10.4.4 Wireless Network Design Facts

The wireless network design process is composed of the following steps:

Step	Description
Gather Network Requirements	Meet with all stakeholders and decision makers to discuss the implementations and gather detailed information. For example, you should: ▪ Identify the intended use of the wireless network. ▪ Identify the location of wireless service areas. ▪ Anticipate the number of wireless devices to be supported in each area. ▪ Discuss future network needs so that you can plan for expansion. ▪ Discuss data encryption and network security requirements.
Clearly Identify Expectations	Expectations should be clearly set and managed to ensure that the network design will fulfill the criteria identified in the previous step. Continue to meet with all stakeholders regularly throughout the process to communicate status, discuss anticipated changes, and review expectations. Document all discussions and decisions.
Identify Key Design Considerations	Create an initial design document by laying out the network on paper. Identify key wireless network design considerations, such as: ▪ Environmental conditions. ▪ Physical RF obstructions that could disrupt a wireless radio signal. ▪ Dynamic RF obstructions that are transient in nature. ▪ Future construction that could disrupt an RF signal. ▪ Sources of RF interference, both internal and external. ▪ The availability of mounting points for networking hardware, such as poles, suspended tile ceilings, and so on. ▪ Estimated bandwidth utilization requirements. ▪ Zoning and permitting requirements. This is usually only required for outdoor deployments. Check your local laws for specific requirements. Later, you will conduct a site survey to validate the initial design.
Conduct Initial RF Modeling and Mapping	Map and model the initial RF design on paper as follows: ▪ Compile all available asset information. This includes existing mounting locations, network media, and network hardware. ▪ Create an initial RF model. RF modeling is the process of identifying initial access point locations, assigning frequencies, and planning power levels.
Perform Bandwidth Planning	You need to understand the network's bandwidth requirements. To do this, identify the following: ▪ The amount of bandwidth required in various locations. ▪ The number of clients that will utilize this network. This is the *device density*. An overcapacity of clients will use up your bandwidth and slow performance of your wireless network. It is better to overestimate the number of devices on your network to ensure that you have the capacity to support them. ▪ The frequency that will be used. The farther away a device is from the access point, the more bandwidth drops. Bandwidth can also be affected by physical obstacles that interfere with the RF signal, as well as by sources of RF interference in the environment. You can measure the strength of the signal at a given distance from the access point by using the received signal strength indicator (RSSI). RSSI is measured as a negative number; a smaller value indicates a stronger signal.

Conduct a Site Survey	Your initial network design may not be accurate due to environment or other conditions that you can't account for on paper. To determine what these conditions are, you need to conduct a site survey.
	Visit each location where an access point will be installed, determine what the RF environment looks like, and then set up a temporary wireless network in the location to see how the radio signal behaves. There are several things you should do:
	▪ Inspect each mounting location identified in your initial design and ensure it is a viable location for an access point.
	▪ Document structural or environmental concerns that may disrupt the RF signal from the access point.
	▪ Verify that the access point can reach the wireless controller from the location.
	  ▪ For a wired backhaul, you must be able to run a wire to the controller.
	  ▪ For a wireless backhaul, the access point's wireless signal must be able to reach either the controller itself or another access point that can relay it to the controller.

	▪ Assess the availability of power to and grounding for the access point. ▪ Log the location's GPS coordinates. Use digital photos to document the location and its surrounding environment.
Internet of Things (IoT)	As you plan your network, remember to include other technologies that facilitate the Internet of Things (IoT), like home security and device data sharing. ▪ *Z-Wave* is a wireless communication protocol that's broadly used in home security and home automation. If you have either of these systems, you probably use Z-Wave technology. It uses a mesh topology so that each device acts as a repeater. As you increase the number of devices you have, it increases the power of your signal. Unlike most newer wireless protocols, Z-Wave uses low-energy radio waves that are capable of little bandwidth. This is because devices that use Z-Wave are designed to need very little bandwidth to interact with each other. ▪ *Ant+* is a protocol used to monitor sensor data. It uses a 2.4 GHz ISM band and has fast transmission rates. Like the Z-Wave protocol, it's compatible with the mesh topology, but can also be used with the point-to-point, star, and tree topologies. It's been used for things like geocaching and health monitors. ▪ *Near-field communication* (NFC) allows devices to communicate and share data with each other. It requires devices to be about four inches apart to communicate with each other. It's very common to see NFC used with cell phones and mobile pay applications. It's also used to pair devices that will then use other technologies to communicate.