10.7.3 Wireless Network Troubleshooting Facts

Regardless of the type of wireless network you use, the actual transmission speed will likely be less than the rated speed. This is because various factors cause a degradation of the signal. If a single connection drops below 2 Mbps, the connection could be terminated. If you are having trouble establishing or keeping a wireless connection, consider the factors in the following table.

Consideration	Description
Wireless On/Off Switch	Some portable devices have a physical wireless switch on the outside of the device. The wireless switch turns the device's integrated wireless network adapter on and off. When adapter is in the off position, no wireless networks are displayed as available.
Incorrect Configuration	The most common source of problems with wireless networking is incorrect configuration. Before considering other problems, verify that the correct SSID and WPA keys have been configured. Remember that WPA keys are not case sensitive, but passphrases are case sensitive. In the case of a standalone (or thick) configuration, make sure each individual AP is properly configured. With a controller-based (or thin) configuration, make sure each AP can communicate with the wireless controller. A similar form of an incorrect configuration is trying to access a wireless network that uses one standard, perhaps 802.11a, with a wireless card that supports a different standard, like 802.11b or 802.11g.
Range	Wireless standards have a limited range. Moving a notebook outside the *effective* range weakens the signal and will likely cause intermittent reception. Moving outside of the *stated* range can cause the connection to drop entirely.
Obstructions	In situations where there is no clear line of sight between transmitter and receiver due to obstructions (such as concrete, window film, or metal studs), the wireless signal is reflected along multiple paths before finally being received. This can cause phase shifts, time delays, and attenuation. To address this, use two or more antennas to increase the quality and reliability of a wireless link. There are two common antenna diversity implementations: ▪ Spatial diversity uses multiple antennas that are physically separated from one another. ▪ Pattern diversity uses two or more co-located antennas with different radiation patterns.
Channel Interference	The 2.4 GHz frequency range is divided into 11 channels, and each channel has some overlap with the channels next to it. You might experience problems with your wireless network when other devices are trying to use the same or adjacent channels. There are also numerous devices that operate in the 2.4 GHz and 5 GHz ranges, which can create background noise and additional interference. ▪ Cordless telephones that operate in the 2.4 GHz range (900 MHz cordless phones do not cause interference) ▪ Other APs in the area (for example, each of your neighbors might have a wireless network, with each configured to use a similar channel) ▪ Microwave ovens ▪ Bluetooth devices ▪ Wireless game controllers To avoid interference, try changing the channel used on the AP. If the area has different wireless networks, configure each with a different channel, with at least two channels separating the channels in use. For example, you might use channels 1, 6, and 11. The strength of your Wi-Fi signal compared to the level of background noise is known as the signal-to-noise ratio (SNR). If the SNR is low, your wireless network will have problems with interference.
Atmospheric and EMI Conditions	Interference from weather or EMI can degrade the signal and cause service interruptions.
AP Placement	The location of the AP can affect signal strength and network access. Keep in mind the following: ▪ Omnidirectional antennas broadcast radio waves in every direction, so the AP should be located in the middle of the area that needs network access. ▪ Devices often get better reception from APs that are above or below them. ▪ In general, placing APs higher up prevents interference problems caused by going through building foundations. ▪ For security reasons, APs should not be placed near outside walls. The signal will emanate beyond the walls. Placing the AP in the center of the building decreases the range of the signals available outside of the building.
Antenna Orientation	For radio frequency wireless devices, the antenna orientation might have a small effect on signal strength. There are two types of antennas that are commonly used in wireless networks, directional antennas and omindirectional antennas. ▪ A directional antenna:

	▪ Creates a narrow, focused signal in a particular direction, which increases the signal strength and transmission distance. ▪ Provides a stronger point-to-point connection. ▪ Is better equipped to handle obstacles. ▪ An omnidirectional antenna: ▪ Disperses the RF wave in an equal 360-degree pattern. ▪ Provides access to many clients in a radius. For devices such as infrared or satellite, the orientation of the receiving device is critical. For these types of devices, make sure the receivers have a line-of-sight path for communication.
Latency	Latency on wireless networks is affected by several factors. Wireless communication operates in *half-duplex* (shared two-way communication). Devices can both send and receive, but not at the same time. Therefore, devices must take turns using the transmission channel. Typically, once a device begins receiving a signal, it must wait for the transmitter to stop transmitting before replying. An unstable wireless network signal can increase the processing that is performed on the signal by both the hardware and software.
Bandwidth Saturation	*Bandwidth saturation* is the point at which all of the available bandwidth on an internet connection has achieved maximum capacity and cannot pass any more data through the connection.
Device Saturation	*Device saturation* is when the percentage of CPU time where I/O requests are issued to a device or the bandwidth utilization for the device is close to 100%.
Untested Updates	*Untested updates* are updates that have not been tested in a test environment on your network before you applied them to your network. You should never deploy an update that you have not tested on your network first.
Frequency Mismatch	*Frequency mismatch* is when devices on the network are not broadcasting on the same frequency.
Absorption	*Absorption* is when a signal passes through objects they lose power or get weaker.
Refraction	*Refraction* is when radio waves pass through objects of different densities and cause the signal to bend or change speeds.