which the dock can be automatically connected to, and is particularly suitable for private docks for individuals.
  - **Shared:** Requires manual confirmation. This setting forces manual connections by disabling the auto-connect toggle on connected clients. This setting is particularly suitable for shared docks in multi-users environments, where it may be undesirable to allow automatic connection to prevent users from inadvertently connecting to the dock while in range (remember that a dock that is currently connected to a user cannot accept other user's connections, and will not be seen in their scan list).
  - **Public:** Requires pairing for all connections. This settings forces the user to pair on every connection (such as. pairing data is lost upon disconnect). This is the most secure setting, and is mostly suitable for docks where the convenience of connection is less of a concern, for example in airports, cafes or hotels.

– **Signal Preferences**
  - **Preferred Radio Channel:** Allows you to assign a specific operating channel, or enable automatic selection by the dock. It is recommended to leave this as *Auto*, as this will allow the dock to select the best channel to operate in, based on interference and other factors.

– **Password**
  - Enable this to assign a password for protecting the dock setting page, preventing unauthorized access.

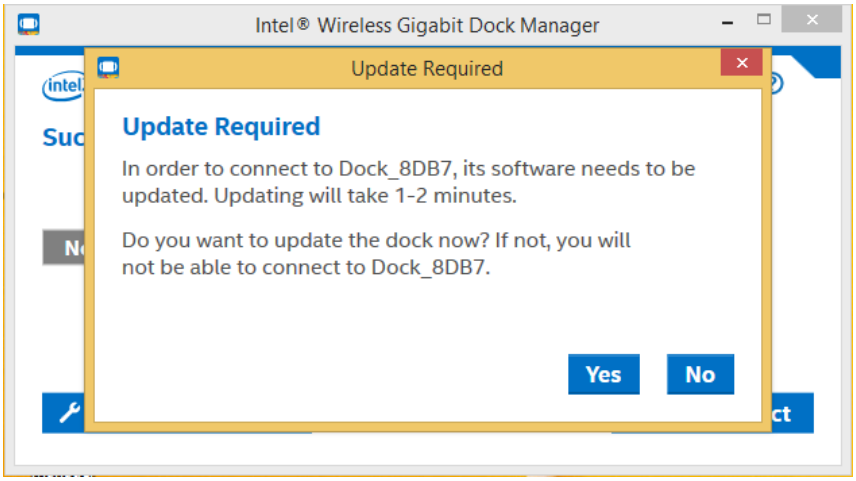
3.3 Dock software update

Your dock software can be upgraded over-the-air from the client.

3.3.1 Update during connection

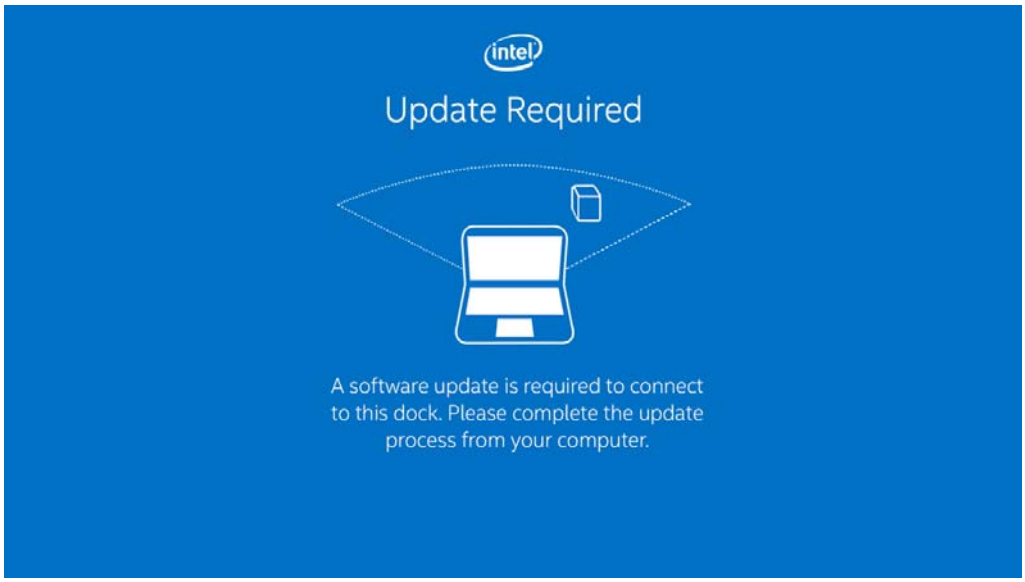
1. When connecting to the dock, the Wireless Dock Manager might inform the user of mandatory dock software update.
2. On mandatory dock software updates, the Wireless Dock Manager will present the message shown in Figure 3-19 while trying to connect.

Figure 3-19 Dock software update required screen



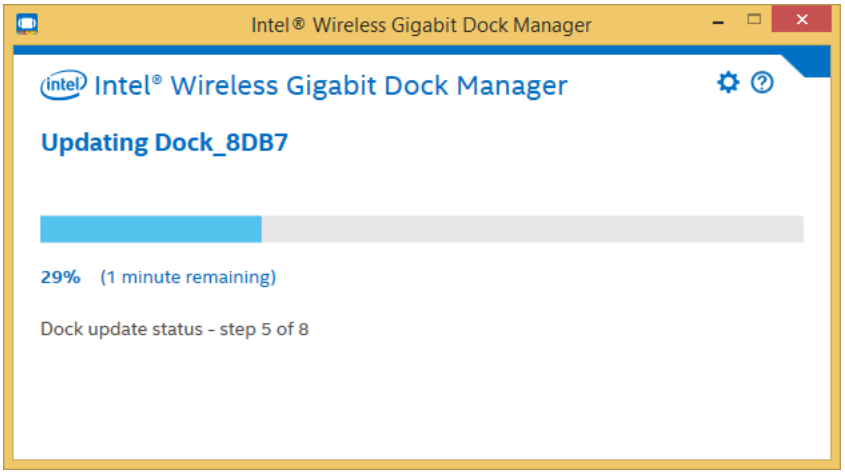
3. In addition, the OSD on the external monitor will show the following message in Figure 3-20.

Figure 3-20 OSD update screen



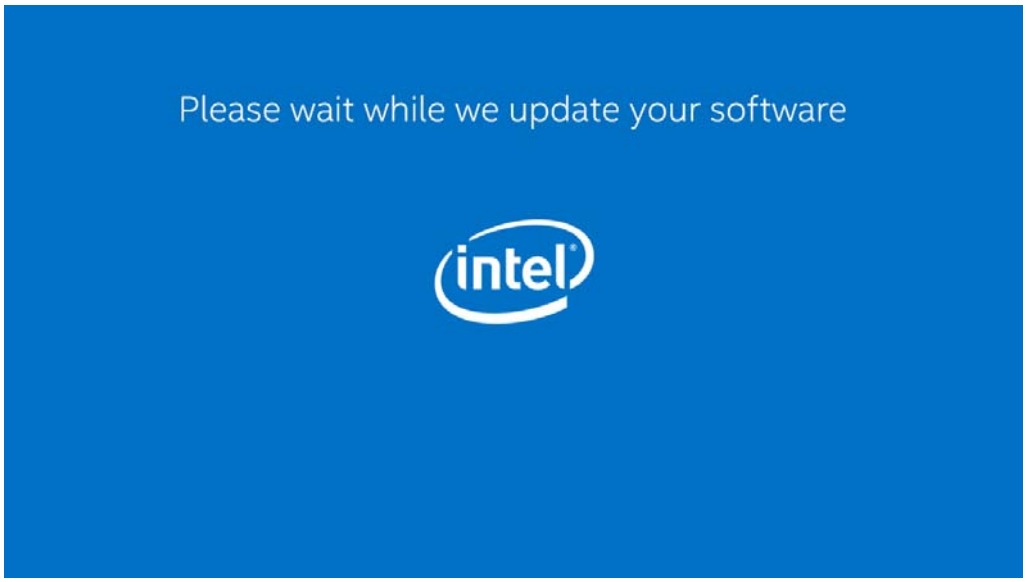
4. Choosing *No* will disconnect. The user cannot connect and work with this dock without performing a software update.
5. Choosing *Yes* will start the dock software update process. A screen similar to the one in Figure 3-21 will be presented, with the bar indicating progress.

Figure 3-21 Dock update progress



6. During the software update process, the dock LED changes color (color is specific to dock vendor), and the OSD will show the screen in Figure 3-22; the screen should have progress bars.

Figure 3-22 OSD update progress screen

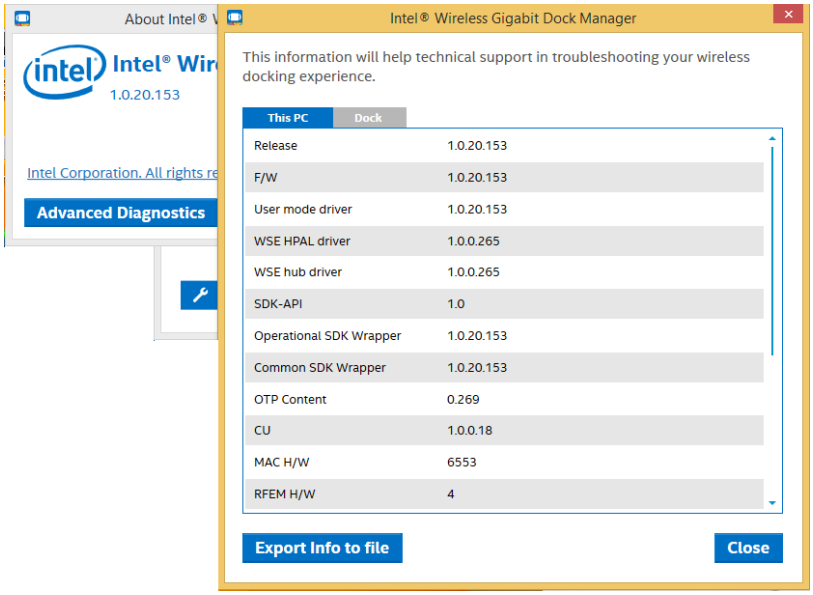


7. Once the update process is complete, the dock will be reset and the client will either automatically re-connect (auto-connect is enabled) or the user will need to manually re-connect to the dock (auto-connect is disabled).

3.4 Diagnostic information

Information shown in diagnostics window will help technical support in troubleshooting your wireless docking experience. In order to open diagnostics window, press the *Advanced Diagnostics* button in the *About* window.

Figure 3-23 Advanced diagnostics window



3.5 Managing docks

User may manage docks he has previously connected to. For each dock, user may delete the dock or remove the autoconnect option. To manage docks, click on the *Manage Remembered Dock* dialog from the settings button, as shown in Figure 3-24 and Figure 3-25.

Figure 3-24 Choose manage remember docks

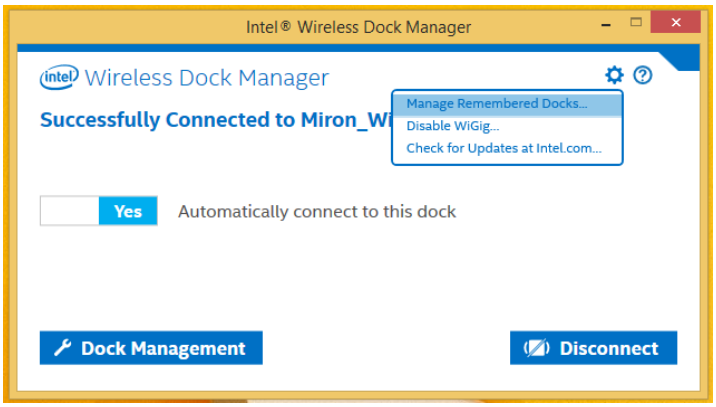
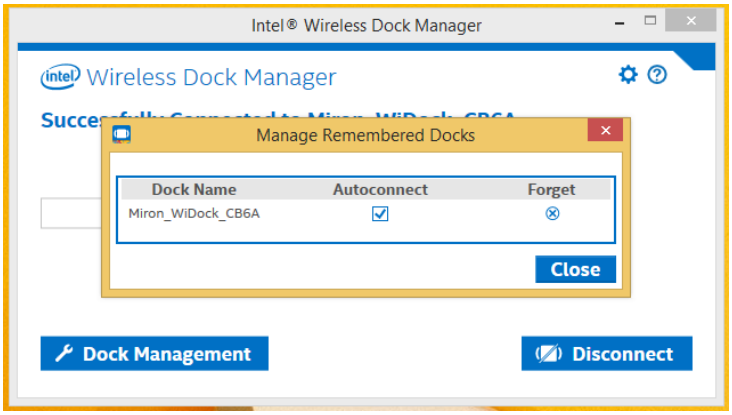


Figure 3-25 Manage dock autoconnect feature



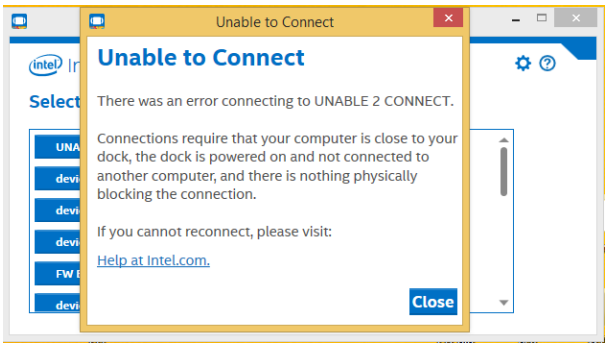
3.6 Notification messages

There are notification messages that inform user about the different application activities, like possible limitations or errors.

3.6.1 Unable to connect

The unable to connect message is displayed if there is an error during the connection or pairing process, as shown in Figure 3-26.

Figure 3-26 Unable to connect



3.6.2 No available docks found

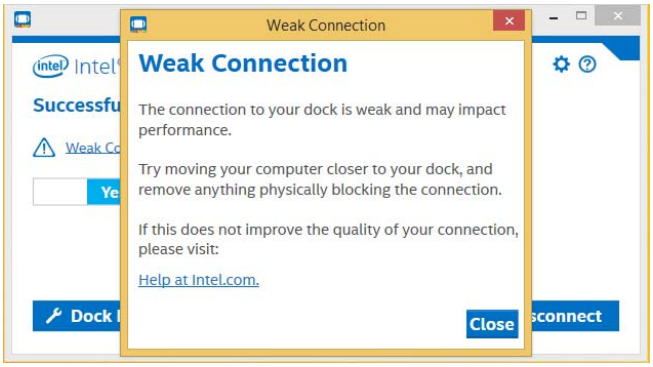
As shown in Figure 3-27, the *no available docks found* message is displayed if scanning was done but no docks have been detected.

Figure 3-27 No docks found

3.6.3 Weak connection

The *weak connection* message is displayed if the connection is weak but connected, as shown in Figure 3-28.

Figure 3-28 Weak connection



3.6.4 WiGig not responding

The *WiGig is not responding* message is displayed if WiGig driver or device is not responding, as shown in Figure 3-29.

Figure 3-29 WiGig not responding

3.6.5 WiGig disabled – critical temperature

The *WiGig is disabled due to overheating* message is displayed if WiGig driver or device is disabled due to a critical temperature error, as shown in Figure 3-30.

Figure 3-30 WiGig disabled due to overheating

3.6.6 WiGig disabled by hardware RF kill switch

The *WiGig is disabled* message is displayed if WiGig driver or device is disabled by the physical radio on/off switch, as shown in Figure 3-31.

Figure 3-31 WiGig disabled by hardware RF Kill switch

3.6.7 WiGig disabled by airplane mode

The *WiGig is disabled* message is displayed if WiGig driver or device is disabled because the device is in airplane mode, as shown in Figure 3-32.

Figure 3-32 WiGig disabled by airplane mode

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4 WiGig Application User Manual for Windows 10*

4.1 User manual

This chapter will be very similar to the previous chapter and will contain the Wigig behavior in Windows 10* OS.

In Windows 10*, the OS will control the network related functionality. This include handling the radio state, scan, connect and manage the profiles. The OS will control this via the setting and the action center pane as will be demonstrate below.

The Intel® Wireless Dock Manager is a dedicated application that runs on the client and allows the user to do all the activities that are not related to network management like manage the dock, get diagnostic info, do FWU etc.

LEDs on the dock, and an OSD (On Screen Display) on the monitor connected to the dock, provide further feedback about the dock status, and assist the user in performing actions.

The activity button on the dock is used in some of the flows (like pairing and connection/disconnection).

4.1.1 Launching the Intel® Wireless Dock Manager

The Intel® Wireless Dock Manager starts automatically with Windows.

To invoke the Intel® Wireless Dock Manager interface, double-click the icon on the desktop, labeled *Intel®* Wireless Wireless *Dock Manager*.

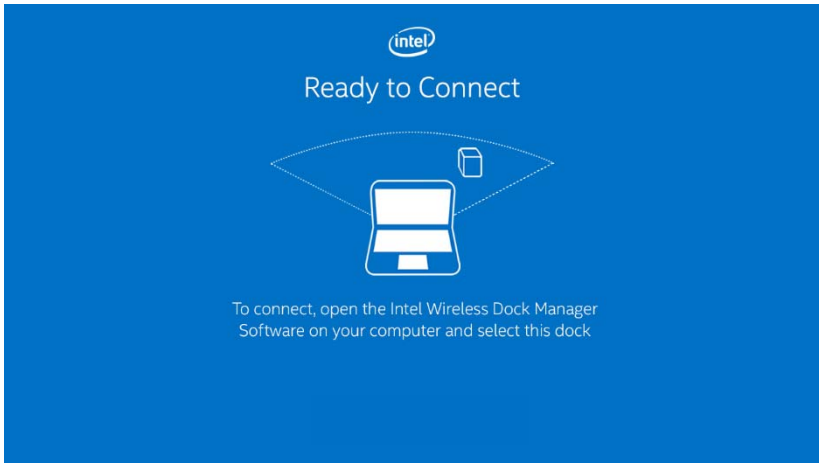
Alternatively, double-click the WiGig tray icon while the device is connected to a dock (the connected icon as shown in Figure 3-1)

The Intel® Wireless Dock Manager application keeps running as an application even if you click the *X* (close window) icon on the application in order to kill it you must use the task manager.

4.1.2 Making the first connection

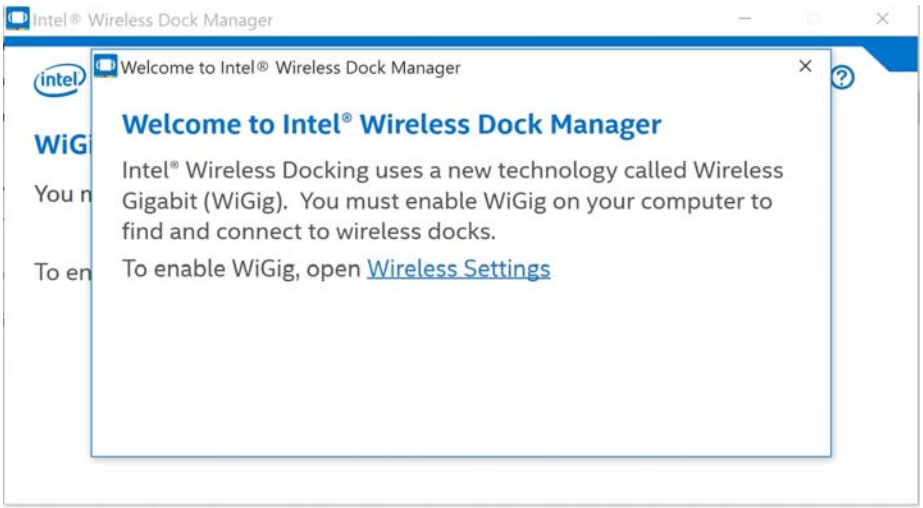
Turn on the power on your dock. When the dock is ready to accept connections, the external monitor will light up and show the welcome OSD screen in Figure 4-1.

Figure 4-1 Welcome OSD screen



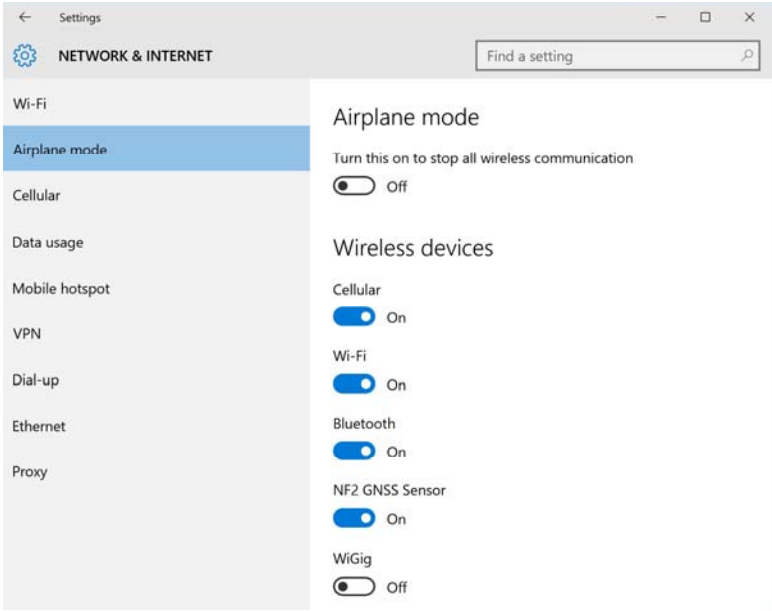
1. This screen remains until the connection is made. After a few minutes of inactivity, the monitor turns off to conserve power. Press the dock activity button to wake up the monitor and continue with the connection.
2. Enable WiGig on your client. WiGig comes disabled out-of-the-box to conserve battery life until the first time WiGig is needed. When the Wireless Dock Manager is launched for the first time, the Welcome screen appears.

