

Networking

Wireless Technologies



Antenna Types

- Wireless antennas
 - Transmits and receives wireless data
- Omnidirectional
 - Send and receive from all directions
- Directional
 - Pull signal from one direction
 - Greater range



A directional antenna



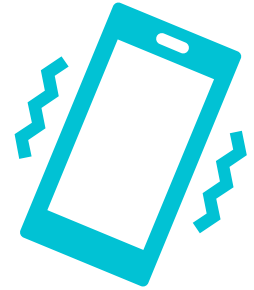
WiFi Encryption

- WPA (Wireless Protected Access)
 - Replaced WEP encryption
 - RC4 cipher with temporal key integrity protocol (TKIP)
 - 128-bit encryption key in every packet
- WPA2
 - Uses AES encryption
 - Uses a 256-key
 - More secure than WPA



Cellular Technologies

- Code-Division Multiple Access (CDMA)
 - Assigns unique code to every call
 - Call is transmitted across all frequencies
- Global System for Mobile Communications (GSM)
 - Cellular phone that contains a subscriber identity module (SIM) chip
 - The chip contains the subscriber's information and is required for the phone to function



Cellular Technologies

- Long-Term Evolution (LTE)
 - Also known as 4G cell service
 - Up to 1Gbps connection speeds
- 3G, 4G, and 5G
 - Cellular connections with different speeds



Technology	Bandwidth	Standards
3G	2 Mbps	WCDMA, CDMA-2000
4G	200 to 1000 Mbps	CDMA, LTE, WiMAX
5G	1 to 10 Gbps	OFDM, MIMO, nm Waves



MIMO

- Multiple-Input, Multiple-Output (MIMO)
 - One of the standards for 5G
 - Sends multiple frames via multiple antennas over multiple paths
 - Then recombined by another set of antennas to optimize throughput and multipath resistance
- Multiuser Multiple-Input, Multiple-Output (MU-MIMO)
 - Like MIMO
 - Allows multiple users/devices to transmit at once