Figure 4-2 Welcome screen



3. Clicking on the *Wireless Settings* link will send you to the *OS Airplane mode* page (Figure 4-3). In this page you will be able to turn on (and later off in case you want) the WiGig RF mode in addition to other devices RF state.

Figure 4-3 Network & Internet screen



4. Alternative way to get to this page is via settings: *Network & Internet -> Airplane mode*.
5. Once you set the WiGig radio button to on, you will be able to find docks in the range. In Windows 10* you will not be able to see the scan results in the *Connect* pane and not in the Intel® Wireless Dock Manager.
6. In order to get to the OS Connect pane, you click on the *Action Center* link (Figure 4-4) or press the keyboard shortcut *Win+k* and the Connect pane will open on the right side of the monitor (Figure 4-5).

Figure 4-4 Dock select

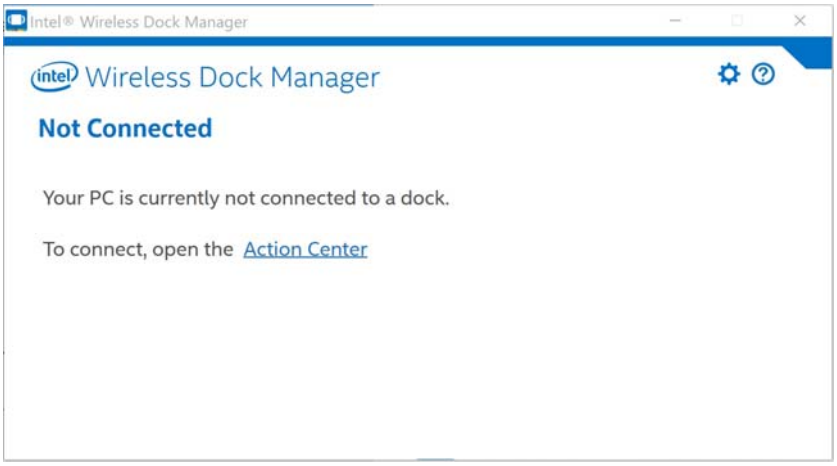
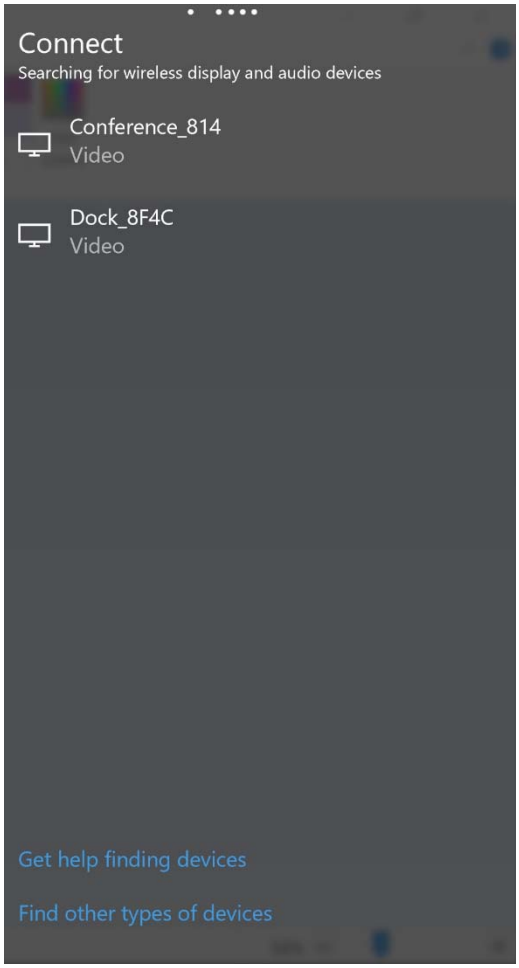


Figure 4-5 Connect pane

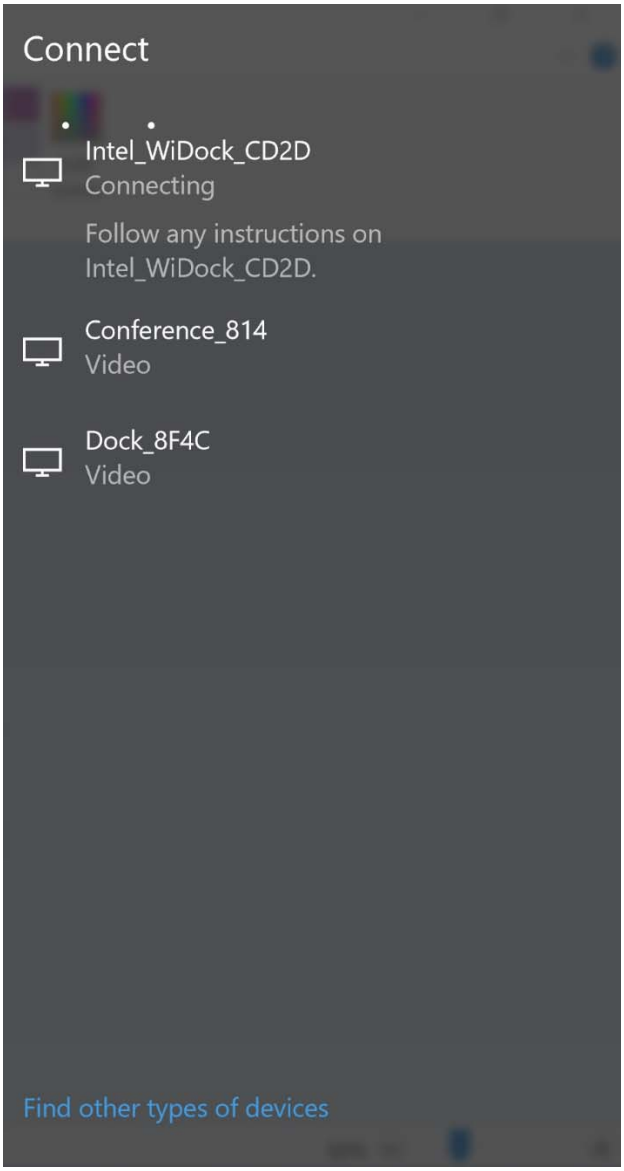


7. Choose the dock you wish to connect to by clicking it in the *Connect* pane.

Note: Since this is the first time you are connecting to this dock, you will need to pair with it. Pairing creates a set of authentication keys that uniquely identify your client and dock pair, and allow them to communicate in a secured, encrypted manner over-the-air.

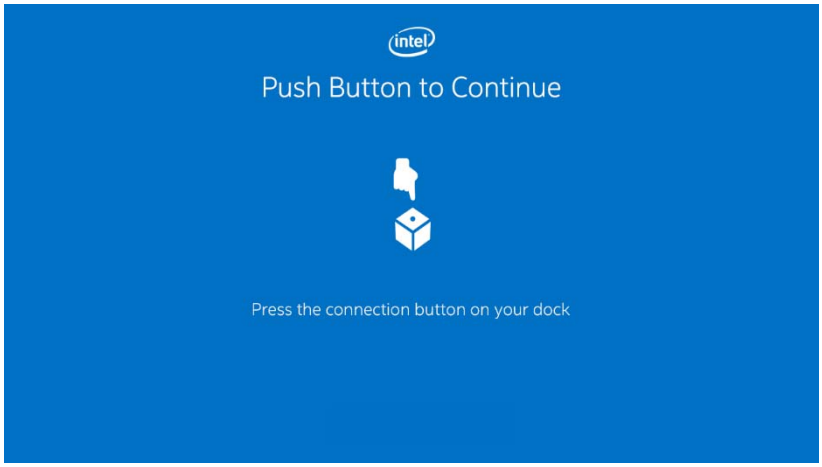
8. After connecting, you will get an instruction in the Connect pane to follow the instructions on the dock Figure 4-6.

Figure 4-6 Connect pane during connecting stage



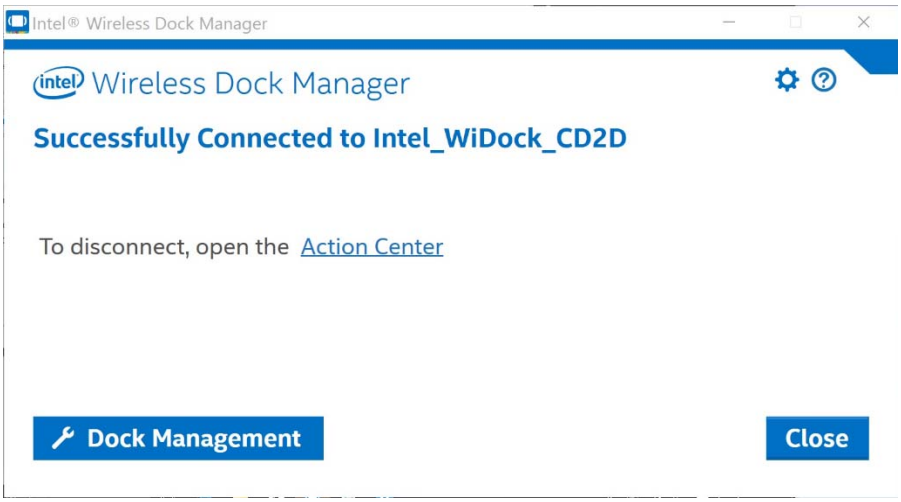
9. A corresponding OSD will appear on the external monitor, as shown in Figure 4-7.
10. Unlike in Win7/8/8.1, you will not see the indication to push the dock button on Intel® Wireless Dock Manager.

Figure 4-7 OSD screen



11. Press the activity button on the dock to complete the pairing process. The *Connected* screen appears shortly after, as shown in Figure 4-8.

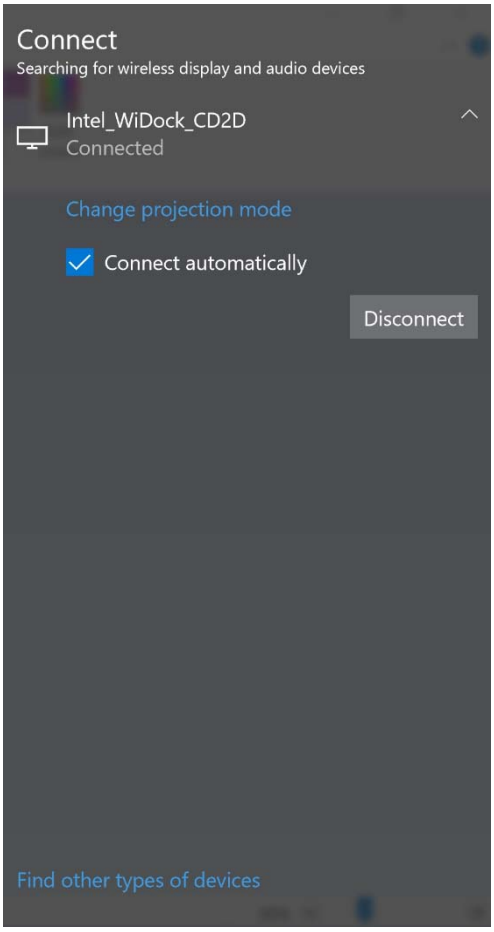
Figure 4-8 Dock Connected screen



Note: A successful connection is also indicated by the dock LED (if available), and the external monitor and USB devices being connected and enumerated on your client (you will hear the Window's gling-gling hot-plug audio cues).

In addition you are also able to see that you are connected via the Connect pane by clicking the *Action Center* link, or by pressing keyboard shortcut *Win+K* as shown in Figure 4-9.

Figure 4-9 Dock connected screen



Congratulations! You have made your first wireless docking connection.

4.1.3 Automatic connection default

This section is not applicable in Win10 as in Win7/8/8.1. Instead in Windows 10* the dock will already be in automatically connect mode.

4.1.4 Automatic connections

If a dock is set to connect automatically, WiGig will attempt to automatically connect to this dock once in range. To this end, WiGig keeps scanning in the background, while consuming very little power.

To connect, simply place your client (assumed to be in S0) near the dock. Within several seconds, WiGig will discover the dock and will connect to it automatically. You do not have to invoke the Wireless Dock Manager, open the lid or take any action, just wait until the external screen comes up and USB devices are enumerated, and you can start working.

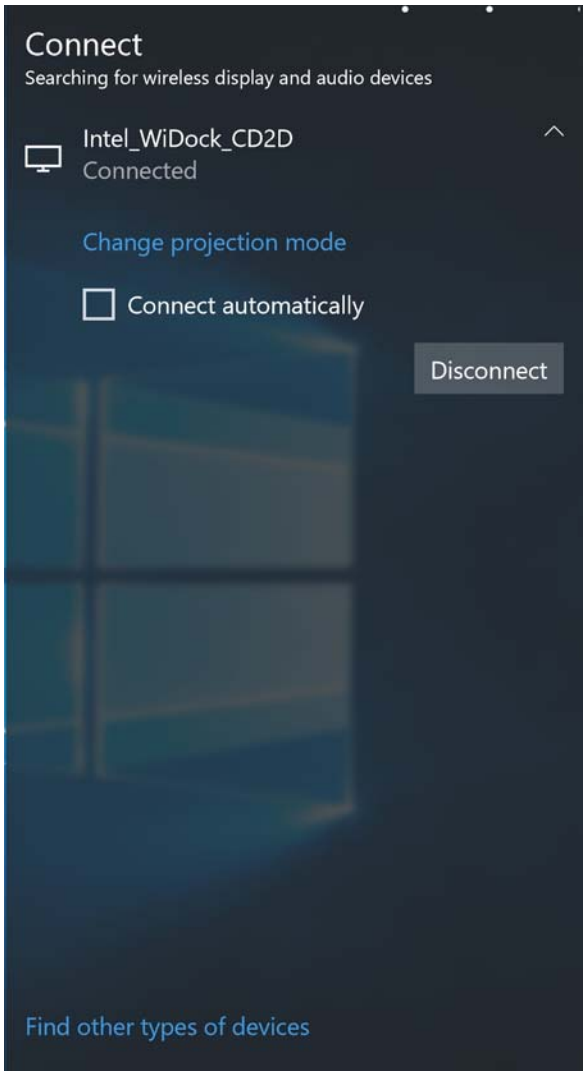
When successfully connected to a dock, the dock LED changes color (color is specific to dock vendor).

Note: For the connection to be fully completed automatically, as described above, the client needs to be powered on and active (such as in S0). If the client is in S3, WiGig will automatically discover the dock, and then you can use the dock button to wake up the

client and complete the docking procedure. See Section 3.1.6 for more details. Ability to wake up the client from the dock is vendor specific and is configured in the BIOS.

You can disable auto-connect by deselecting the *Connect automatically* check box while connected, as shown in Figure 4-10.

Figure 4-10 Disabling the auto-connect setting



You can only change a dock between automatic and manual connection when you are actively connected to the dock.

Once auto-connect is disabled, the client will no longer connect automatically and you will have to manually select the dock from the client, as described in Section 3.1.5.

4.1.5 Manually connecting to a dock

When the dock is defined as manual, the connection is done similarly to the connection flow that was describe above without the stage where the user is requested to push the button.

4.1.6 Automatic connection in S3 (depends on BIOS configuration)

Same as in Section 3.1.6

4.1.7 Automatic connection in connected standby

Same as in Section 3.1.7

4.1.8 Disconnecting from the dock

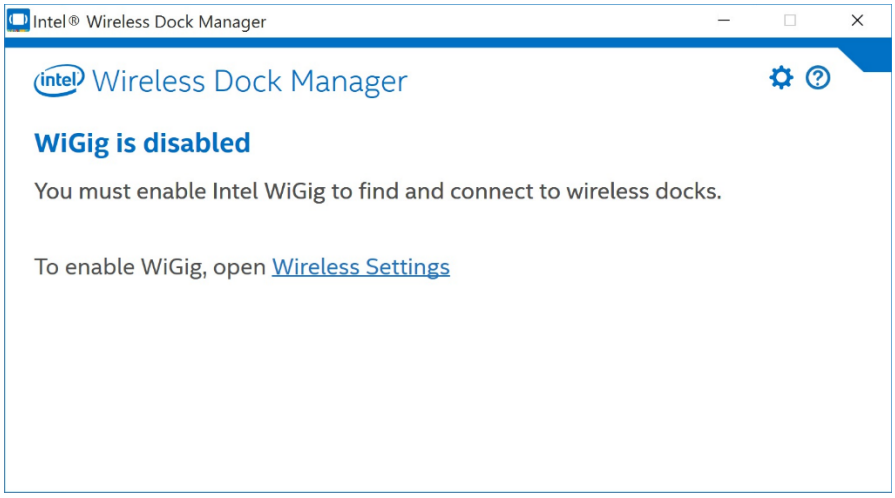
Same as in Section 3.1.8.

The only differentiation is in order to manually disconnect, the user cannot disconnect from the Intel® Wireless Dock Manager but instead has to do it from the *Connect* pane.

4.1.9 Disabling and enabling WiGig

1. In Win10 the ability to disable the WiGig is done only via the OS Airplane mode setting page (*settings-> Network & Internet -> Airplane mode*).
2. When WiGig is disabled, you cannot find and connect to wireless docks; the screen shown in Figure 4-11 comes up in case the Intel® Wireless Dock Manager is open. Disabling minimizes the power consumption of the WiGig radio in the client.

Figure 4-11 WiGig disable confirmation screen



3. To enable WiGig go to the *Airplane mode* setting page by clicking the *Wireless Setting* link or by *settings->Network & Internet -> Airplane mode* and turning on the WiGig.

4.2 Changing dock settings

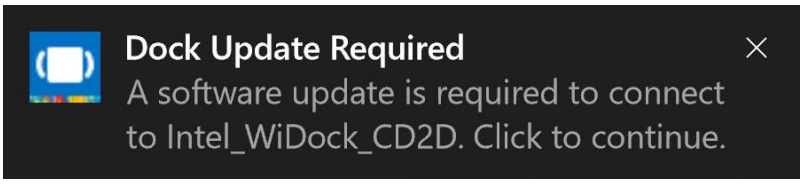
Same as in Section 3.2.

4.3 Dock software update

Your dock software can be upgraded over-the-air from the client.

1. When connecting to the dock, the Wireless Dock Manager might inform the user of mandatory dock software update.
2. On Mandatory dock software updates, you will get a toast notifying that the dock update is required Figure 4-12.

Figure 4-12 Dock update required toast



3. Clicking on this toast will pop up the Intel® Wireless Dock Manager application.
4. From this point forward the process of updating the dock is similar to the process describe in Section 3.3

4.4 Diagnostic information

Same as in Section 4.4.

4.5 Managing docks

User may delete docks he has previously connected to.

1. To delete docks go to *Connected* devices (Settings ->Devices -> Connected devices), click on the dock you want to remove and then press the *Remove device* button, as shown in 4-13 and then approve it as shown in Figure 4-13.

Figure 4-13 Remove device

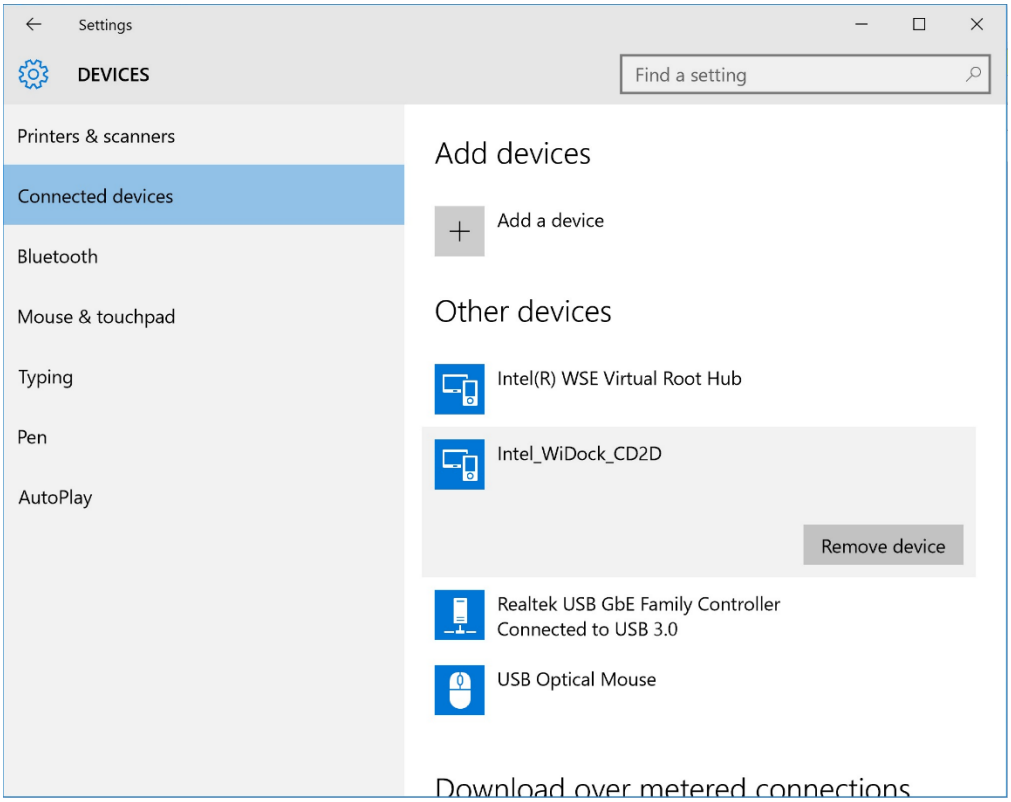


Figure 4-14 Remove Device approval

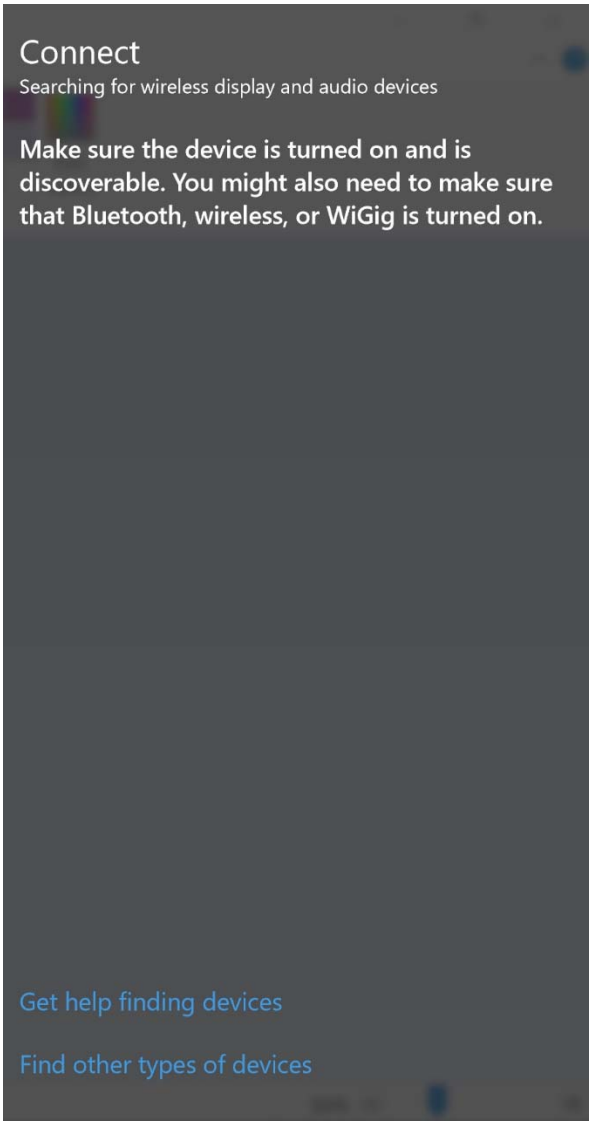
4.6 Notification messages

There are notification messages that inform user about the different application activities, like possible limitations or errors.

4.6.1 Not found

In case no device can be found the *Connect* pane will return with a request to verify that the RF is on. See Figure 4-15.

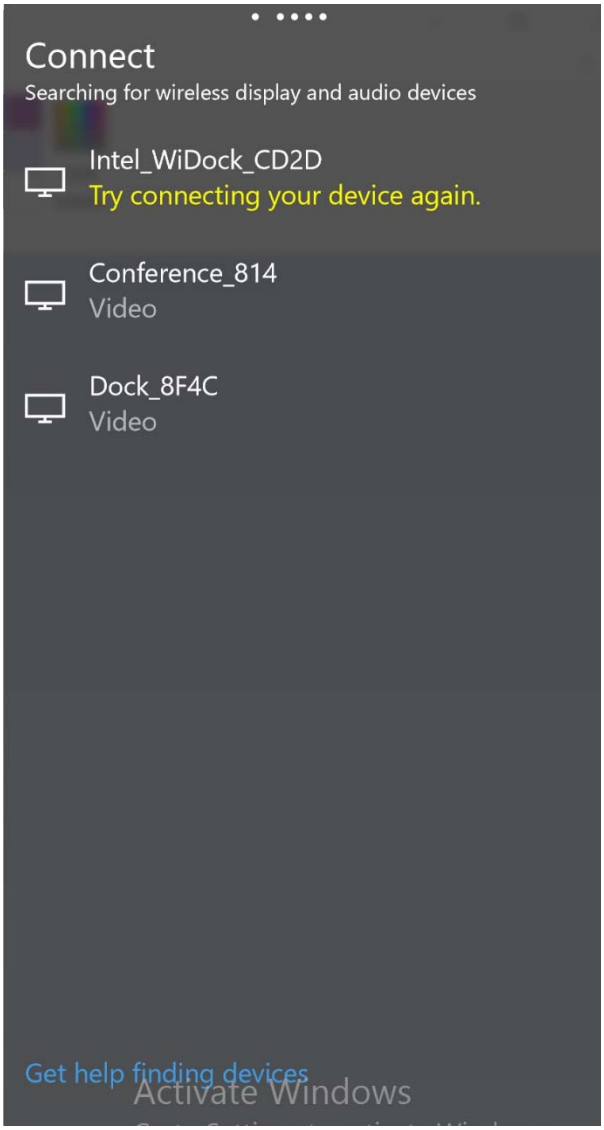
Figure 4-15 Device not found



4.6.2 Try Connecting your device again

In case there was a problem in the pairing flow (before the user has the dock profile) the *Connect* pane will return with an error *Try connecting your device again* Figure 4-16.

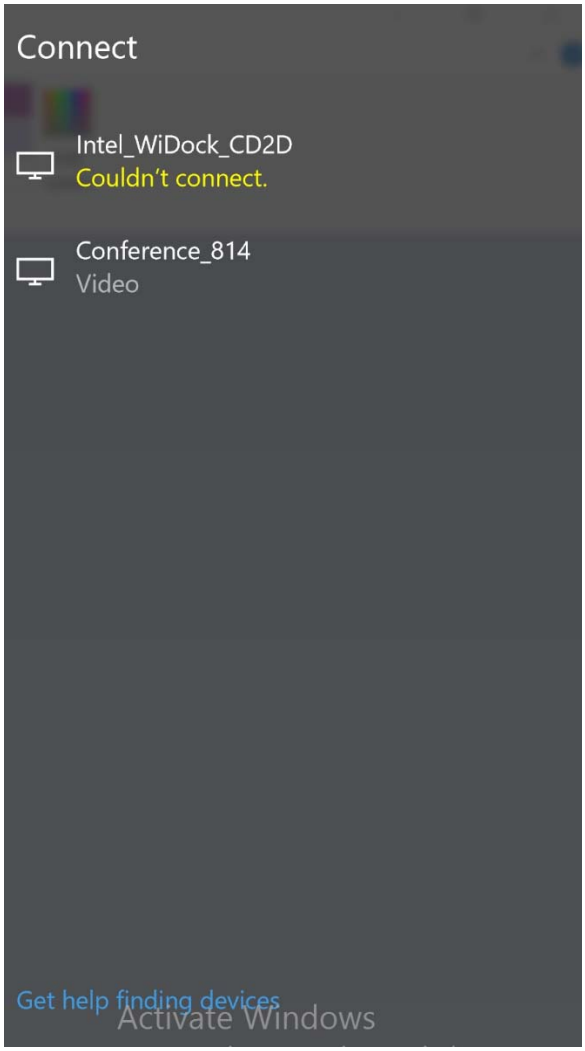
Figure 4-16 Try connecting your device again



4.6.3 Couldn't connect

In case there was a problem in the connecting flow (after the user has the dock profile) the *Connect* pane will return with an error *Couldn't connect* Figure 4-17.

Figure 4-17 Couldn't connect



4.6.4 Weak connection

The *weak connection* toast is displayed if the connection is weak but connected, as shown in Figure 4-18. In addition in case the Intel® Wireless Dock Manager application is open it will notify the user about this state as describe in Figure 4-19.

Figure 4-18 Weak connection toast

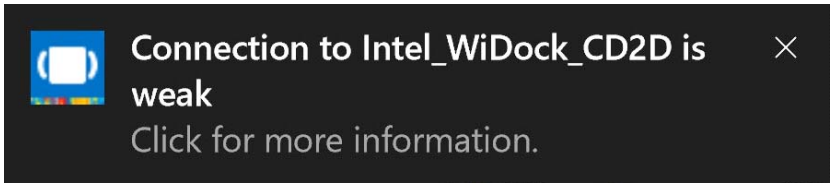
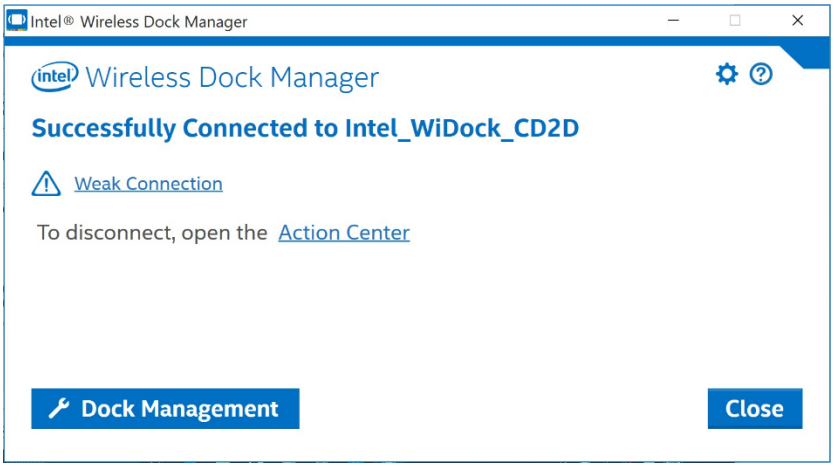


Figure 4-19 Weak connection screen



4.6.5 WiGig disabled – critical temperature

In case the WiGig is disabled due to overheating, toast will be popup Figure 4-20. In addition in case the Intel® Wireless Dock Manager application is open it will notify the user about this state as describe in Figure 4-21.

Figure 4-20 WiGig disabled due to overheating toast

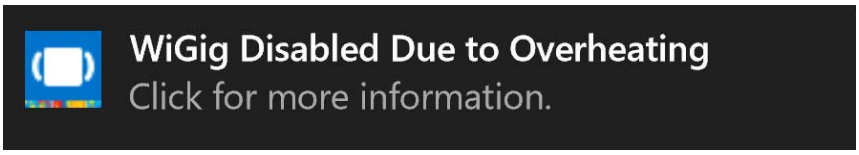
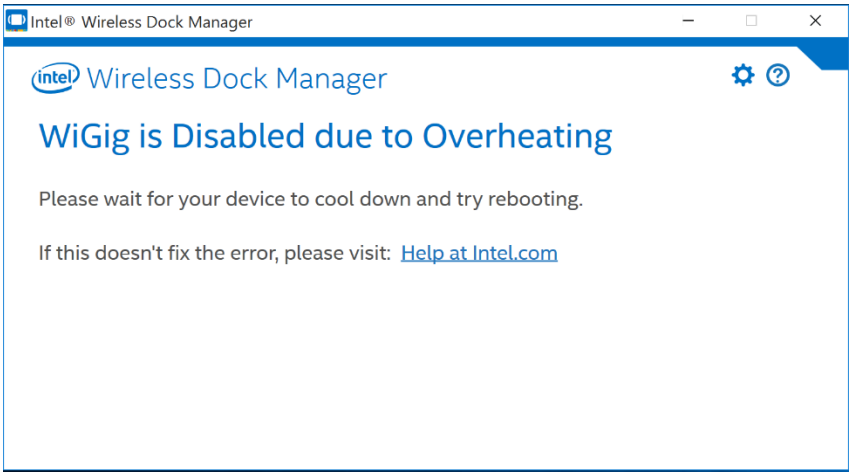


Figure 4-21 WiGig disabled due to overheating screen



§

5 The Wireless Dock and Multiple Displays

5.1 Intel® WiGig A/V wireless capabilities

Intel® WiGig is seen by the Intel® Display Driver as a DP V1.2 Branch device. It advertises its capabilities to the driver using standard DisplayPort V1.2a tools.

The capabilities include A/V bandwidth, as well as other capabilities related to the internal A/V subsystem.

Intel® WiGig HW can support up to two A/V streams. This limitation is advertised to the Intel DisplayPort Driver, which then limits the number of active streams sent over the Intel® WiGig DP interface.

When the user connects three displays to the MST hub at the output of the Intel® WiGig-based dock, only two out of the three displays connected can be active at the same time.

5.1.1 Intel® WiGig DisplayPort Bandwidth and other limitations

The DisplayPort V1.2a standard defines mechanisms that allow branch devices to advertise their capabilities and limitations to the Display Driver. There are two main limitations which may affect the user experience:

1. **DisplayPort Bandwidth (AKA PBN):** Intel® WiGig DP interface operates at 4 × 2.7 gbps speed. This results in an ability to support single display resolutions of up to 2560x1600@60 Hz or Dual Display Resolutions of 1920×1200@60 Hz.

   For example, if the user connects 2 1600p60 capable displays to the dock, it cannot drive the native resolution to both displays due to the DP BW limitation. The Display Driver will remove some of the video modes from one of the displays while allowing native resolution to the 2nd display.

2. **Wireless Branch Device Limitations (AKA CCS):** Intel® WiGig DP interface advertises Wireless Branch Device limitations related to the capabilities of the integrated video Encoders and Decoders.

   Currently the advertised limitations are:

   a. Frame Width <= 2560
   b. Frame Height <= 1600
   c. Max Frame Rate = 60 Hz
   d. Min Frame Rate = 59 Hz
   e. Max Pixel Clock = 268 MHz
   f. RGB: Only color space modes supported
   g. Progressive only modes supported

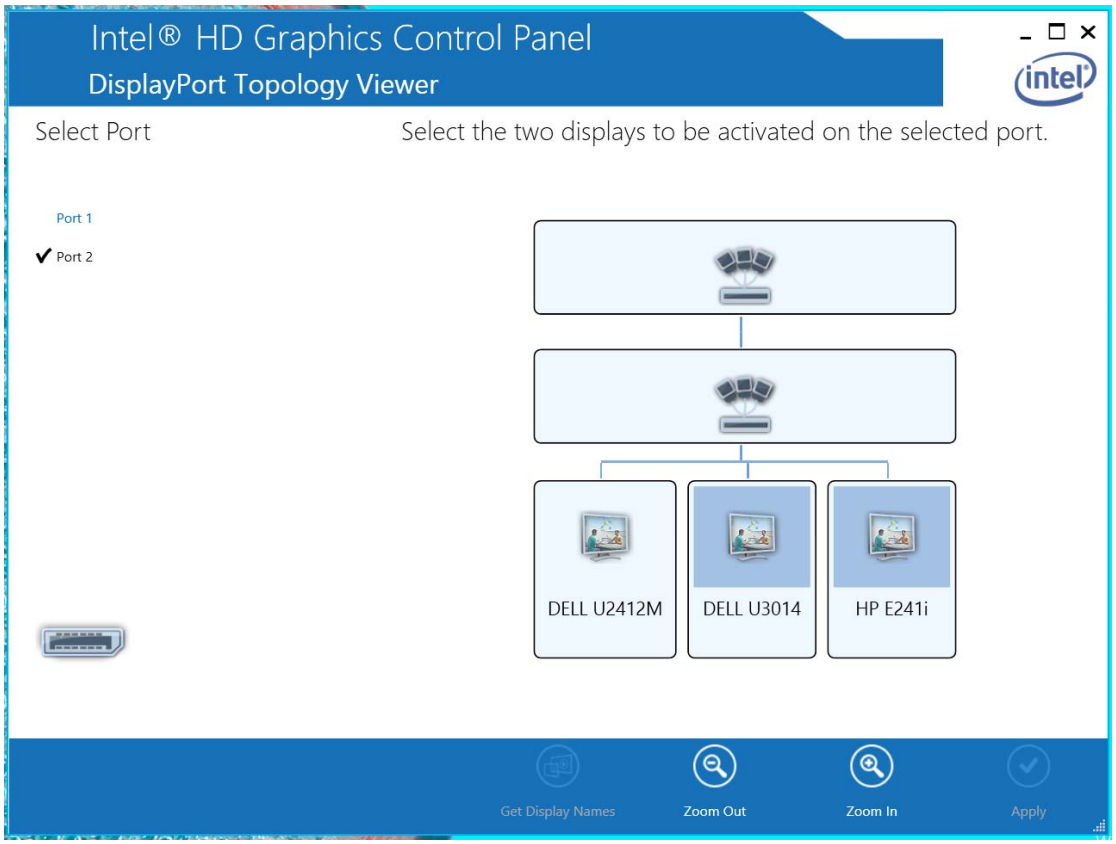
   All display modes not meeting the criteria above will be removed by the display driver and not shown by the Resolution Manager.

5.2 User experience when connecting more than two displays to the wireless dock

The driver initially selects two default displays. These will be the displays connected to the output ports #1 and #2 of the MST hub device. The display connected to port #3 will not be used and will not be seen on the OS resolution manager.

The Intel® Display Driver generates a popup window stating: *DisplayPort Topology Notification. A new DisplayPort Topology has been identified*. Click the popup to open the Intel® HD Graphics control panel's DisplayPort Topology Viewer (see Figure 5-1). The user is requested to select the two displays to be activated for the Intel® WiGig selected port. Selected displays are marked in light-blue.

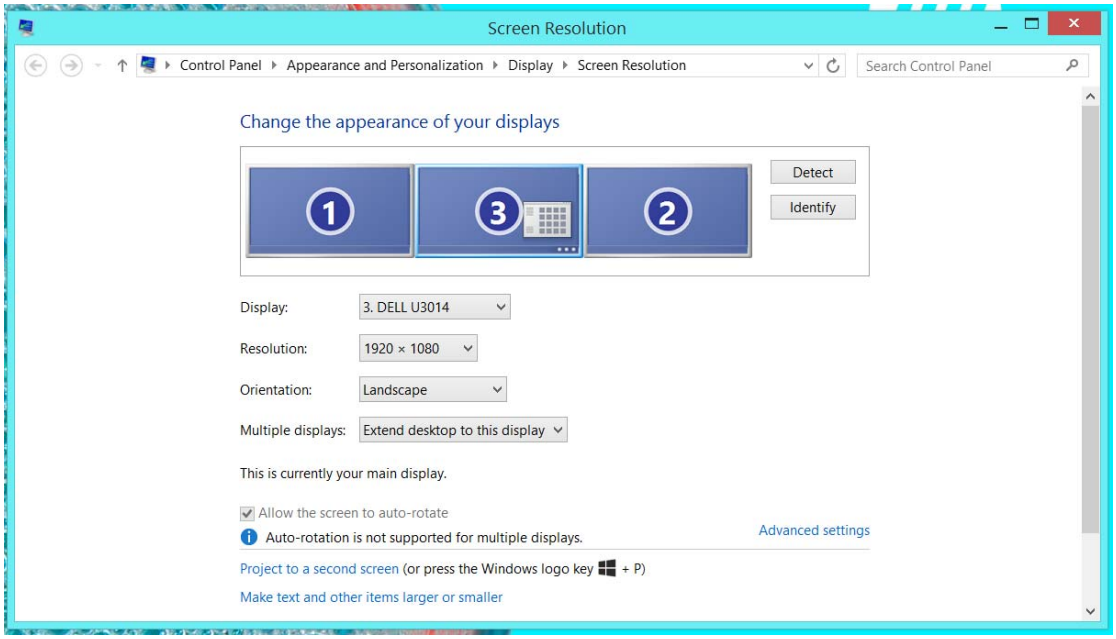
Figure 5-1 DisplayPort topology viewer



Once the user selects the active displays the display driver will re-initiate the A/V link setup process and activate the selected displays.

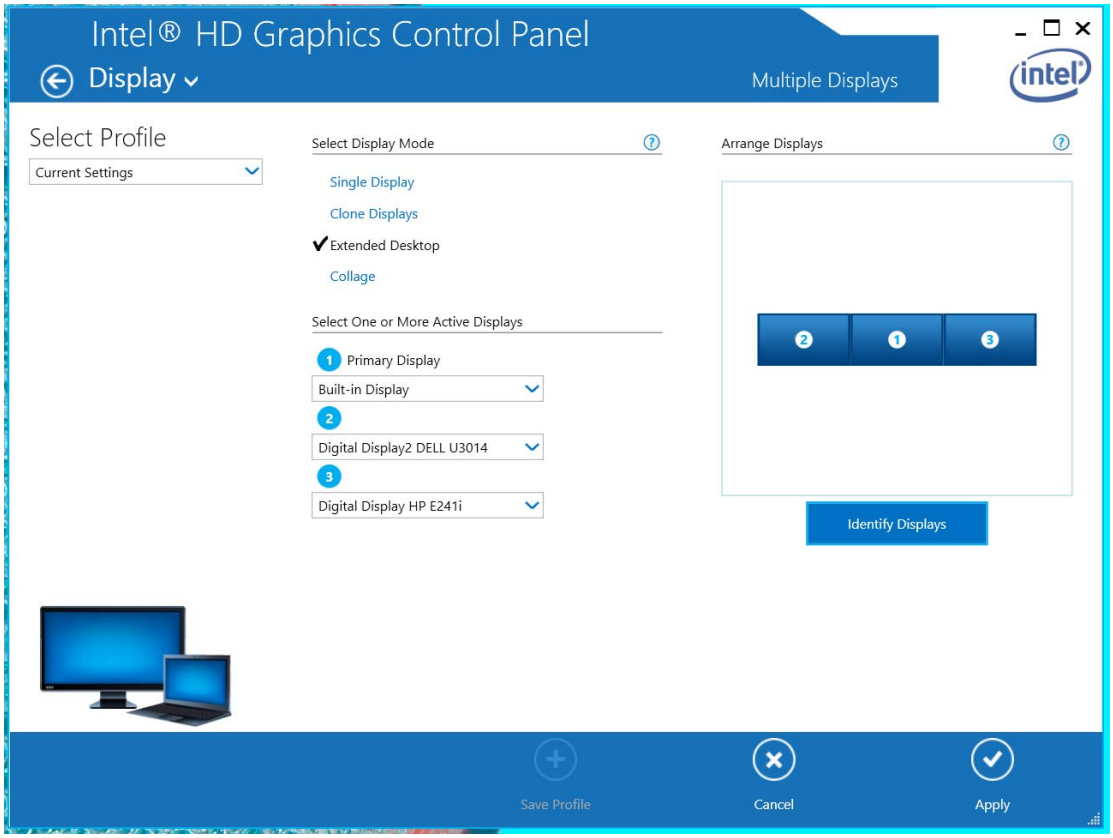
Only the selected displays will be seen on Windows Screen Resolution Manager. The unselected display will not be shown (see Figure 5-2). The user can select the operating mode (duplicate/extend), activate and deactivate the screens using the Windows Screen Resolution Manager.

Figure 5-2 Windows screen resolution manager



The same behavior occurs when the user uses the Intel® Graphics Control Panel Display tab (see Figure 5-3). On this screen only the two displays selected in the Topology Manager will be seen.

Figure 5-3 Graphics control panel



§

Intel® WiFi Adapter Information Guide

This version of Intel® PROSet/Wireless WiFi Software is compatible with the adapters listed below. However, note that newer features provided in this software release are generally not supported for older, legacy adapters.

The following adapters are supported on this release for Windows* 8 and Windows* 8.1 with Windows* 7 drivers from Intel®:

- Intel® Centrino® Wireless-N 100
- Intel® Centrino® Wireless-N 130
- Intel® Centrino® Wireless-N 1000
- Intel® Centrino® Wireless-N 1030
- Intel® Centrino® Advanced-N 6200
- Intel® Centrino® Advanced-N 6230

The following adapters are supported on this release for Windows* 8 with Windows* 8 drivers from Intel®:

- Intel® Centrino® Wireless-N 105
- Intel® Centrino® Wireless-N 135
- Intel® Centrino® Wireless-N 2200
- Intel® Centrino® Wireless-N 2230
- Intel® Centrino® Wireless-N + WiMAX 6150
- Intel® Centrino® Advanced-N 6205
- Intel® Centrino® Advanced-N 6235
- Intel® Centrino® Advanced-N + WiMAX 6250
- Intel® Centrino® Ultimate-N 6300
- Intel® Dual Band Wireless-AC 7260
- Intel® Dual Band Wireless-N 7260
- Intel® Wireless-N 7260
- Intel® Dual Band Wireless-AC 3160
- Intel® Dual Band Wireless-AC 7265
- Intel® Dual Band Wireless-N 7265
- Intel® Wireless-N 7265
- Intel® Tri-Band Wireless-AC 18260

The release for Windows* 8.1 with Windows* 8 drivers from Intel®:

- Intel® Centrino® Wireless-N 105
- Intel® Centrino® Wireless-N 135
- Intel® Centrino® Wireless-N 2200
- Intel® Centrino® Wireless-N 2230
- Intel® Centrino® Wireless-N + WiMAX 6150
- Intel® Centrino® Advanced-N 6205
- Intel® Centrino® Advanced-N 6235
- Intel® Centrino® Advanced-N + WiMAX 6250
- Intel® Centrino® Ultimate-N 6300

The following adapters are supported on this release for Windows* 8.1 with Windows* 8.1 drivers from Intel®:

- Intel® Dual Band Wireless-AC 7260
- Intel® Dual Band Wireless-N 7260
- Intel® Wireless-N 7260
- Intel® Dual Band Wireless-AC 3160
- Intel® Dual Band Wireless-AC 7265
- Intel® Dual Band Wireless-N 7265
- Intel® Wireless-N 7265
- Intel® Tri-Band Wireless-AC 18260

With your WiFi network card, you can access WiFi networks, share files or printers, or even share your Internet connection. All of these features can be explored using a WiFi network in your home or office. This WiFi network solution is designed for both home and business use. Additional users and features can be added as your networking needs grow and change.

This guide contains basic information about Intel adapters. It includes information about several adapter properties that you can set to control and enhance the performance of your adapter with your particular wireless network and environment. Intel® wireless adapters enable fast connectivity without wires for desktop and notebook PCs.

- Adapter Settings
- Regulatory Information
- Specifications
- Important Information
- Support
- Warranty
- Glossary

Depending on the model of your Intel WiFi adapter, your adapter is compatible with 802.11a, 802.11b, 802.11g, and 802.11n (draft 2.0) wireless standards. Operating at 5GHz or 2.4GHz frequency at data rates of up to 450 Mbps, you can now connect your computer to existing high-speed networks that use multiple access points within large or small environments. Your WiFi adapter maintains automatic data rate control according to the access point location and signal strength to achieve the fastest possible connection. All of your wireless network connections are easily managed by the WiFi connection utility. Profiles that are set up through the WiFi connection utility provide enhanced security measures with 802.1X network authentication.

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*Other names and brands may be claimed as the property of others.

Intel Corporation assumes no responsibility for errors or omissions in this document. Nor does Intel make any commitment to update the information contained herein.

"IMPORTANT NOTICE FOR ALL USERS OR DISTRIBUTORS:

Intel wireless LAN adapters are engineered, manufactured, tested, and quality checked to ensure that they meet all necessary local and governmental regulatory agency requirements for the regions that they are designated and/or marked to ship into. Because wireless LANs are generally unlicensed devices that share spectrum with radars, satellites, and other licensed and unlicensed devices, it is sometimes necessary to dynamically detect, avoid, and limit usage to avoid interference with these devices. In many instances Intel is required to provide test data to prove regional and local compliance to regional and governmental regulations before certification or approval to use the product is granted. Intel's wireless LAN's EEPROM, firmware, and software driver are designed to carefully control parameters that affect radio operation and to ensure electromagnetic compliance (EMC). These parameters include, without limitation, RF power, spectrum usage, channel scanning, and human exposure.

For these reasons Intel cannot permit any manipulation by third parties of the software provided in binary format with the wireless LAN adapters (e.g., the EEPROM and firmware). Furthermore, if you use any patches, utilities, or code with the Intel wireless LAN adapters that have been manipulated by an unauthorized party (i.e., patches, utilities, or code (including open source code modifications) which have not been validated by Intel), (i) you will be solely responsible for ensuring the regulatory compliance of the products, (ii) Intel will bear no liability, under any theory of liability for any issues associated with the modified products, including without limitation, claims under the warranty and/or issues arising from regulatory non-compliance, and (iii) Intel will not provide or be required to assist in providing support to any third parties for such modified products.

Note: Many regulatory agencies consider Wireless LAN adapters to be "modules", and accordingly, condition system-level regulatory approval upon receipt and review of test data documenting that the antennas and system

configuration do not cause the EMC and radio operation to be non-compliant."

January 7, 2014

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Adapter Settings

The **Advanced** tab displays the device properties for the WiFi adapter installed on your computer.

How to Access

At the Intel® PROSet/Wireless WiFi Connection Utility, Advanced Menu click **Adapter Settings**. Select the **Advanced** tab.

WiFi Adapter Settings Description

Name	Description
802.11ac Mode (5GHz)	The 802.11ac standard builds on 802.11n standard. 802.11ac Mode delivers up to 867Mbps (theoretical) by increasing channel bandwidth to 80MHz and adding higher density modulation (256 QAM). Select **Enabled** or **Disabled** to set the 802.11ac mode of the WiFi adapter. Enabled is the default setting. This setting applies to 802.11ac capable adapters only.
802.11n Channel Width (2.4 GHz)	Set high throughput channel width to maximize performance. Set the channel width to **Auto** or **20MHz**. Use 20MHz if 802.11n channels are restricted. This setting applies to 802.11n capable adapters only. **NOTE**: This setting *does not apply* to the Intel® Wireless WiFi Link 4965AGN (uses 20 MHz channel width only).
802.11n Channel Width (5.2 GHz)	Set high throughput channel width to maximize performance. Set the channel width to **Auto** or **20MHz**. Use 20MHz if 802.11n channels are restricted. This setting applies to 802.11n capable adapters only. **NOTE**: This setting *does not apply* to the following adapters: • Intel® WiFi Link 1000 • Intel® Wireless WiFi Link 4965AGN
802.11n Mode	The 802.11n standard builds on previous 802.11 standards by adding multiple-input multiple-output (MIMO). MIMO increases data throughput to improve transfer rate. Select **Enabled** or **Disabled** to set the 802.11n mode of the WiFi adapter. Enabled is the default setting. This setting applies to 802.11n capable adapters only. **NOTE**: To achieve transfer rates greater than 54 Mbps on 802.11n connections, WPA2*-AES security must be selected. No security (**None**) can be selected to enable network setup and troubleshooting. An administrator can enable or disable support for high throughput mode to reduce power-consumption or conflicts with other bands or compatibility issues.
Ad Hoc Channel 802.11b/g	Select **Enabled** or **Disabled**.
Ad Hoc QoS Mode	Quality of Service (QoS) control in ad hoc networks. QoS provides prioritization of traffic from the access point over a wireless LAN based on traffic classification. WMM (Wi-Fi Multimedia) is the QoS certification of the Wi-Fi Alliance (WFA). When WMM is enabled, the WiFi adapter uses WMM to support priority tagging and queuing capabilities for Wi-Fi networks. • **WMM Enabled** (Default) • **WMM Disabled**
Bluetooth®	Enable or disable Bluetooth® AMP. AMP stands for alternate MAC/PHY and uses the 802.11 (Wi-

AMP	Fi) as the high-speed transport. If disabled, Bluetooth HS is turned off.
HT Mode / VHT Mode / Disabled	This settings lets you select HT Mode (High Throughput mode), VHT Mode (Very High Throughput Mode) or to disable both modes. HT Mode supports 802.11n compatibility, whereas VHT Mode supports 802.11ac compatibility.
Fat Channel Intolerant	This setting communicates to access points that this WiFi adapter does not prefer 40MHz channels in the 2.4GHz band. The default setting is for this to be turned off (disabled), so that the adapter does not send this notification. If the access point continues to use 40MHz channels, the WiFi adapter will also use 40MHz channels if the 802.11n Channel Width (2.4GHz) setting is AUTO. **NOTE**: This setting *does not apply* to the following adapters: • Intel® Wireless WiFi Link 4965AG_ • Intel® PRO/Wireless 3945ABG Network Connection
Mixed mode protection	Use to avoid data collisions in a mixed 802.11b and 802.11g environment. Request to Send/Clear to Send (RTS/CTS) should be used in an environment where clients may not hear each other. CTS-to-self can be used to gain more throughput in an environment where clients are in close proximity and can hear each other.
Preferred Band	In an environment with other radiating devices nearby (such as microwave ovens, cordless telephones, access points, or client devices), in order to reduce interference you may want prefer the 5GHz band over the 2.4GHz band, or vice-versa. Your choices are: • No Preference • Prefer 2.4GHz band • Prefer 5GHz band Here are the various Wi-Fi bands: • 802.11 legacy - 2.4GHz • 802.11a - 3.7GHz and 5GHz • 802.11b - 2.4GHz • 802.11g - 2.4GHz • 802.11n - 2.4GHz and 5GHz • 802.11ac - 5GHz
Roaming Aggressiveness	This setting lets you define how aggressively your wireless client roams to improve connection to an access point. There are five available settings. • **3. Medium**: This is the default. A balanced setting between not roaming and performance. • **1. Lowest**: Your wireless client will not roam. Only significant link quality degradation causes it to roam to another access point. • **5. Highest**: Your wireless client continuously tracks the link quality. If any degradation occurs, it tries to find and roam to a better access point.
Transmit Power	**Default Setting**: Highest power setting. **Lowest: Minimum Coverage**: Set the adapter to the lowest transmit power. Enables you to expand the number of coverage areas or confine a coverage area. Reduces the coverage area in high traffic areas to improve overall transmission quality and avoids congestion and interference with other devices. **Highest: Maximum Coverage**: Set the adapter to a maximum transmit power level. Select for maximum performance and range in environments with limited additional WiFi radio devices. **NOTE**: The optimal setting is for a user to always set the transmit power at the lowest possible level that is still compatible with the quality of their communication. This allows the maximum number of wireless devices to operate in dense areas and reduce interference with other devices that it shares the same radio spectrum with. **NOTE**: This setting takes effect when either Network (Infrastructure) or Device to Device (ad

	hoc) mode is used.
Wake on Magic Packet	This setting, enabled, wakes the computer from a sleep state when it receives a "magic packet" from a sending computer. The magic packet contains the MAC address of the intended destination computer. Enabling turns on Wake on Magic Packet. Disabling turns off Wake on Magic Packet. Disabling this only disables the magic packet feature, not Wake on Wireless LAN.
Wake on Pattern Match	This feature wakes the computer from a sleep state when a particular wake pattern is received at the adapter. This feature is supported by the Window* 7 and Windows 8. Such patterns typically are: • Wake on new incoming TCP connection for IPv4 and IPv6 (TCP SYN IPv4 and TCP SYN IPv6). • Wake on 802.1x re-authentication packets. Disabling this only disables the pattern match feature, not Wake on Wireless LAN.
Wireless Mode	Select which mode to use for connection to a wireless network: • **802.11a only**: Connect the wireless WiFi adapter to 802.11a networks only. Not applicable for all adapters. • **802.11b only**: Connect the wireless WiFi adapter to 802.11b networks only. Not applicable for all adapters. • **802.11g only**: Connect the wireless WiFi adapter to 802.11g networks only. • **802.11a and 802.11g**: Connect the WiFi adapter to 802.11a and 802.11g networks only. Not applicable for all adapters. • **802.11b and 802.11g**: Connect the WiFi adapter to 802.11b and 802.11g networks only. Not applicable for all adapters. • **802.11a, 802.11b, and 802.11g**: (Default) - Connect to either 802.11a, 802.11b or 802.11g wireless networks. Not applicable for all adapters.
OK	Saves settings and returns to the previous page.
Cancel	Closes and cancels any changes.

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Trademarks and Disclaimers

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Regulatory Information

This section provides regulatory information for the following wireless adapters:

- Intel® Centrino® Wireless-N 100
- Intel® Centrino® Wireless-N 105
- Intel® Centrino® Wireless-N 130
- Intel® Centrino® Wireless-N 135
- Intel® Centrino® Wireless-N 1000
- Intel® Centrino® Wireless-N 1030
- Intel® Centrino® Wireless-N 2200
- Intel® Centrino® Wireless-N 2230
- Intel® Centrino® Wireless-N + WiMAX 6150
- Intel® Centrino® Advanced-N 6200
- Intel® Centrino® Advanced-N 6205
- Intel® Centrino® Advanced-N 6230
- Intel® Centrino® Advanced-N 6235
- Intel® Centrino® Advanced-N + WiMAX 6250
- Intel® Centrino® Ultimate-N 6300
- Intel® Dual Band Wireless-AC 7260
- Intel® Dual Band Wireless-N 7260
- Intel® Wireless-N 7260
- Intel® Dual Band Wireless-AC 3160
- Intel® Dual Band Wireless-AC 7265
- Intel® Dual Band Wireless-N 7265
- Intel® Wireless-N 7265
- Intel® Tri-Band Wireless-AC 18260

egulations and standards in the wireless LAN field (IEEE 802.11 and similar standards), the information provided herein is subject to change. Intel Corporation assumes no responsibility for errors or omissions in this document.

Intel WiFi/WiMAX Wireless Adapters

Information in this section supports the following wireless adapters:

- Intel® Centrino® Wireless-N + WiMAX 6150
- Intel® Centrino® Advanced-N + WiMAX 6250

See Specifications for complete wireless adapter specifications.

NOTE: In this section, all references to the "wireless adapter" refer to all adapters listed above.

The following information is provided:

- Information for the User
- Regulatory Information
- Information for OEMs and Host Integrators

INFORMATION FOR THE USER

Safety Notices

USA FCC Radio Frequency Exposure

The FCC with its action in ET Docket 96-8 has adopted a safety standard for human exposure to radio frequency (RF) electromagnetic energy emitted by FCC certified equipment. The wireless adapter meets the Human Exposure limits

found in OET Bulletin 65, supplement C, 2001, and ANSI/IEEE C95.1, 1992. Proper operation of this radio according to the instructions found in this manual will result in exposure substantially below the FCC's recommended limits.

The following safety precautions should be observed:

- Do not touch or move antenna while the unit is transmitting or receiving.
- Do not hold any component containing the radio such that the antenna is very close or touching any exposed parts of the body, especially the face or eyes, while transmitting.
- Do not operate the radio or attempt to transmit data unless the antenna is connected; this behavior may cause damage to the radio.
- Use in specific environments:
    - The use of wireless adapters in hazardous locations is limited by the constraints posed by the safety directors of such environments.
    - The use of electronic devices equipped with wireless adapters on airplanes is governed by rules for each commercial airline operator.
    - The use of wireless adapters in hospitals is restricted to the limits set forth by each hospital.

Explosive Device Proximity Warning

Warning: Do not operate a portable transmitter (including this wireless adapter) near unshielded blasting caps or in an explosive environment unless the transmitter has been modified to be qualified for such use.

Antenna Warnings

Warning: The wireless adapter is not designed for use with high-gain directional antennas.

Use On Aircraft Caution

Caution: Regulations of commercial airline operators may prohibit airborne operation of certain electronic devices equipped with radio-frequency wireless devices (wireless adapters) because their signals could interfere with critical aircraft instruments.

Other Wireless Devices

Safety Notices for Other Devices in the Wireless Network: See the documentation supplied with wireless adapters or other devices in the wireless network.

Local Restrictions on 802.11a, 802.11b, 802.11g, 802.11n, and 802.16e Radio Usage

Caution: Due to the fact that the frequencies used by 802.11a, 802.11b, 802.11g, 802.11n, and 802.16e wireless LAN devices may not yet be harmonized in all countries, 802.11a, 802.11b, 802.11g, 802.11n, and 802.16e products are designed for use only in specific countries, and are not allowed to be operated in countries other than those of designated use. As a user of these products, you are responsible for ensuring that the products are used only in the countries for which they were intended and for verifying that they are configured with the correct selection of frequency and channel for the country of use. The device transmit power control (TPC) interface is part of the Intel® PROSet/Wireless WiFi Connection Utility Software. Operational restrictions for Equivalent Isotropic Radiated Power (EIRP) are provided by the system manufacturer. Any deviation from the permissible power and frequency settings for the country of use is an infringement of national law and may be punished as such.

Wireless Interoperability

The wireless adapter is designed to be interoperable with other wireless LAN products that are based on direct sequence spread spectrum (DSSS) radio technology and to comply with the following standards:

- IEEE Std. 802.11b compliant Standard on Wireless LAN
- IEEE Std. 802.11g compliant Standard on Wireless LAN
- IEEE Std. 802.11a compliant Standard on Wireless LAN
- IEEE Std. 802.11n draft 2.0 compliant on Wireless LAN

IEEE 802.16e-2005 Wave 2 compliant
- Wireless Fidelity certification, as defined by the Wi-Fi Alliance
- WiMAX certification as defined by the WiMAX Forum

The Wireless Adapter and Your Health

The wireless adapter, like other radio devices, emits radio frequency electromagnetic energy. The level of energy emitted by the wireless adapter, however, is less than the electromagnetic energy emitted by other wireless devices such as mobile phones. The wireless adapter operates within the guidelines found in radio frequency safety standards and recommendations. These standards and recommendations reflect the consensus of the scientific community and result from deliberations of panels and committees of scientists who continually review and interpret the extensive research literature. In some situations or environments, the use of the wireless adapter may be restricted by the proprietor of the building or responsible representatives of the applicable organization. Examples of such situations may include:

- Using the wireless adapter on board airplanes, or
- Using the wireless adapter in any other environment where the risk of interference with other devices or services is perceived or identified as being harmful.

If you are uncertain of the policy that applies to the use of wireless adapters in a specific organization or environment (an airport, for example), you are encouraged to ask for authorization to use the adapter before you turn it on.

REGULATORY INFORMATION

USA - Federal Communications Commission (FCC)

This wireless adapter is restricted to indoor use due to its operation in the 5.15 to 5.25 and 5.470 to 5.75GHz frequency ranges. FCC requires this wireless adapter to be used indoors for the frequency ranges 5.15 to 5.25GHz and 5.470 to 5.75GHz to reduce the potential for harmful interference to co-channel mobile satellite systems. No configuration controls are provided for Intel® wireless adapters allowing any change in the frequency of operations outside the FCC grant of authorization for U.S. operation according to Part 15.407 of the FCC rules.

- Intel® wireless adapters are intended for OEM integrators only.
- Intel® wireless adapters cannot be co-located with any other transmitter unless approved by the FCC.

This wireless adapter complies with Part 15 of the FCC Rules. Operation of the device is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference that may cause undesired operation.

Class B Device Interference Statement

This wireless adapter has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This wireless adapter generates, uses, and can radiate radio frequency energy. If the wireless adapter is not installed and used in accordance with the instructions, the wireless adapter may cause harmful interference to radio communications. There is no guarantee, however, that such interference will not occur in a particular installation. If this wireless adapter does cause harmful interference to radio or television reception (which can be determined by turning the equipment off and on), the user is encouraged to try to correct the interference by taking one or more of the following measures:

- Reorient or relocate the receiving antenna of the equipment experiencing the interference.
- Increase the distance between the wireless adapter and the equipment experiencing the interference.
- Connect the computer with the wireless adapter to an outlet on a circuit different from that to which the equipment experiencing the interference is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NOTE: The adapter must be installed and used in strict accordance with the manufacturer's instructions

as described in the user documentation that comes with the product. Any other installation or use will violate FCC Part 15 regulations.

Safety Approval Considerations

This device has been safety approved as a component and is for use only in complete equipment where the acceptability of the combination is determined by the appropriate safety agencies. When installed, consideration must be given to the following:

- It must be installed into a compliant host device meeting the requirement of UL/EN/IEC 60950-1 2nd edition including the general provisions of enclosure design 1.6.2 and specifically paragraph 1.2.6.2 (Fire Enclosure).
- The device shall be supplied by a SELV source when installed in the end-use equipment.
- A heating test shall be considered in the end-use product for meeting the requirement of UL/EN/IEC 60950-1 2nd edition.

Low Halogen

Applies only to brominated and chlorinated flame retardants (BFRs/CFRs) and PVC in the final product. Intel components as well as purchased components on the finished assembly meet JS-709 requirements, and the PCB / substrate meet IEC 61249-2-21 requirements. The replacement of halogenated flame retardants and/or PVC may not be better for the environment.

Japan

5GHz 帯は室内でのみ使用のこと

Korea

해당 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없음.
해당 무선 설비는 5150-5250MHz 대역에서 실내에서만 사용할 수 있음.

Mexico

La operación de este equipo está sujeta a las siguientes dos condiciones: (1) es posible que este equipo o dispositivo no cause interferencia perjudicial y (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Taiwan

第十二條

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條

低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
前項合法通信，指依電信法規定作業之無線電通信。
低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

在**5.25-5.35** 秭赫頻帶內操作之無線資訊傳輸設備　限於室內使用。

Radio Approvals

To determine whether you are allowed to use your wireless network device in a specific country, please check to see if the radio type number that is printed on the identification label of your device is listed in the manufacturer's OEM Regulatory Guidance document.

Modular Regulatory Certification Country Markings

A list of countries requiring regulatory markings is available. Note that the lists include only countries requiring marking but not all certified countries. To find the regulatory country marking information for your adapter, perform these steps:

1. Open this web site: http://www.intel.com/support/wireless/wlan/
2. Click on the *link for your adapter*.
3. Click **Document and Guides**.
4. Under **Regulatory Information**, click Regulatory documents *for your adapter*.

Regulatory ID

USA: Model 7265D2W, FCC ID: PD97265D2

Canada: Model 7265D2W &7265D2W AN, IC: 1000M-7265D2

INFORMATION FOR OEMs and HOST INTEGRATORS

The guidelines described within this document are provided to OEM integrators installing Intel® wireless adapters in notebook and tablet PC host platforms. Adherence to these requirements is necessary to meet the conditions of compliance with FCC rules, including RF exposure. When all antenna type and placement guidelines described herein are fulfilled the Intel® wireless adapters may be incorporated into notebook and tablet PC host platforms with no further restrictions. If any of the guidelines described herein are not satisfied it may be necessary for the OEM or integrator to perform additional testing and/or obtain additional approval. The OEM or integrator is responsible to determine the required host regulatory testing and/or obtaining the required host approvals for compliance.

- Intel® wireless adapters are intended for OEMs and host integrators only.
- The Intel® wireless adapter FCC Grant of Authorization describes any limited conditions of modular approval.
- The Intel® wireless adapters must be operated with an access point that has been approved for the country of operation.
- Changes or modification to Intel® wireless adapters by OEMs, integrators or other third parties is not

permitted. Any changes or modification to Intel® wireless adapters by OEMs, integrators or other third parties will void authorization to operate the adapter.

Antenna Type and Gains

Only antennas of the same type and with equal or less gains as shown below may be used with the Intel® wireless adapters. Other types of antennas and/or higher gain antennas may require additional authorization for operation.

Antenna Type	Antenna Location (Main/Aux	2.4GHz Peak Gain in dBi*	2.6GHz Peak Gain in dBi*	5.2GHz Peak Gain in dBi*	5.5GHz Peak Gain in dBi*	5.7GHz Peak Gain in dBi*
PIFA	Main					
	Aux	3.24	3.47	3.73	4.77	4.77
	MIMO					
*All antenna gains include cable loss.						

Antenna Placement Within the Host Platform

To ensure RF exposure compliance the antenna(s) used with the Intel® wireless adapters must be installed in notebook or tablet PC host platforms to provide a minimum separation distance from all persons, in all operating modes and orientations of the host platform, with strict adherence to the table below. The antenna separation distance applies to both horizontal and vertical orientation of the antenna when installed in the host system.

Intel® Wireless Adapter	Minimum required antenna-to-user separation distance
Intel® Centrino® Wireless-N + WiMAX 6150	18 mm
Intel® Centrino® Wireless-N + WiMAX 6350	17 mm

Simultaneous Transmission of Intel® Wireless Adapters with Other Integrated or Plug-In Transmitters

Based upon FCC Knowledge Database publication number 616217 D03 Supplement https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?id=33240&switch=P, when there are multiple transmitting devices installed in a host device, an RF exposure transmitting assessment shall be performed to determine the necessary application and test requirements. OEM integrators must identify all possible combinations of simultaneous transmission configurations for all transmitters and antennas installed in the host system. This includes transmitters installed in the host as mobile devices (>20 cm separation from user) and portable devices (<20 cm separation from user). OEM integrators should consult the actual FCC KDB 616217 D03 Supplement document for all details in making this assessment to determine if any additional requirements for testing or FCC approval is necessary.

Information To Be Supplied to the End User by the OEM or Integrator

The following regulatory and safety notices must be published in documentation supplied to the end user of the product or system incorporating the Intel® wireless adapter, in compliance with local regulations. Host system must be labeled with "Contains FCC ID: XXXXXXXX", FCC ID displayed on label.

The Intel® wireless adapter must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. Intel Corporation is not responsible for any radio or television interference caused by unauthorized modification of the devices included with the wireless adapter kit or the substitution or attachment of connecting cables and equipment other than that specified by Intel Corporation. The correction of interference caused by such unauthorized modification, substitution or attachment is the responsibility of the user. Intel Corporation and authorized resellers or distributors are not liable for any damage or

violation of government regulations that may arise from the user failing to comply with these guidelines.

Local Restriction of 802.11a, 802.11b, 802.11g, 802.11n, and 802.11e Radio Usage

The following statement on local restrictions must be published as part of the compliance documentation for all 802.11a, 802.11b, 802.11g and 802.11n products.

⚠ **Caution**: Due to the fact that the frequencies used by 802.11a, 802.11b, 802.11g, 802.11n, and 802.16e wireless LAN devices may not yet be harmonized in all countries, 802.11a, 802.11b, 802.11g, 802.11n, and 802.16e products are designed for use only in specific countries, and are not allowed to be operated in countries other than those of designated use. As a user of these products, you are responsible for ensuring that the products are used only in the countries for which they were intended and for verifying that they are configured with the correct selection of frequency and channel for the country of use. Any deviation from the permissible power and frequency settings for the country of use is an infringement of national law and may be punished as such.

Intel WiFi Adapters, 802.11n Compliant

The information in this section applies to the following products:

- Intel® Centrino® Wireless-N 100
- Intel® Centrino® Wireless-N 105
- Intel® Centrino® Wireless-N 130
- Intel® Centrino® Wireless-N 135
- Intel® Centrino® Wireless-N 1000
- Intel® Centrino® Wireless-N 1030
- Intel® Centrino® Wireless-N 2200
- Intel® Centrino® Wireless-N 2230
- Intel® Centrino® Advanced-N 6200
- Intel® Centrino® Advanced-N 6205
- Intel® Centrino® Advanced-N 6230
- Intel® Centrino® Advanced-N 6235
- Intel® Centrino® Ultimate-N 6300
- Intel® Dual Band Wireless-AC 7260
- Intel® Dual Band Wireless-N 7260
- Intel® Wireless-N 7260
- Intel® Dual Band Wireless-AC 3160
- Intel® Dual Band Wireless-AC 7265
- Intel® Dual Band Wireless-N 7265
- Intel® Wireless-N 7265
- Intel® Tri-Band Wireless-AC 18260

See s adapter specifications.

NOTE: In this section, all references to the "wireless adapter" refer to all adapters listed above.

The following information is provided:

- Information for the User
- Regulatory Information
- Information for OEMs and Host Integrators
- Statements of European Compliance

INFORMATION FOR THE USER

Safety Notices

USA FCC Radio Frequency Exposure

The FCC with its action in ET Docket 96-8 has adopted a safety standard for human exposure to radio frequency (RF) electromagnetic energy emitted by FCC certified equipment. The wireless adapter meets the Human Exposure limits found in OET Bulletin 65, supplement C, 2001, and ANSI/IEEE C95.1, 1992. Proper operation of this radio according to the instructions found in this manual will result in exposure substantially below the FCC's recommended limits.

The following safety precautions should be observed:

- Do not touch or move antenna while the unit is transmitting or receiving.
- Do not hold any component containing the radio such that the antenna is very close or touching any exposed parts of the body, especially the face or eyes, while transmitting.
- Do not operate the radio or attempt to transmit data unless the antenna is connected; this behavior may cause damage to the radio.
- Use in specific environments:
    - The use of wireless adapters in hazardous locations is limited by the constraints posed by the safety directors of such environments.
    - The use of wireless adapters on airplanes is governed by the Federal Aviation Administration (FAA).
    - The use of wireless adapters in hospitals is restricted to the limits set forth by each hospital.

Explosive Device Proximity Warning

Warning: Do not operate a portable transmitter (including this wireless adapter) near unshielded blasting caps or in an explosive environment unless the transmitter has been modified to be qualified for such use.

Antenna Warnings

Warning: The wireless adapter is not designed for use with high-gain directional antennas.

Use On Aircraft Caution

Caution: Regulations of commercial airline operators may prohibit airborne operation of certain electronic devices equipped with radio-frequency wireless devices (wireless adapters) because their signals could interfere with critical aircraft instruments.

Other Wireless Devices

Safety Notices for Other Devices in the Wireless Network: See the documentation supplied with wireless adapters or other devices in the wireless network.

Local Restrictions on 802.11a, 802.11b, 802.11g, 802.11n, and 802.11ac Radio Usage

Caution: Due to the fact that the frequencies used by 802.11a, 802.11b, 802.11g, 802.11n, and 802.11ac wireless LAN devices may not yet be harmonized in all countries, 802.11a, 802.11b, 802.11g and 802.11n products are designed for use only in specific countries, and are not allowed to be operated in countries other than those of designated use. As a user of these products, you are responsible for ensuring that the products are used only in the countries for which they were intended and for verifying that they are configured with the correct selection of frequency and channel for the country of use. The device transmit power control (TPC) interface is part of the Intel® PROSet/Wireless WiFi Connection Utility Software. Operational restrictions for Equivalent Isotropic Radiated Power (EIRP) are provided by the system manufacturer. Any deviation from the permissible power and frequency settings for the country of use is an infringement of national law and may be punished as such.

Wireless Interoperability

The wireless adapter is designed to be interoperable with other wireless LAN products that are based on direct sequence spread spectrum (DSSS) radio technology and to comply with the following standards:

- IEEE Std. 802.11b compliant Standard on Wireless LAN
- IEEE Std. 802.11g compliant Standard on Wireless LAN
- IEEE Std. 802.11a compliant Standard on Wireless LAN

IEEE Std. 802.11n compliant Standard on Wireless LAN
- IEEE Std. 802.11ac draft compliant on Wireless LAN
- Wireless Fidelity certification, as defined by the Wi-Fi Alliance

The Wireless Adapter and Your Health

The wireless adapter, like other radio devices, emits radio frequency electromagnetic energy. The level of energy emitted by the wireless adapter, however, is less than the electromagnetic energy emitted by other wireless devices such as mobile phones. The wireless adapter operates within the guidelines found in radio frequency safety standards and recommendations. These standards and recommendations reflect the consensus of the scientific community and result from deliberations of panels and committees of scientists who continually review and interpret the extensive research literature. In some situations or environments, the use of the wireless adapter may be restricted by the proprietor of the building or responsible representatives of the applicable organization. Examples of such situations may include:

- Using the wireless adapter on board airplanes, or
- Using the wireless adapter in any other environment where the risk of interference with other devices or services is perceived or identified as being harmful.

If you are uncertain of the policy that applies to the use of wireless adapters in a specific organization or environment (an airport, for example), you are encouraged to ask for authorization to use the adapter before you turn it on.

REGULATORY INFORMATION

USA - Federal Communications Commission (FCC)

This wireless adapter is restricted to indoor use due to its operation in the 5.15 to 5.25 and 5.470 to 5.75GHz frequency ranges. FCC requires this wireless adapter to be used indoors for the frequency ranges 5.15 to 5.25GHz and 5.470 to 5.75GHz to reduce the potential for harmful interference to co-channel mobile satellite systems. No configuration controls are provided for Intel® wireless adapters allowing any change in the frequency of operations outside the FCC grant of authorization for U.S. operation according to Part 15.407 of the FCC rules.

- Intel® wireless adapters are intended for OEM integrators only.
- Intel® wireless adapters cannot be co-located with any other transmitter unless approved by the FCC.

This wireless adapter complies with Part 15 of the FCC Rules. Operation of the device is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference that may cause undesired operation.

NOTE: The radiated output power of the adapter is far below the FCC radio frequency exposure limits. Nevertheless, the adapter should be used in such a manner that the potential for human contact during normal operation is minimized. To avoid the possibility of exceeding the FCC radio frequency exposure limits, you should keep a distance of at least 20cm between you (or any other person in the vicinity), or the minimum separation distance as specified by the FCC grant conditions, and the antenna that is built into the computer. Details of the authorized configurations can be found at http://www.fcc.gov/oet/ea/ by entering the FCC ID number on the device.

Class B Device Interference Statement

This wireless adapter has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This wireless adapter generates, uses, and can radiate radio frequency energy. If the wireless adapter is not installed and used in accordance with the instructions, the wireless adapter may cause harmful interference to radio communications. There is no guarantee, however, that such interference will not occur in a particular installation. If this wireless adapter does cause harmful interference to radio or television reception (which can be determined by turning the equipment off and on), the user is encouraged to try to correct the interference by taking one or more of the following measures:

- Reorient or relocate the receiving antenna of the equipment experiencing the interference.
- Increase the distance between the wireless adapter and the equipment experiencing the interference.
- Connect the computer with the wireless adapter to an outlet on a circuit different from that to which the equipment experiencing the interference is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NOTE: The adapter must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. Any other installation or use will violate FCC Part 15 regulations.

Safety Approval Considerations

This device has been safety approved as a component and is for use only in complete equipment where the acceptability of the combination is determined by the appropriate safety agencies. When installed, consideration must be given to the following:

- It must be installed into a compliant host device meeting the requirement of UL/EN/IEC 60950-1 2nd edition including the general provisions of enclosure design 1.6.2 and specifically paragraph 1.2.6.2 (Fire Enclosure).
- The device shall be supplied by a SELV source when installed in the end-use equipment.
- A heating test shall be considered in the end-use product for meeting the requirement of UL/EN/IEC 60950-1 2nd edition.

Low Halogen

Applies only to brominated and chlorinated flame retardants (BFRs/CFRs) and PVC in the final product. Intel components as well as purchased components on the finished assembly meet JS-709 requirements, and the PCB / substrate meet IEC 61249-2-21 requirements. The replacement of halogenated flame retardants and/or PVC may not be better for the environment.

Canada – Industry Canada (IC)

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil se conforme aux normes Canada d'Industrie de RSS permis-exempt. L'utilisation est assujetti aux deux conditions suivantes: (1) cet appareil ne peut pas causer d'interférences, et (2) cet appareil doit accepter des interférences , y compris des interférences qui peuvent causer desopérations non désirées de l'appareil.

Caution: When using IEEE 802.11a wireless LAN, this product is restricted to indoor use due to its operation in the 5.15- to 5.25-GHz frequency range. Industry Canada requires this product to be used indoors for the frequency range of 5.15GHz to 5.25GHz to reduce the potential for harmful interference to co-channel mobile satellite systems. High power radar is allocated as the primary user of the 5.25- to 5.35-GHz and 5.65 to 5.85-GHz bands. These radar stations can cause interference with and/or damage to this device. The maximum allowed antenna gain for use with this device is 6dBi in order to comply with the E.I.R.P limit for the 5.25- to 5.35 and 5.725 to 5.85GHz frequency range in point-to-point operation. To comply with RF exposure requirements all antennas should be located at a minimum distance of 20cm, or the minimum separation distance allowed by the module approval, from the body of all persons.

Attention: l'utilisation d'un réseau sans fil IEEE802.11a est restreinte à une utilisation en intérieur à cause du fonctionnement dans la bande de fréquence 5.15-5.25 GHz. Industry Canada requiert que ce produit soit utilisé à l'intérieur des bâtiments pour la bande de fréquence 5.15-5.25 GHz afin de réduire les possibilités d'interférences nuisibles aux canaux co-existants des systèmes de transmission satellites. Les radars de puissances ont fait l'objet d'une allocation primaire de fréquences dans les bandes 5.25-5.35 GHz et 5.65-5.85 GHz. Ces stations radar peuvent créer des interférences avec ce produit et/ou lui être nuisible. Le gain d'antenne maximum permissible pour une utilisation avec ce produit est de 6 dBi afin d'être conforme aux limites de puissance isotropique rayonnée équivalente (P.I.R.E.) applicable dans les bandes 5.25-5.35 GHz et 5.725-5.85 GHz en fonctionnement point-à-

point. Pour se conformer aux conditions d'exposition de RF toutes les antennes devraient être localisées à une distance minimum de 20 cm, ou la distance de séparation minimum permise par l'approbation du module, du corps de toutes les personnes.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Selon les règlements de Canada d'Industrie, cet émetteur de radio peut seulement fonctionner en utilisant une antenne du type et de gain maximum (ou moindre) que le gain approuvé pour l'émetteur par Canada d'Industrie. Pour réduire lesinterférences radio potentielles avec les autres utilisateurs, le type d'antenne et son gain devraient être choisis de façon à ce que la puissance isotrope rayonnée équivalente(P.I.R.E.) ne soit pas supérieure à celle qui est nécessaire pour une communication réussie.

European Union

The low band 5.15 - 5.35GHz is for indoor use only.

This equipment complies with the essential requirements of the European Union directive 1999/5/EC. See Statements of European Union Compliance.

European Union Declarations of Conformity

To view the European Union Declaration of Conformity for your adapter, perform these steps.

1. Open this web site: http://developer.intel.com/design/litcentr/ce_docs/index.htm.
2. Under the **Wireless Products** menu select your adapter.
3. Click **Go**.

To view additional regulatory information for your adapter, perform these steps:

1. Open this web site: http://www.intel.com/support/wireless/wlan/
2. Click on the link for your adapter.
3. Click **Document and Guides**.
4. Under **Regulatory Information**, click Regulatory documents for your adapter.

Waste Electrical and Electronic Equipment Directive (WEEE)

Restriction of Hazardous Substances Directive (RoHS) Compliant

All products described herein are compliant with the European Union's RoHS Directive.

For CE Mark-Related Questions related to the wireless adapter, contact:

Intel Corporation Attn: Corporate Quality 2200 Mission College Blvd. Santa Clara, CA 95054-1549 USA

Japan

5GHz 帯は室内でのみ使用のこと

Korea

해당 무선설비는 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없음.
해당 무선 설비는 5150-5250MHz 대역에서 실내에서만 사용할 수 있음.

Mexico

La operación de este equipo está sujeta a las siguientes dos condiciones: (1) es posible que este equipo o dispositivo no cause interferencia perjudicial y (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Morocco

The operation of this product in the radio channel 2 (2417 MHz) is not authorized in the following cities: Agadir, Assa-Zag, Cabo Negro, Chaouen, Goulmima, Oujda, Tan Tan, Taourirt, Taroudant and Taza.

The operation of this product in the radio channels 4, 5, 6 et 7 (2425 - 2442 MHz) is not authorized in the following cities: Aéroport Mohamed V, Agadir, Aguelmous, Anza, Benslimane, Béni Hafida, Cabo Negro, Casablanca, Fès, Lakbab, Marrakech, Merchich, Mohammédia, Rabat, Salé, Tanger, Tan Tan, Taounate, Tit Mellil, Zag.

Pakistan

"PTA APPROVED MODEL"

Taiwan

第十二條

經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條

低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
前項合法通信，指依電信法規定作業之無線電通信。
低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

在**5.25-5.35** 秭赫頻帶內操作之無線資訊傳輸設備　限於室內使用。

Singapore

Complies with
IDA Standards
DB 02941

Radio Approvals

To determine whether you are allowed to use your wireless network device in a specific country, please check to see if the radio type number that is printed on the identification label of your device is listed in the manufacturer's OEM Regulatory Guidance document.

Modular Regulatory Certification Country Markings

A list of countries requiring regulatory markings is available. Note that the lists include only countries requiring marking but not all certified countries. To find the regulatory country marking information for your adapter, perform these steps:

1. Open this web site: http://www.intel.com/support/wireless/wlan/
2. Click on the *link for your adapter*.
3. Click **Document and Guides**
4. Under **Regulatory Information**, click Regulatory documents *for your adapter*.

INFORMATION FOR OEMS and HOST INTEGRATORS

The guidelines described within this document are provided to OEM integrators installing Intel® wireless adapters in notebook and tablet PC host platforms. Adherence to these requirements is necessary to meet the conditions of compliance with FCC rules, including RF exposure. When all antenna type and placement guidelines described herein are fulfilled the Intel® wireless adapters may be incorporated into notebook and tablet PC host platforms with no further restrictions. If any of the guidelines described herein are not satisfied it may be necessary for the OEM or integrator to perform additional testing and/or obtain additional approval. The OEM or integrator is responsible to determine the required host regulatory testing and/or obtaining the required host approvals for compliance.

- Intel® wireless adapters are intended for OEMs and host integrators only.
- The Intel® wireless adapter FCC Grant of Authorization describes any limited conditions of modular approval.
- The Intel® wireless adapters must be operated with an access point that has been approved for the country of operation.
- Changes or modification to Intel® wireless adapters by OEMs, integrators or other third parties is not permitted. Any changes or modification to Intel® wireless adapters by OEMs, integrators or other third parties will void authorization to operate the adapter.

Antenna Type and Gains

Only antennas of the same type and with equal or less gains as shown below may be used with the Intel® wireless adapters. Other types of antennas and/or higher gain antennas may require additional authorization for operation.

Antenna Type	Antenna Location (Main/Aux	2.4GHz Peak Gain in dBi*	2.6GHz Peak Gain in dBi*	5.2GHz Peak Gain in dBi*	5.5GHz Peak Gain in dBi*	5.7GHz Peak Gain in dBi*
PIFA	Main					
	Aux	3.24	3.47	3.73	4.77	4.77
	MIMO					
*All antenna gains include cable loss.						

Antenna Placement Within the Host Platform

To ensure RF exposure compliance the antenna(s) used with the Intel® wireless adapters must be installed in notebook or tablet PC host platforms to provide a minimum separation distance from all persons, in all operating modes and orientations of the host platform, with strict adherence to the table below. The antenna separation distance applies to both horizontal and vertical orientation of the antenna when installed in the host system.

Wireless Adapter	Minimum required antenna-to-user

	separation distance
Intel® Centrino® Wireless-N 100	9 mm
Intel® Centrino® Wireless-N 105	9 mm
Intel® Centrino® Wireless-N 130	8 mm
Intel® Centrino® Wireless-N 135	9 mm
Intel® Centrino® Wireless-N 1000*	20 mm
Intel® Centrino® Wireless-N 1030	8 mm
Intel® Centrino® Wireless-N 2200	9 mm
Intel® Centrino® Wireless-N 2230	6 mm
Intel® Centrino® Advanced-N 6200*	20 mm
Intel® Centrino® Advanced-N 6205	12 mm
Intel® Centrino® Advanced-N 6230	12 mm
Intel® Centrino® Advanced-N 6235	8 mm
Intel® Centrino® Ultimate-N 6300	13 mm
Intel® Dual Band Wireless-AC 7260	8 mm
Intel® Dual Band Wireless-N 7260	8 mm
Intel® Wireless-N 7260	8 mm
Intel® Dual Band Wireless-AC 3160	8 mm
Intel® Dual Band Wireless-AC 7265	8 mm
Intel® Dual Band Wireless-N 7265	8 mm
Intel® Tri-Band Wireless-AC 18260	8 mm
[illegible] lled in mobile devices only (requires > 20 cm antenna separation from the body of user).	

For WiFi/Bluetooth combination adapters it is recommended that a 5 cm separation distance between transmitting antennas be provided within the host system to maintain an adequate separation ratio for simultaneous WiFi and Bluetooth transmission. For less than 5 cm separation the separation ratio must be verified according to FCC publication KDB 447498 for the specific adapter.

Simultaneous Transmission of Intel® Wireless Adapters with Other Integrated or Plug-In Transmitters

Based upon FCC Knowledge Database publication number 616217 https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?id=33240&switch=P, when there are multiple transmitting devices installed in a host device, an RF exposure transmitting assessment shall be performed to determine the necessary application and test requirements. OEM integrators must identify all possible combinations of simultaneous transmission configurations for all transmitters and antennas installed in the host system. This includes transmitters installed in the host as mobile devices (>20 cm separation from user) and portable devices (<20 cm separation from user). OEM integrators should consult the actual FCC KDB 616217 document for all details in making this assessment to determine if any additional requirements for testing or FCC approval is necessary.

Information To Be Supplied to the End User by the OEM or Integrator

The following regulatory and safety notices must be published in documentation supplied to the end user of the product or system incorporating the Intel® wireless adapter, in compliance with local regulations. Host system must be labeled with "Contains FCC ID: XXXXXXXX", FCC ID displayed on label.

The wireless adapter must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. For country-specific approvals, see Radio Approvals. Intel Corporation is not responsible for any radio or television interference caused by unauthorized

modification of the devices included with the wireless adapter kit or the substitution or attachment of connecting cables and equipment other than that specified by Intel Corporation. The correction of interference caused by such unauthorized modification, substitution or attachment is the responsibility of the user. Intel Corporation and authorized resellers or distributors are not liable for any damage or violation of government regulations that may arise from the user failing to comply with these guidelines.

Local Restriction of 802.11a, 802.11b, 802.11g, and 802.11n Radio Usage

The following statement on local restrictions must be published as part of the compliance documentation for all 802.11a, 802.11b, 802.11g and 802.11n products.

⚠ **Caution**: Due to the fact that the frequencies used by 802.11a, 802.11b, 802.11g and 802.11n wireless LAN devices may not yet be harmonized in all countries, 802.11a, 802.11b, 802.11g and 802.11n products are designed for use only in specific countries, and are not allowed to be operated in countries other than those of designated use. As a user of these products, you are responsible for ensuring that the products are used only in the countries for which they were intended and for verifying that they are configured with the correct selection of frequency and channel for the country of use. Any deviation from permissible settings and restrictions in the country of use could be an infringement of national law and may be punished as such.

Statements of European Compliance

Each of the adapters listed below comply with the essential requirements of the European Union directive 1999/5/EC.

- Intel® Centrino® Wireless-N 100
- Intel® Centrino® Wireless-N 105
- Intel® Centrino® Wireless-N 130
- Intel® Centrino® Wireless-N 135
- Intel® Centrino® Wireless-N 1000
- Intel® Centrino® Wireless-N 1030
- Intel® Centrino® Wireless-N 2200
- Intel® Centrino® Wireless-N 2230
- Intel® Centrino® Advanced-N 6200
- Intel® Centrino® Advanced-N 6205
- Intel® Centrino® Advanced-N 6230
- Intel® Centrino® Advanced-N 6235
- Intel® Centrino® Ultimate-N 6300
- Intel® Dual Band Wireless-AC 7260
- Intel® Dual Band Wireless-N 7260
- Intel® Wireless-N 7260
- Intel® Dual Band Wireless-AC 3160
- Intel® Dual Band Wireless-AC 7265
- Intel® Dual Band Wireless-N 7265
- Intel® Wireless-N 7265

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Trademarks and Disclaimers

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Specifications

This section provides specification information for the family of Intel® wireless adapters. The following list may not be all inclusive.

- Intel® Centrino® Wireless-N 100
- Intel® Centrino® Wireless-N 105
- Intel® Centrino® Wireless-N 130
- Intel® Centrino® Wireless-N 135
- Intel® Centrino® Wireless-N 1000
- Intel® Centrino® Wireless-N 1030
- Intel® Centrino® Wireless-N 2200
- Intel® Centrino® Wireless-N 2230
- Intel® Centrino® Wireless-N + WiMAX 6150
- Intel® Centrino® Advanced-N 6200
- Intel® Centrino® Advanced-N 6205
- Intel® Centrino® Advanced-N 6230
- Intel® Centrino® Advanced-N 6235
- Intel® Centrino® Advanced-N + WiMAX 6250
- Intel® Centrino® Ultimate-N 6300
- Intel® Dual Band Wireless-AC 7260
- Intel® Dual Band Wireless-N 7260
- Intel® Wireless-N 7260
- Intel® Dual Band Wireless-AC 3160
- Intel® Dual Band Wireless-AC 7265
- Intel® Dual Band Wireless-N 7265
- Intel® Wireless-N 7265

Intel® Centrino® Wireless-N 100, Intel® Centrino® Wireless-N 105, Intel® Centrino® Wireless-N 130 and Intel® Centrino® Wireless-N 135

Form Factor	PCI Express* Half-Mini Card	
Dimensions	Half-Mini Card: Width 1.049 in x Length 1.18 in x Height 0.18 in (26.64 mm x 30 mm x 4.5 mm)	
Antenna Interface Connector	Hirose U.FL-R-SMT mates with cable connector U.FL-LP-066	
Antenna Diversity	On-board diversity	
Connector Interface	52-pin Mini Card edge connector	
Voltage	3.3 V	
Operating Temperature	0 to +80 degrees Celsius	
Humidity	50% to 95% non-condensing (at temperatures of 25 ºC to 35 ºC)	
WiFi		
Frequency Modulation	2.4 GHz (802.11b/g/n)	
Frequency band	2.400 - 2.4835 GHz (dependent on country)	
Modulation	BPSK, QPSK, 16 QAM, 64 QAM	CCK, DQPSK, DBPSK
Wireless Medium	2.4 GHz ISM: Orthogonal Frequency Division Multiplexing (OFDM)	
Channels	All channels as defined by the relevant specification and country rules.	

IEEE 802.11n Data Rates	MIMO Configuration: 1X1 **Tx / Rx**: 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2 Mbps
IEEE 802.11g Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps
IEEE 802.11b Data Rates	11, 5.5, 2, 1 Mbps
Bluetooth Support	• Intel® Centrino® Wireless-N 100: None • Intel® Centrino® Wireless-N 105: None • Intel® Centrino® Wireless-N 130: Bluetooth 2.1, 2.1 + EDR, 3.0, 3.0+HS • Intel® Centrino® Wireless-N 135: Bluetooth 4.0 (Bluetooth Low-Energy and Bluetooth 3.0 +HS)
General	
Operating Systems	Windows* 7 (32-bit and 64-bit), Windows* 8 (32-bit and 64-bit), Windows* 8.1 (32-bit and 64-bit)
Wi-Fi Alliance* certification	Wi-Fi* certification for 802.11b, 802.11g, 802.11n, WPA-Personal, WPA-Enterprise, WPA2-Personal, WPA2-Enterprise, WMM, WPS
Cisco Compatible Extensions certification	Cisco Compatible Extensions, v4.0
IEEE Feature Sets	IEEE 802.11b, 802.11g, 802.11n, 802.11e, 802.11i, 802.11d, 802.11h
Architecture	Infrastructure or ad hoc (peer-to-peer) operating modes
Security	WPA-Personal, WPA2-Personal, WPA-Enterprise, WPA2-Enterprise, AES-CCMP 128-bit, WEP 128-bit and 64-bit; 802.1X: EAP-SIM, LEAP, PEAP, TKIP, EAP-FAST, EAP-TLS, EAP-TTLS, EAP-AKA
Product Safety	UL, C-UL, CB (IEC/EN 60950-1)

Intel® Centrino® Wireless-N 1000

WiFi / WiMAX	
Form Factor	PCI Express* Mini Card and Half-Mini Card
SKUs	Intel® Centrino® Wireless-N 1000 - 1X2 MC/HMC
Dimensions	Mini Card: Width 2.0 in x Length 1.18 in x Height 0.18 in (50.80 mm x 30 mm x 4.5 mm) Half-Mini Card: Width 1.049 in x Length 1.18 in x Height 0.18 in (26.64 mm x 30 mm x 4.5 mm)
Antenna Interface Connector	Hirose U.FL-R-SMT mates with cable connector U.FL-LP-066
Antenna Diversity	On-board diversity
Connector Interface	52-pin Mini Card edge connector
Voltage	3.3 V
Operating Temperature	0 to +80 degrees Celsius
Humidity	50% to 90% non-condensing (at temperatures of 25 ºC to 35 ºC)
WiFi	
Frequency Modulation	2.4 GHz (802.11b/g/n)
Frequency band	2.41-2.474 GHz (dependent on country)
Modulation	BPSK, QPSK, 16 QAM, 64 QAM, CCK, DQPSK, DBPSK

Wireless Medium	2.4 GHz ISM: Orthogonal Frequency Division Multiplexing (OFDM)
Channels	All channels as defined by the relevant specification and country rules.
IEEE 802.11n Data Rates	300, 270, 243, 240, 180, 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2 Mbps
IEEE 802.11g Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps
IEEE 802.11b Data Rates	11, 5.5, 2, 1 Mbps
WiFi General	
Operating Systems	Microsoft Windows* XP (32 and 64 bit) and Windows Vista* (32 and 64 bit), Ubuntu Linux*
Wi-Fi Alliance* certification	Wi-Fi* certification for 802.11b, 802.11g, 802.11n, WPA-Personal, WPA-Enterprise, WPA2-Personal, WPA2-Enterprise, WMM, WPS
Cisco Compatible Extensions certification	Cisco Compatible Extensions, v4.0
WLAN Standard	IEEE 802.11g, 802.11b, 802.11n, 802.11d, 802.11e, 802.11i,
Architecture	Infrastructure or ad hoc (peer-to-peer) operating modes
Security	WPA-Personal, WPA2-Personal, WPA-Enterprise, WPA2-Enterprise, 802.1X: EAP-SIM, LEAP, PEAP, EAP-FAST, EAP-TLS, EAP-TTLS, EAP-AKA
Encryption	AES-CCMP 128-bit, WEP 128-bit and 64-bit, CKIP, TKIP
Product Safety	UL, C-UL, CB (IEC/EN 60950-1)

Intel® Centrino® Wireless-N 2200 and Intel® Centrino® Wireless-N 2230

Form Factor	PCI Express* Half-Mini Card	
Dimensions	Half-Mini Card: Width 1.049 in x Length 1.18 in x Height 0.18 in (26.64 mm x 30 mm x 4.5 mm)	
Antenna Interface Connector	Hirose U.FL-R-SMT mates with cable connector U.FL-LP-066	
Antenna Diversity	On-board diversity	
Connector Interface	52-pin Mini Card edge connector	
Voltage	3.3 V	
Operating Temperature	0 to +80 degrees Celsius	
Humidity	50% to 95% non-condensing (at temperatures of 25 ºC to 35 ºC)	
WiFi		
Frequency Modulation	2.4 GHz (802.11b/g/n)	
Frequency band	2.400 - 2.4835 GHz (dependent on country)	
Modulation	BPSK, QPSK, 16 QAM, 64 QAM	CCK, DQPSK, DBPSK
Wireless Medium	2.4 GHz ISM: Orthogonal Frequency Division Multiplexing (OFDM)	
Channels	All channels as defined by the relevant specification and country rules.	
IEEE 802.11n Data Rates	MIMO Configuration: 2X2 **Tx / Rx**: 300, 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2 Mbps	
IEEE 802.11g Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11b Data	11, 5.5, 2, 1 Mbps	

Rates	
Bluetooth Support	• Intel® Centrino® Wireless-N 2200: None • Intel® Centrino® Wireless-N 2230: Bluetooth 4.0 (Bluetooth Low-Energy and Bluetooth 3.0 +HS)
General	
Operating Systems	Windows* 7 (32-bit and 64-bit), Windows* 8 (32-bit and 64-bit), Windows* 8.1 (32-bit and 64-bit)
Wi-Fi Alliance* certification	Wi-Fi* certification for 802.11b, 802.11g, 802.11n, WPA-Personal, WPA-Enterprise, WPA2-Personal, WPA2-Enterprise, WMM, WPS
Cisco Compatible Extensions certification	Cisco Compatible Extensions, v4.0
IEEE Feature Sets	IEEE 802.11b, 802.11g, 802.11n, 802.11e, 802.11i, 802.11d, 802.11h
Architecture	Infrastructure or ad hoc (peer-to-peer) operating modes
Security	WPA-Personal, WPA2-Personal, WPA-Enterprise, WPA2-Enterprise, AES-CCMP 128-bit, WEP 128-bit and 64-bit; 802.1X: EAP-SIM, LEAP, PEAP, TKIP, EAP-FAST, EAP-TLS, EAP-TTLS, EAP-AKA
Product Safety	UL, C-UL, CB (IEC/EN 60950-1)

Intel® Centrino® Wireless-N 1030 and Intel® Centrino® Advanced-N 6230

Form Factor	PCI Express* Half-Mini Card	
Dimensions	Half-Mini Card: Width 1.049 in x Length 1.18 in x Height 0.18 in (26.64 mm x 30 mm x 4.5 mm)	
Antenna Interface Connector	Hirose U.FL-R-SMT mates with cable connector U.FL-LP-066	
Antenna Diversity	On-board diversity	
Network Standards	802.11a/b/g/n (varies by adapter) and Bluetooth 3.0 + HS	
Connector Interface	52-pin Mini Card edge connector	
Voltage	3.3 V	
Operating Temperature	0 to +80 degrees Celsius	
Humidity	50% to 95% non-condensing (at temperatures of 25 ºC to 35 ºC)	
WiFi Network Standards	Intel® Centrino® Wireless-N 1030: 802.11b/g/n Intel® Centrino® Advanced-N 6230: 802.11a/g/n	
Frequency Modulation	**5 GHz (802.11a/n)**	**2.4 GHz (802.11b/g/n)**
Frequency band	5.15 GHz - 5.85 GHz (dependent on country)	2.400 - 2.4835 GHz (dependent on country)
Modulation	BPSK, QPSK, 16 QAM, 64 QAM	CCK, DQPSK, DBPSK
Wireless Medium	5 GHz UNII: Orthogonal Frequency Division Multiplexing (OFDM)	2.4 GHz ISM: Orthogonal Frequency Division Multiplexing (OFDM)
Channels	All channels as defined by the relevant specification and country rules.	
IEEE 802.11n Data Rates	Intel® Centrino® Advanced-N 6230:	

	Tx/Rx (Mbps): 300, 270, 243, 240, 216.7, 195, 180, 173.3, 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2
	Intel® Centrino® Wireless-N 1030: Rx (Mbps): 300, 270, 243, 240, 180 Rx/Tx (Mbps): 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2
IEEE 802.11a Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps
IEEE 802.11g Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps
IEEE 802.11b Data Rates	11, 5.5, 2, 1 Mbps
Bluetooth	Bluetooth Version 3.0 + HS
General	
Operating Systems	• Microsoft Windows* XP (32-bit and 64-bit) • Windows Vista* (32-bit and 64-bit) • Windows* 7 (32-bit and 64-bit) • Windows* 8 (32-bit and 64-bit) • Windows* 8.1 (32-bit and 64-bit)
Wi-Fi Alliance* certification	Wi-Fi* certification for 802.11b, 802.11g, 802.11a, 802.11h, 802.11d, WPA-Personal, WPA-Enterprise, WPA2-Personal, WPA2-Enterprise, WPS, WMM, WMM Power Save, EAP-SIM, LEAP, PEAP, TKIP, EAP-FAST, EAP-TLS, EAP-TTLS, EAP-AKA, P2P
Cisco Compatible Extensions certification	Cisco Compatible Extensions, v4.0
WLAN Standard	IEEE 802.11g, 802.11b, 802.11a, 802.11n
Architecture	Infrastructure or ad hoc (peer-to-peer) operating modes
Security	WPA-Personal, WPA2-Personal, WPA-Enterprise, WPA2-Enterprise, AES-CCMP 128-bit, WEP 128-bit and 64-bit; 802.1X: EAP-SIM, LEAP, PEAP, TKIP, EAP-FAST, EAP-TLS, EAP-TTLS, EAP-AKA
Product Safety	UL, C-UL, CB (IEC/EN 60950-1)

Intel® Centrino® Advanced-N 6235

Form Factor	PCI Express* Half-Mini Card
Dimensions	Half-Mini Card: Width 1.049 in x Length 1.18 in x Height 0.18 in (26.64 mm x 30 mm x 4.5 mm)
Antenna Interface Connector	Hirose U.FL-R-SMT mates with cable connector U.FL-LP-066
Antenna Diversity	On-board diversity
Network Standards	802.11a/b/g/n and Bluetooth 4.0
Connector Interface	52-pin Mini Card edge connector
Voltage	3.3 V
Operating Temperature	0 to +80 degrees Celsius
Humidity	50% to 95% non-condensing (at temperatures of 25 ºC to 35 ºC)

Frequency Modulation	**5 GHz (802.11a/n)**	**2.4 GHz (802.11b/g/n)**
Frequency band	5.15 GHz - 5.85 GHz (dependent on country)	2.400 - 2.4835 GHz (dependent on country)
Modulation	BPSK, QPSK, 16 QAM, 64 QAM	CCK, DQPSK, DBPSK
Wireless Medium	5 GHz UNII: Orthogonal Frequency Division Multiplexing (OFDM)	2.4 GHz ISM: Orthogonal Frequency Division Multiplexing (OFDM)
Channels	All channels as defined by the relevant specification and country rules.	
IEEE 802.11n Data Rates	Tx/Rx (Mbps): 300, 270, 243, 240, 216.7, 195, 180, 173.3, 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2	
IEEE 802.11a Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11g Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11b Data Rates	11, 5.5, 2, 1 Mbps	
Bluetooth	Bluetooth Version 4.0 (3.0 +HS)	
General		
Operating Systems	Windows* 7 (32-bit and 64-bit), Windows* 8 (32-bit and 64-bit), Windows* 8.1 (32-bit and 64-bit)	
Wi-Fi Alliance* certification	Wi-Fi* certification for 802.11b, 802.11g, 802.11a, 802.11h, 802.11d, WPA-Personal, WPA-Enterprise, WPA2-Personal, WPA2-Enterprise, WPS, WMM, WMM Power Save, EAP-SIM, LEAP, PEAP, TKIP, EAP-FAST, EAP-TLS, EAP-TTLS, EAP-AKA, P2P	
Cisco Compatible Extensions certification	Cisco Compatible Extensions, v4.0	
WLAN Standard	IEEE 802.11g, 802.11b, 802.11a, 802.11n	
Architecture	Infrastructure or ad hoc (peer-to-peer) operating modes	
Security	WPA-Personal, WPA2-Personal, WPA-Enterprise, WPA2-Enterprise, AES-CCMP 128-bit, WEP 128-bit and 64-bit; 802.1X: EAP-SIM, LEAP, PEAP, TKIP, EAP-FAST, EAP-TLS, EAP-TTLS, EAP-AKA	
Product Safety	UL, C-UL, CB (IEC/EN 60950-1)	

Intel® Centrino® Advanced-N + WiMAX 6250 and Intel® Centrino® Wireless-N + WiMAX 6150

Form Factor	PCI Express* Half-Mini Card
Dimensions	Half-Mini Card: Width 1.049 in x Length 1.18 in x Height 0.18 in (26.64 mm x 30 mm x 4.5 mm)
Antenna Interface Connector	Hirose U.FL-R-SMT mates with cable connector U.FL-LP-066
Antenna Diversity	On-board diversity
Connector Interface	52-pin Mini Card edge connector
Voltage	3.3 V
Operating Temperature	0 to +80 degrees Celsius
Humidity	50% to 95% non-condensing (at temperatures of 25 ºC to 35 ºC)
WiFi	

Frequency Modulation	Intel® Centrino® Advanced-N + WiMAX 6250 2.4 GHz (802.11b/g/n), 5 GHz (802.11a/n)	Intel® Centrino® Wireless-N + WiMAX 6150 2.4 GHz (802.11b/g/n)
Frequency band	5.15 GHz - 5.85 GHz (dependent on country)	2.400 - 2.4835 GHz (dependent on country)
Modulation	BPSK, QPSK, 16 QAM, 64 QAM	CCK, DQPSK, DBPSK
Wireless Medium	5 GHz UNII: Orthogonal Frequency Division Multiplexing (OFDM)	2.4 GHz ISM: Orthogonal Frequency Division Multiplexing (OFDM)
Channels	All channels as defined by the relevant specification and country rules.	
IEEE 802.11n Data Rates	**Intel® Centrino® Wireless-N + WiMAX 6150** MIMO Configuration: 1X2 **Rx**: 300, 270, 243, 240, 180 Mbps **Rx/Tx**: 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2 Mbps	
	Intel® Centrino® Advanced-N + WiMAX 6250 MIMO Configuration: 2X2 **Tx/Rx**: 300, 270, 243, 240, 180, 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2 Mbps	
IEEE 802.11a Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11g Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11b Data Rates	11, 5.5, 2, 1 Mbps	
General		
Operating Systems	• Microsoft Windows* XP (32-bit and 64-bit) • Windows Vista* (32-bit and 64-bit) • Windows* 7 (32-bit and 64-bit) • Windows* 8 (32-bit and 64-bit) • Windows* 8.1 (32-bit and 64-bit)	
Wi-Fi Alliance* certification	Wi-Fi* certification for 802.11b, 802.11g, 802.11a, 802.11h, 802.11d, WPA-Personal, WPA-Enterprise, WPA2-Personal, WPA2-Enterprise, WMM, WMM Power Save, EAP-SIM, LEAP, PEAP, TKIP, EAP-FAST, EAP-TLS, EAP-TTLS, EAP-AKA	
Cisco Compatible Extensions certification	Cisco Compatible Extensions, v4.0	
IEEE Feature Sets	**Intel® Centrino® Wireless-N + WiMAX 6150**: IEEE 802.11b, 802.11g, 802.11n, 802.11e, 802.11i, 802.11h, 802.11d **Intel® Centrino® Advanced-N + WiMAX 6250**: 802.11a, IEEE 802.11b, 802.11g, 802.11n, 802.11e, 802.11i, 802.11h, 802.11d	
Architecture	Infrastructure or ad hoc (peer-to-peer) operating modes	
Security	WPA-Personal, WPA2-Personal, WPA-Enterprise, WPA2-Enterprise, AES-CCMP 128-bit, WEP 128-bit and 64-bit; 802.1X: EAP-SIM, LEAP, PEAP, TKIP, EAP-FAST, EAP-TLS, EAP-TTLS, EAP-AKA	
Product Safety	UL, C-UL, CB (IEC/EN 60950-1)	
WiMAX General		
Operating Systems	• Microsoft Windows* XP (32-bit and 64-bit) • Windows Vista* (32-bit and 64-bit)	

	Windows* 7 (32-bit and 64-bit) • Windows* 8 (32-bit and 64-bit) • Windows* 8.1 (32-bit and 64-bit)
Standard Compliance	802.16e-2005 Corrigenda 2 (D4)
WiMAX System Profile Feature set	**Intel® Centrino® Wireless-N + WiMAX 6150**: Mobile WiMAX release 1, Wave II. Supports 3A and 1A/B profiles **Intel® Centrino® Advanced-N + WiMAX 6250**: Mobile WiMAX release 1, Wave II. Supports 3A, 5A/C, 1A/B, and 5BL profiles
Security	Key Management Protocol (PKMv2)
Encryption	128-bit CCMP (Counter-Mode/CBC-MAC) based on AES encryption
WiMAX	
Frequency band	Intel® Centrino® Wireless-N + WiMAX 6150: 2.3-2.4 GHz / 2.496-2.690 GHz Intel® Centrino® Advanced-N + WiMAX 6250: 2.3-2.4 GHz / 2.496-2.690 GHz / 3.4-3.8 GHz
Modulation	UL - QPSK, 16 QAM DL - QPSK, 16 QAM, 64 QAM
Wireless Medium	Duplex mode: TDD operations Scalable OFDMA (SOFDMA): 512 and 1024 FFT sub-carrier permutation: PUSC Intel® Centrino® Wireless-N + WiMAX 6150: Channel bandwidths: 5 and 10 MHz Intel® Centrino® Advanced-N + WiMAX 6250: Channel bandwidths: 5, 7, 8.75 and 10 MHz
WiMAX Network Release Feature set	SPWG/NWG Release 1.5
Rate Performance	Intel® Centrino® Wireless-N + WiMAX 6150: Up to 10 Mbps DL and 4 Mbps UL @ peak rate (OTA performance, 10MHz channel) Intel® Centrino® Advanced-N + WiMAX 6250: Up to 20 Mbps DL and 6 Mbps UL @ peak rate (OTA performance, 10MHz channel)
RF Transmitter Output Power	Compliance with Power class 2

Intel® Centrino® Advanced-N 6200, Intel® Centrino® Advanced-N 6205 and Intel® Centrino® Ultimate-N 6300

Form Factor	Intel® Centrino® Advanced-N 6200, Intel® Centrino® Ultimate-N 6300: PCI Express* Full-Mini Card and Half-Mini Card. Intel® Centrino® Advanced-N 6205: PCI Express* Half-Mini Card.
Dimensions	Full-Mini Card: Width 2.00 in x Length 1.18 in x Height 0.18 in (50.95 mm x 30 mm x 4.5 mm) Half-Mini Card: Width 1.049 in x Length 1.18 in x Height 0.18 in (26.64 mm x 30 mm x 4.5 mm)
Antenna Interface Connector	Hirose U.FL-R-SMT mates with cable connector U.FL-LP-066
Antenna Diversity	On-board diversity

Connector Interface	52-pin Mini Card edge connector	
Voltage	3.3 V	
Operating Temperature	0 to +80 degrees Celsius	
Humidity	50% to 95% non-condensing (at temperatures of 25 ºC to 35 ºC)	
Frequency Modulation	**5 GHz (802.11a/n)**	**2.4 GHz (802.11b/g/n)**
Frequency band	5.15 GHz - 5.85 GHz (dependent on country)	2.400 - 2.4835 GHz (dependent on country)
Modulation	BPSK, QPSK, 16 QAM, 64 QAM	CCK, DQPSK, DBPSK
Wireless Medium	5 GHz UNII: Orthogonal Frequency Division Multiplexing (OFDM)	2.4 GHz ISM: Orthogonal Frequency Division Multiplexing (OFDM)
Channels	All channels as defined by the relevant specification and country rules.	
IEEE 802.11n Data Rates	Intel® Centrino® Ultimate-N 6300: Tx/Rx: 450, 405, 360, 300, 270, 243, 240, 216.7, 195, 180, 173.3, 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2 Mbps	
	Intel® Centrino® Advanced-N 6200, Intel® Centrino® Advanced-N 6205: Tx/Rx: 300, 270, 243, 240, 180, 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2 Mbps	
IEEE 802.11a Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11g Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11b Data Rates	11, 5.5, 2, 1 Mbps	
General		
Operating Systems	• Microsoft Windows* XP (32-bit and 64-bit) • Windows Vista* (32-bit and 64-bit) • Windows* 7 (32-bit and 64-bit) • Windows* 8 (32-bit and 64-bit) • Windows* 8.1 (32-bit and 64-bit)	
Wi-Fi Alliance* certification	Wi-Fi* certification for 802.11b, 802.11g, 802.11a, 802.11h, 802.11d, WPA-Personal, WPA-Enterprise, WPA2-Personal, WPA2-Enterprise, WMM, WMM Power Save, EAP-SIM, LEAP, PEAP, TKIP, EAP-FAST, EAP-TLS, EAP-TTLS, EAP-AKA	
Cisco Compatible Extensions certification	Cisco Compatible Extensions, v4.0	
WLAN Standard	IEEE 802.11g, 802.11b, 802.11a, 802.11n	
Architecture	Infrastructure or ad hoc (peer-to-peer) operating modes	
Security	WPA-Personal, WPA2-Personal, WPA-Enterprise, WPA2-Enterprise, AES-CCMP 128-bit, WEP 128-bit and 64-bit; 802.1X: EAP-SIM, LEAP, PEAP, TKIP, EAP-FAST, EAP-TLS, EAP-TTLS, EAP-AKA	
Product Safety	UL, C-UL, CB (IEC/EN 60950-1)	

Intel® Dual Band Wireless-AC 7260

Form Factors	Half-Mini Card and M.2 (Next Generation Form Factor - NGFF)
Electrical interfaces	PCIe and USB 2.0 for both form factors

Antenna Interface Connector	Hirose U.FL-R-SMT mates with cable connector U.FL-LP-066	
Antenna Diversity	On-board diversity	
IEEE 802.11 Networking Standards	802.11ac, 802.11abgn, 802.11d, 802.11e, 802.11i, 802.11h, 802.11w	
Operating Temperature	0 to +80 degrees Celsius	
Humidity	50% to 95% non-condensing (at temperatures of 25 ºC to 35 ºC)	
Frequency Modulation	**5GHz (802.11ac/n)**	**2.4GHz (802.11b/g/n)**
Frequency band	5.15GHz - 5.85GHz (dependent on country)	2.400 - 2.4835GHz (dependent on country)
Modulation	BPSK, QPSK, 16 QAM, 64 QAM, 256 QAM	CCK, DQPSK, DBPSK
Wireless Medium	5GHz UNII: Orthogonal Frequency Division Multiplexing (OFDM)	2.4GHz ISM: Orthogonal Frequency Division Multiplexing (OFDM)
Channels	All channels as defined by the relevant specification and country rules.	
Spatial streams	Intel® Dual Band Wireless-AC 7260: 2 X 2	
Data Rates	All data rates are theoretical maximums.	
IEEE 802.11ac Data Rates	Intel® Dual Band Wireless-AC 7260: Up to 867 Mbps	
IEEE 802.11n Data Rates	Tx/Rx (Mbps): 300, 270, 243, 240, 216.7, 195, 180, 173.3, 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2	
IEEE 802.11a Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11g Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11b Data Rates	11, 5.5, 2, 1 Mbps	
Bluetooth	Dual Mode Bluetooth* 2.1, 2.1+EDR, 3.0, 3.0+HS, 4.0 (BLE)	
General		
Operating Systems	Windows* 7 (32-bit and 64-bit), Windows* 8 (32-bit and 64-bit), Windows* 8.1 (64-bit)	
Wi-Fi Alliance* certification	Wi-Fi CERTIFIED* for 802.11ac, a/b/g, n, WMM*, WPA*, WPA2*, and WPS, WPS 2.0, Protected Management Frames. Wi-Fi Direct* for peer-to-peer device connections.	
Architecture	Infrastructure and SoftAP; Supports simultaneous Client and SoftAP modes	
Cisco Compatible Extensions certification	Cisco Compatible Extensions, v4.0	
Security		
Authentication	WPA and WPA2, 802.1X (EAP-TLS, TTLS, PEAP, LEAP, EAP-FAST), EAP-SIM, EAP-AKA	
Authentication Protocols	PAP, CHAP, TLS, GTC, MS-CHAP*, MS-CHAPv2	
Encryption	64-bit and 128-bit WEP, AES-CCMP, TKIP	
Wi-Fi Direct* Encryption and Authentication	WPA2, AES-CCMP	
Product Safety	UL, C-UL, CB (IEC/EN 60950-1)	

Intel® Dual Band Wireless-N 7260

Intel® Wireless-N 7260

Form Factors	Half-Mini Card, M.2 (Next Generation Form Factor - NGFF)	
Electrical interfaces	PCIe, USB 2.0 for both form factors	
Antenna Interface Connector	Hirose U.FL-R-SMT mates with cable connector U.FL-LP-066	
Antenna Diversity	On-board diversity	
IEEE 802.11 Networking Standards	Intel® Dual Band Wireless-N 7260 • Model 7260HMW AN - 802.11agn, 2x2, Bluetooth 4.0, PCIe, USB, HMC • Model 7260NGW AN - 802.11agn, 2x2, Bluetooth 4.0, PCIe, USB, M.2 • Model 7260HMW NB - 802.11agn, 2x2, PCIe, USB, HMC • Model 7260NGW NB - 802.11agn, 2x2, PCIe, USB, M.2 Intel® Wireless-N 7260 • Model 7260HMW BN - 802.11agn, 2x2, PCIe, USB, M.2 • Model 7260NGW BN - 802.11bgn, 2x2, Bluetooth 4.0, PCIe, USB, M.2	
Operating Temperature	0 to +80 degrees Celsius	
Humidity	50% to 95% non-condensing (at temperatures of 25 ºC to 35 ºC)	
Frequency Modulation (See above, not all bands supported by all adapters)	**5GHz (802.11a/n)**	**2.4GHz (802.11b/g/n)**
Frequency band	5.15GHz - 5.85GHz (dependent on country)	2.400 - 2.4835GHz (dependent on country)
Modulation	BPSK, QPSK, 16 QAM, 64 QAM	CCK, DQPSK, DBPSK
Wireless Medium	5GHz UNII: Orthogonal Frequency Division Multiplexing (OFDM)	2.4GHz ISM: Orthogonal Frequency Division Multiplexing (OFDM)
Channels	All channels as defined by the relevant specification and country rules.	
802.11n spatial streams	All adapters: 2 X 2 spatial streams	
Data Rates	All data rates are theoretical maximums.	
IEEE 802.11n Data Rates	Tx/Rx (Mbps): 300, 270, 243, 240, 216.7, 195, 180, 173.3, 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2	
IEEE 802.11a Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11g Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11b Data Rates	11, 5.5, 2, 1 Mbps	
Bluetooth	Dual Mode Bluetooth* 2.1, 2.1+EDR, 3.0, 3.0+HS, 4.0 (BLE) supported by the following adapters • Model 7260HMW AN • Model 7260NGW AN • Model 7260NGW BN	

General	
Operating Systems	Windows* 7 (32-bit and 64-bit), Windows 8 (32-bit and 64-bit), Windows* 8.1 (64-bit)
Wi-Fi Alliance* certification	Wi-Fi CERTIFIED* for 802.11ac, a/b/g, n, WMM*, WPA*, WPA2*, and WPS, WPS 2.0, Protected Management Frames. Wi-Fi Direct* for peer-to-peer device connections.
Architecture	Infrastructure and SoftAP; Supports simultaneous Client and SoftAP modes
Cisco Compatible Extensions certification	Cisco Compatible Extensions, v4.0
Security	
Authentication	WPA and WPA2, 802.1X (EAP-TLS, TTLS, PEAP, LEAP, EAP-FAST), EAP-SIM, EAP-AKA
Authentication Protocols	PAP, CHAP, TLS, GTC, MS-CHAP*, MS-CHAPv2
Encryption	64-bit and 128-bit WEP, AES-CCMP, TKIP
Wi-Fi Direct* Encryption and Authentication	WPA2, AES-CCMP
Product Safety	UL, C-UL, CB (IEC/EN 60950-1)

Intel® Dual Band Wireless-AC 3160

Form Factors	Half-Mini Card and M.2 (Next Generation Form Factor - NGFF)	
Electrical interfaces	PCIe and USB 2.0 for both form factors	
Antenna Interface Connector	Hirose U.FL-R-SMT mates with cable connector U.FL-LP-066	
Antenna Diversity	On-board diversity	
IEEE 802.11 Networking Standards	802.11ac, 802.11abgn, 802.11d, 802.11e, 802.11i, 802.11h, 802.11w	
Operating Temperature	0 to +80 degrees Celsius	
Humidity	50% to 90% non-condensing (at temperatures of 25 ºC to 35 ºC)	
Frequency Modulation	**5GHz (802.11ac/n)**	**2.4GHz (802.11b/g/n)**
Frequency band	5.15GHz - 5.85GHz (dependent on country)	2.400 - 2.4835GHz (dependent on country)
Modulation	BPSK, QPSK, 16 QAM, 64 QAM, 256 QAM	CCK, DQPSK, DBPSK
Wireless Medium	5GHz UNII: Orthogonal Frequency Division Multiplexing (OFDM)	2.4GHz ISM: Orthogonal Frequency Division Multiplexing (OFDM)
Channels	All channels as defined by the relevant specification and country rules.	
Spatial streams	Intel® Dual Band Wireless-AC 3160: 1 X 1	
Data Rates	All data rates are theoretical maximums.	
IEEE 802.11ac Data Rates	Intel® Dual Band Wireless-AC 3160: Up to 433 Mbps	
IEEE 802.11n Data Rates	Tx/Rx (Mbps): 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2	
IEEE 802.11a Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11g Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	

IEEE 802.11b Data Rates	11, 5.5, 2, 1 Mbps
Bluetooth	Dual Mode Bluetooth* 2.1, 2.1+EDR, 3.0, 3.0+HS, 4.0 (BLE)
General	
Operating Systems	Windows* 7 (32-bit and 64-bit), Windows 8 (32-bit and 64-bit), Windows* 8.1 (64-bit)
Wi-Fi Alliance* certification	Wi-Fi CERTIFIED* for 802.11ac, a/b/g, n, WMM*, WPA*, WPA2*, and WPS, WPS 2.0, Protected Management Frames. Wi-Fi Direct* for peer-to-peer device connections.
Architecture	Infrastructure and SoftAP; Supports simultaneous Client and SoftAP modes
Cisco Compatible Extensions certification	Cisco Compatible Extensions, v4.0
Security	
Authentication	WPA and WPA2, 802.1X (EAP-TLS, TTLS, PEAP, LEAP, EAP-FAST), EAP-SIM, EAP-AKA
Authentication Protocols	PAP, CHAP, TLS, GTC, MS-CHAP*, MS-CHAPv2
Encryption	64-bit and 128-bit WEP, AES-CCMP, TKIP
Wi-Fi Direct* Encryption and Authentication	WPA2, AES-CCMP
Product Safety	UL, C-UL, CB (IEC/EN 60950-1)

Intel® Dual Band Wireless-AC 7265 (Models 7265NGW and 7265D2W)

Form Factors	M.2 (Next Generation Form Factor - NGFF)	
Electrical interfaces	PCIe and USB 2.0	
Antenna Interface Connector	Hirose U.FL-R-SMT mates with cable connector U.FL-LP-066	
Antenna Diversity	On-board diversity	
IEEE 802.11 Networking Standards	802.11abgn, 802.11ac, 802.11d, 802.11e, 802.11i, 802.11h, 802.11w	
Operating Temperature	0 to +80 degrees Celsius	
Humidity	50% to 90% RH non-condensing (at temperatures of 25 ºC to 35 ºC)	
Frequency Modulation	**5GHz (802.11ac/n)**	**2.4GHz (802.11b/g/n)**
Frequency band	5.15GHz - 5.85GHz (dependent on country)	2.400 - 2.4835GHz (dependent on country)
Modulation	BPSK, QPSK, 16 QAM, 64 QAM, 256 QAM	CCK, DQPSK, DBPSK
Wireless Medium	5GHz UNII: Orthogonal Frequency Division Multiplexing (OFDM)	2.4GHz ISM: Orthogonal Frequency Division Multiplexing (OFDM)
Channels	All channels as defined by the relevant specification and country rules.	
Spatial streams	Intel® Dual Band Wireless-AC 7265: 2 X 2	
Data Rates	All data rates are theoretical maximums.	
IEEE 802.11ac Data Rates	Intel® Dual Band Wireless-AC 7265: Up to 867 Mbps	
IEEE 802.11n Data Rates	Tx/Rx (Mbps): 300, 270, 243, 240, 216.7, 195, 180, 173.3, 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2	
IEEE 802.11a Data	54, 48, 36, 24, 18, 12, 9, 6 Mbps	

Rates	
IEEE 802.11g Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps
IEEE 802.11b Data Rates	11, 5.5, 2, 1 Mbps
Bluetooth	Dual Mode Bluetooth* 2.1, 2.1+EDR, 3.0, 3.0+HS, 4.0 (BLE)
General	
Operating Systems	Windows* 7 (32-bit and 64-bit), Windows* 8 (32-bit and 64-bit), Windows* 8.1 (64-bit)
Wi-Fi Alliance* certification	Wi-Fi CERTIFIED* for 802.11ac, a/b/g, n, WMM*, WPA*, WPA2*, and WPS, WPS 2.0, Protected Management Frames. Wi-Fi Direct* for peer-to-peer device connections.
Architecture	Infrastructure and SoftAP; Supports simultaneous Client and SoftAP modes
Cisco Compatible Extensions certification	Cisco Compatible Extensions, v4.0
Security	
Authentication	WPA and WPA2, 802.1X (EAP-TLS, TTLS, PEAP, LEAP, EAP-FAST), EAP-SIM, EAP-AKA
Authentication Protocols	PAP, CHAP, TLS, GTC, MS-CHAP*, MS-CHAPv2
Encryption	64-bit and 128-bit WEP, AES-CCMP, TKIP
Wi-Fi Direct* Encryption and Authentication	WPA2, AES-CCMP
Product Safety	UL, C-UL, CB (IEC/EN 60950-1)

Intel® Dual Band Wireless-N 7265 (Models 7265NGW AN and 7265NGW NB)
Intel® Wireless-N 7265 (Model 7265NGW BN)

Form Factors	M.2 (Next Generation Form Factor - NGFF)	
Electrical interfaces	PCIe, USB 2.0	
Antenna Interface Connector	Hirose U.FL-R-SMT mates with cable connector U.FL-LP-066	
Antenna Diversity	On-board diversity	
IEEE 802.11 Networking Standards	Intel® Dual Band Wireless-N 7265 • Model 7265NGW AN - 802.11agn, 2x2, Bluetooth 4.0, PCIe, USB, M.2 • Model 7265NGW NB - 802.11agn, 2x2, PCIe, USB, M.2 Intel® Wireless-N 7265 • Model 7265NGW BN - 802.11bgn, 2x2, Bluetooth 4.0, PCIe, USB, M.2	
Operating Temperature	0 to +80 degrees Celsius	
Humidity	50% to 90% non-condensing (at temperatures of 25 ºC to 35 ºC)	
Frequency Modulation (See above, not all bands supported by all	**5GHz (802.11a/n)**	**2.4GHz (802.11b/g/n)**

adapters)		
Frequency band	5.15GHz - 5.85GHz (dependent on country)	2.400 - 2.4835GHz (dependent on country)
Modulation	BPSK, QPSK, 16 QAM, 64 QAM	CCK, DQPSK, DBPSK
Wireless Medium	5GHz UNII: Orthogonal Frequency Division Multiplexing (OFDM)	2.4GHz ISM: Orthogonal Frequency Division Multiplexing (OFDM)
Channels	All channels as defined by the relevant specification and country rules.	
802.11n spatial streams	All adapters: 2 X 2 spatial streams	
Data Rates	All data rates are theoretical maximums.	
IEEE 802.11n Data Rates	Tx/Rx (Mbps): 300, 270, 243, 240, 216.7, 195, 180, 173.3, 150, 144, 135, 130, 120, 117, 115.5, 90, 86.667, 72.2, 65, 60, 57.8, 45, 43.3, 30, 28.9, 21.7, 15, 14.4, 7.2	
IEEE 802.11a Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11g Data Rates	54, 48, 36, 24, 18, 12, 9, 6 Mbps	
IEEE 802.11b Data Rates	11, 5.5, 2, 1 Mbps	
Bluetooth	Dual Mode Bluetooth* 2.1, 2.1+EDR, 3.0, 3.0+HS, 4.0 (BLE) supported by the following adapters • Model 7265HMW AN • Model 7265NGW AN • Model 7265NGW BN	
General		
Operating Systems	Windows* 7 (32-bit and 64-bit), Windows 8 (32-bit and 64-bit), Windows* 8.1 (64-bit)	
Wi-Fi Alliance* certification	Wi-Fi CERTIFIED* for 802.11ac, a/b/g, n, WMM*, WPA*, WPA2*, and WPS, WPS 2.0, Protected Management Frames. Wi-Fi Direct* for peer-to-peer device connections.	
Architecture	Infrastructure and SoftAP; Supports simultaneous Client and SoftAP modes	
Cisco Compatible Extensions certification	Cisco Compatible Extensions, v4.0	
Security		
Authentication	WPA and WPA2, 802.1X (EAP-TLS, TTLS, PEAP, LEAP, EAP-FAST), EAP-SIM, EAP-AKA	
Authentication Protocols	PAP, CHAP, TLS, GTC, MS-CHAP*, MS-CHAPv2	
Encryption	64-bit and 128-bit WEP, AES-CCMP, TKIP	
Wi-Fi Direct* Encryption and Authentication	WPA2, AES-CCMP	
Product Safety	UL, C-UL, CB (IEC/EN 60950-1)	

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Important Information

- Safety Information
- Third Party Software Notices

Safety Information

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zlib.h -- interface of the 'zlib' general purpose compression library, version 1.2.3, July 18th, 2005

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Jean-loup Gailly jloup@gzip.org
Mark Adler madler@alumni.caltech.edu

Adapter Driver

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WPA Supplicant

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Issue Date: 29/07/2002

This file contains the definitions required to use AES (Rijndael) in C.

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Corporate Web Site: http://www.intel.com

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Glossary

Term	Definition
802.11	The 802.11 standard refers to a family of specifications developed by the IEEE for wireless LAN technology. The 802.11 specifies an over-the-air interface between a wireless client and a base station or between two wireless clients and provides 1 or 2 Mbps transmission in the 2.4 GHz band using either frequency hopping spread spectrum (FHSS) or direct sequence spread spectrum (DSSS).
802.11a	The 802.11a standard specifies a maximum data transfer rate of 54 Mbps and an operating frequency of 5 GHz. The 802.11a standard uses the Orthogonal Frequency Division Multiplexing (OFDM) transmission method. Additionally, the 802.11a standard supports 802.11 features such as WEP encryption for security.
802.11b	802.11b is an extension to 802.11 that applies to wireless networks and provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz band. 802.11b uses only DSSS. Throughput data rate 5+ Mbps in the 2.4 GHz band.
802.11g	The 802.11g standard specifies a maximum data transfer rate of 54 Mbps, an operating frequency of 2.4GHz, and WEP encryption for security. 802.11g networks are also referred to as Wi-Fi* networks.
802.11n	A task group of the IEEE 802.11 committee has defined a new draft specification that provides for increased throughput speeds of up to 540 Mbps. The specification provides for Multiple-Input-Multiple-Output (MIMO) technology, or using multiple receivers and multiple transmitters in both the client and access point, to achieve improved performance.
802.1X	802.1X is the IEEE Standard for Port-Based Network Access Control. This is used in conjunction with EAP methods to provide access control to wired and wireless networks.
AAA Server	Authentication, Authorization and Accounting Server. A system to control access to computer resources and track user activity.
Access Point (AP)	A device that connects wireless devices to another network. For example, a wireless LAN, Internet modem or others.
Ad Hoc Network	A communication configuration in which every computer has the same capabilities, and any computer can initiate a communication session. Also known as a peer-to-peer network, a device to device network or a computer-to-computer network.
AES-CCMP	Advanced Encryption Standard - Counter CBC-MAC Protocol is the new method for privacy protection of wireless transmissions specified in the IEEE 802.11i standard. AES-CCMP provides a stronger encryption method than TKIP. The AES algorithm is capable of using cryptographic keys of 128, 192, and 256 bits to encrypt and decrypt data in 128-bit blocks. AES-CCMP uses the AES block cipher, but restricts the key length to 128 bits. AES-CCMP incorporates two sophisticated cryptographic techniques (counter mode and CBC-MAC) to provide improved security between the mobile client and the access point.
Authentication	Verifies the identity of a user logging onto a network. Passwords, digital certificates, smart cards and biometrics are used to prove the identity of the client to the network. Passwords and digital certificates are also used to identify the network to the client.
Available network	One of the networks listed under Available networks on the Wireless Networks tab of the Wireless Network Connection Properties (Windows* XP environment). Any wireless network that is broadcasting and is within receiving range of the WiFi adapter appears on the list.
BER	Bit Error Rate. The ratio of errors to the total number of bits being sent in a data transmission from one location to another.
Bit Rate	The total number of bits (ones and zeros) per second that a network connection can support. Note that this bit rate will vary, under software control, with different signal path conditions.
Broadcast SSID	Used to allow an access point to respond to clients on a wireless network by sending probes.
BSSID	A unique identifier for each wireless client on a wireless network. The Basic Service Set Identifier (BSSID) is the Ethernet MAC address of each adapter on the network.

CA (Certificate Authority)	A corporate certification authority implemented on a server. In addition, Internet Explorer's certificate can import a certificate from a file. A trusted CA certificate is stored in the root store.
CCX (Cisco Compatible eXtension)	Cisco Compatible Extensions Program ensures that devices used on Cisco wireless LAN infrastructure meet the security, management and roaming requirements.
Certificate	Used for client authentication. A certificate is registered on the authentication server (for example, RADIUS server) and used by the authenticator.
CKIP	Cisco Key Integrity Protocol (CKIP) is a Cisco proprietary security protocol for encryption in 802.11 media. CKIP uses a key message integrity check and message sequence number to improve 802.11 security in infrastructure mode. CKIP is Cisco's version of TKIP.
Client computer	The computer that gets its Internet connection by sharing either the host computer's connection or the access point's connection.
DSSS	Direct Sequence Spread Spectrum. Technology used in radio transmission. Incompatible with FHSS.
EAP	Short for Extensible Authentication Protocol, EAP sits inside of Point-to-Point Protocol's (PPP) authentication protocol and provides a generalized framework for several different authentication methods. EAP is supposed to head off proprietary authentication systems and let everything from passwords to challenge-response tokens and public-key infrastructure certificates all work smoothly.
EAP-AKA	EAP-AKA (Extensible Authentication Protocol Method for UMTS Authentication and Key Agreement) is an EAP mechanism for authentication and session key distribution, using the Universal Mobile Telecommunications System (UMTS) Subscriber Identity Module (USIM). The USIM card is a special smart card used with cellular networks to validate a given user with the network.
EAP-FAST	EAP-FAST, like EAP-TTLS and PEAP, uses tunneling to protect traffic. The main difference is that EAP-FAST does not use certificates to authenticate. Provisioning in EAP-FAST is negotiated solely by the client as the first communication exchange when EAP-FAST is requested from the server. If the client does not have a pre-shared secret Protected Access Credential (PAC), it can request to initiate a provisioning EAP-FAST exchange to dynamically obtain one from the server. EAP-FAST documents two methods to deliver the PAC: manual delivery through an out-of-band secure mechanism, and automatic provisioning. • Manual delivery mechanisms can be any delivery mechanism that the administrator of the network feels is sufficiently secure for their network. • Automatic provisioning establishes an encrypted tunnel to protect the authentication of the client and the delivery of the PAC to the client. This mechanism, while not as secure as a manual method may be, is more secure than the authentication method used in LEAP. The EAP-FAST method can be divided into two parts: provisioning, and authentication. The provisioning phase involves the initial delivery of the PAC to the client. This phase only needs to be performed once per client and user.
EAP-GTC	The EAP-GTC (Generic Token Card) is similar to the EAP-OTP except with hardware token cards. The request contains a displayable message, and the response contains the string read from the hardware token card.
EAP-OTP	EAP-OTP (One-Time Password) is similar to MD5, except it uses the OTP as the response. The request contains a displayable message. The OTP method is defined in RFC 2289.
EAP-SIM	Extensible Authentication Protocol-Subscriber Identity Module (EAP-SIM) authentication can be used with: • Network Authentication types: Open, Shared, and WPA*-Enterprise, WPA2*-Enterprise. • Data Encryption types: None, WEP and CKIP. A SIM card is a special smart card that is used by Global System for Mobile Communications (GSM) based digital cellular networks. The SIM card is used to validate your credentials with the

	network
EAP-TLS	A type of authentication method that uses EAP and a security protocol called the Transport Layer Security (TLS). EAP-TLS uses certificates that use passwords. EAP-TLS authentication supports dynamic WEP key management.
EAP-TTLS	A type of authentication method that uses EAP and Tunneled Transport Layer Security (TTLS). EAP-TTLS uses a combination of certificates and another security method such as passwords.
Encryption	Scrambling data so that only the authorized recipient can read it. Usually a key is needed to interpret the data.
FHSS	Frequency-Hop Spread Spectrum. Technology used in radio transmission. Incompatible with DSSS.
File and printer sharing	A capability that allows a number of people to view, modify, and print the same file(s) from different computers.
Fragmentation threshold	The threshold at which the wireless adapter breaks the packet into multiple frames. This determines the packet size and affects the throughput of the transmission.
GHz (Gigahertz)	A unit of frequency equal to 1,000,000,000 cycles per second.
Host computer	The computer that is directly connected to the Internet via a modem or network adapter.
Infrastructure network	A wireless network centered around an access point. In this environment, the access point not only provides communication with the wired network, but also mediates wireless network traffic in the immediate neighborhood.
IEEE	Institute of Electrical and Electronics Engineers (IEEE) is an organization involved in defining computing and communications standards.
Internet Protocol (IP) address	The address of a computer that is attached to a network. Part of the address designates which network the computer is on, and the other part represents the host identification.
LAN (Local Area Network)	A high-speed, low-error data network covering a relatively small geographic area.
LEAP (Light Extensible Authentication Protocol)	A version of Extensible Authentication Protocol (EAP). LEAP is a proprietary extensible authentication protocol developed by Cisco that provides a challenge-response authentication mechanism and dynamic key assignment.
MAC (Media Access Control) Address	A hardwired address applied at the factory. It uniquely identifies network hardware, such as a wireless adapter, on a LAN or WAN.
Mbps (Megabits-per-second)	Transmission speed of 1,000,000 bits per second.
MHz (Megahertz)	A unit of frequency equal to 1,000,000 cycles per second.
MIC (Michael)	Message Integrity Check (commonly called Michael).
MS-CHAP	An EAP mechanism used by the client. Microsoft Challenge Authentication Protocol (MS-CHAP) Version 2, is used over an encrypted channel to enable server validation. The challenge and response packets are sent over a non-exposed TLS encrypted channel.
ns(Nanosecond)	1 billionth (1/1,000,000,000) of a second.
OFDM	Orthogonal Frequency Division Multiplexing.
Open authentication	Allows any device network access. If encryption is not enabled on the network, any device that knows the Service Set Identifier (SSID) of the access point can gain access to the network.
PEAP	Protected Extensible Authentication Protocol (PEAP) is an Internet Engineering Task Force (IETF) draft protocol sponsored by Microsoft, Cisco, and RSA Security. PEAP creates an encrypted tunnel similar to the tunnel used in secure web pages (SSL). Inside the encrypted tunnel, a number of other EAP authentication methods can be used to perform client authentication. PEAP requires a

	TLS certificate on the RADIUS server, but unlike EAP-TLS there is no requirement to have a certificate on the client. PEAP has not been ratified by the IETF. The IETF is currently comparing PEAP and TTLS (Tunneled TLS) to determine an authentication standard for 802.1X authentication in 802.11 wireless systems. PEAP is an authentication type designed to take advantage of server-side EAP-Transport Layer Security (EAP-TLS) and to support various authentication methods, including user passwords and one-time passwords, and Generic Token Cards.
Peer-to-Peer mode	A wireless network structure that allows wireless clients to communicate directly with each other without using an access point.
Power save mode	The state in which the radio is periodically powered down to conserve power. When the portable computer is in Power Save mode, received packets are stored in the access point until the wireless adapter wakes up.
Preferred network	One of the networks that has been configured. Such networks are listed under Preferred networks on the Wireless Networks tab of the Wireless Network Connection Properties (Windows* XP environment).
RADIUS (Remote Authentication Dial-In User Service)	RADIUS is an authentication and accounting system that verifies user's credentials and grants access to requested resources.
RF (Radio Frequency)	The international unit for measuring frequency is Hertz (Hz), which is equivalent to the older unit of cycles per second. One MegaHertz (MHz) is one million Hertz. One GigaHertz (GHz) is one billion Hertz. For reference: the standard US electrical power frequency is 60 Hz, the AM broadcast radio frequency band is 0.55 -1.6 MHz, the FM broadcast radio frequency band is 88-108 MHz, and microwave ovens typically operate at 2.45 GHz.
Roaming	Movement of a wireless node between two micro cells. Roaming usually occurs in infrastructure networks built around multiple access points. Current wireless network roaming is only supported in the same subnet of a network.
RTS threshold	The number of frames in the data packet at or above which an RTS/CTS (request to send/clear to send) handshake is turned on before the packet is sent. The default value is 2347.
Shared key	An encryption key known only to the receiver and sender of data. This is also referred to as a pre-shared key.
SIM (Subscriber Identity Module)	A SIM card is used to validate credentials with the network. A SIM card is a special smart card used by GSM-based digital cellular networks.
Silent mode	Silent Mode Access Points or Wireless Routers have been configured to not broadcast the SSID for the wireless network. This makes it necessary to know the SSID in order to configure the wireless profile to connect to the access point or wireless router.
Single Sign On	Single Sign On feature set allows the 802.1X credentials to match your Windows log on user name and password credentials for wireless network connections.
SSID (Service Set Identifier)	SSID or network name is a value that controls access to a wireless network. The SSID for your wireless network card must match the SSID for any access point that you want to connect with. If the value does not match, you are not granted access to the network. Each SSID may be up to 32 alphanumeric characters long and is case-sensitive.
stealth	A stealth access point is one that has the capability and is configured to not broadcast its SSID. This is the WiFi network name that appears when a DMU (Device Management Utility, such as Intel® PROSet/Wireless WiFi Connection Utility) scans for available wireless networks. Although this can enhance wireless network security, it is commonly considered a weak security feature. To connect to a stealth access point, a user must specifically know the SSID and configure their DMU accordingly. The feature is not a part of the 802.11 specification, and is known by differing names by various vendors: closed mode, private network, SSID broadcasting.
TKIP (Temporal Key Integrity Protocol)	Temporal Key Integrity protocol improves data encryption. Wi-Fi Protected Access* uses its TKIP. TKIP provides important data encryption enhancements including a re-keying method. TKIP is part of the IEEE 802.11i encryption standard for wireless networks. TKIP is the next generation of WEP, the Wired Equivalency Protocol, which is used to secure 802.11 wireless networks. TKIP provides per packet key mixing, a message integrity check and a re-keying mechanism, thus

	fixing the flaws of WEP.
TLS (Transport Layer Security)	A type of authentication method using the Extensible Authentication Protocol (EAP) and a security protocol called the Transport Layer Security (TLS). EAP-TLS uses certificates which use passwords. EAP-TLS authentication supports dynamic WEP key management. The TLS protocol is intended to secure and authenticate communications across a public network through data encryption. The TLS Handshake Protocol allows the server and client to provide mutual authentication and to negotiate an encryption algorithm and cryptographic keys before data is transmitted.
TTLS (Tunneled Transport Layer Security)	These settings define the protocol and the credentials used to authenticate a user. In TTLS, the client uses EAP-TLS to validate the server and create a TLS-encrypted channel between the client and server. The client can use another authentication protocol. Typically password-based protocols challenge over this encrypted channel to enable server validation. The challenge and response packets are sent over a non-exposed TLS encrypted channel. TTLS implementations today support all methods defined by EAP, as well as several older methods (CHAP, PAP, MS-CHAP and MS-CHAP-V2). TTLS can easily be extended to work with new protocols by defining new attributes to support new protocols.
WEP (Wired Equivalent Privacy)	Wired Equivalent Privacy, 64- and 128-bit (64-bit is sometimes referred to as 40-bit). This is a low-level encryption technique designed to give the user about the same amount of privacy that he would expect from a LAN. WEP is a security protocol for wireless local area networks (WLANs) defined in the 802.11b standard. WEP is designed to provide the same level of security as that of a wired LAN. WEP aims to provide security by data over radio waves so that it is protected as it is transmitted from one end point to another.
WEP Key	Either a pass phrase or hexadecimal key. The pass phrase must be 5 ASCII characters for 64-bit WEP or 13 ASCII characters for 128-bit WEP. For pass phrases, 0-9, a-z, A-Z, and ~!@#$%^&*()_+|`-={}|[]\:";'<>?,./ are all valid characters. The hex key must be 10 hexadecimal characters (0-9, A-F) for 64-bit WEP or 26 hexadecimal characters (0-9, A-F) for 128-bit WEP.
Wi-Fi* (Wireless Fidelity)	Is meant to be used generically when referring of any type to 802.11 network, whether 802.11b, 802.11a, or dual-band.
WiMAX	WiMAX, the Worldwide Interoperability for Microwave Access, is a telecommunications technology aimed at providing wireless data over long distances in a variety of ways, from point-to-point links to full mobile cellular type access. It is based on the IEEE 802.16 standard. The name WiMAX was created by the WiMAX Forum, which was formed in June 2001 to promote conformance and interoperability of the standard. The forum describes WiMAX as "a standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL."
Wireless router	A stand-alone wireless hub that allows any computer that has a wireless network adapter to communicate with another computer within the same network and to connect to the Internet.
WLAN (Wireless Local-Area Network)	A type of local-area network that uses high-frequency radio waves rather than wires to communicate between nodes.
WPA* (Wi-Fi Protected Access)	This is a security enhancement that strongly increases the level of data protection and access control to a wireless network. WPA is an interim standard that will be replaced with the IEEE's 802.11i standard upon its completion. WPA consists of RC4 and TKIP and provides support for BSS (Infrastructure) mode only. WPA and WPA2 are compatible.
WPA2* (Wi-Fi Protected Access 2)	This is the second generation of WPA that complies with the IEEE TGi specification. WPA2 consists of AES encryption, pre-authentication and PMKID caching. It provides support for BSS (Infrastructure) mode and IBSS (ad hoc) mode. WPA and WPA2 are compatible.
WPA-Enterprise	Wi-Fi Protected Access-Enterprise applies to corporate users. A new standards-based, interoperable security technology for wireless LAN (subset of IEEE 802.11i draft standard) that encrypts data sent over radio waves. WPA is a Wi-Fi standard that was designed to improve upon the security features of WEP as follows: • Improved data encryption through the temporal key integrity protocol (TKIP). TKIP uses a

	hashing algorithm to scramble the encryption keys and adds an integrity-checking feature to ensure that the keys have not been tampered with. • User authentication, which is generally missing in WEP, through the extensible authentication protocol (EAP). WEP regulates access to a wireless network based on a computer's hardware-specific MAC address, which is relatively simple to be sniffed out and stolen. EAP is built on a more secure public-key encryption system to ensure that only authorized network users can access the network. WPA is an interim standard that will be replaced with the IEEE's 802.11i standard upon its completion.
WPA-Personal	Wi-Fi Protected Access-Personal provides a level of security in the small network or home environment.
WPA-PSK (Wi-Fi Protected-Access Pre-Shared Key)	WPA-PSK mode does not use an authentication server. It can be used with the data encryption types WEP or TKIP. WPA-PSK requires configuration of a pre-shared key (PSK). You must enter a pass phrase or 64 hex characters for a pre-shared key of length 256-bits. The data encryption key is derived from the PSK.

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