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Technology Brief
Wireless Local Area Networks

General Information: Wireless Local Area Networks (WLAN's) are an access method for mobile users to a local area network. These users may have a Laptop, Tablet, Smartphone or other mobile device with an integrated wireless network card to connect via radio frequency (RF) signals to the wired network through a Wireless Access Point (AP or WAP). These operate using a group of low power, unlicensed, frequencies controlled in the United States by the Federal Communications Commission (FCC).

Technologies: WLAN products are designed around the Ethernet standards established by the Institute of Electrical and Electronics Engineers (IEEE) and currently, there are 5 distinct groups of technologies and implementations of standards based wireless access systems for premise systems using unlicensed RF gear:

- **802.11a** this is an alternative to 11b, it offers higher bandwidth but less distance, it is not interoperable with 11b or 11g but it offers higher immunity to RF Interference and less contention for available frequencies.
- **802.11b** the original "standard" and still widely used product set on older equipment.
- **802.11g** based on the 11b standard, it offers backwards compatability with 802.11b products but with much higher bandwidth. Uses a different modulation scheme than 802.11b
- **802.11n** Increases bandwidth and throughput by trunking or adding together channels and typically has multiple antenna arrays (Multiple Inputs-Multiple Ouputs or MIMO).
- **802.11ac** is the latest release and operates exclusively in the 5 Ghz. range, typically has 2 LAN connections, multiple antenna arrays and 2 radio modules to support the high bandwidth throughput users are requiring.

<i>Technology</i>	<i>Frequency</i>	<i>Max Bandwidth</i>	<i>Typical Coverage</i>	<i>Note/Comment</i>
802.11a	5.0 Ghz.	54 Mbps	150 ft	Less RF Interference
802.11b	2.4 Ghz.	11 Mbps	300 ft	Compatible with 11G
802.11g	2.4 Ghz.	54 Mbps	300 ft	Compatible with 11B
802.11n	2.4 & 5.0 Ghz.	130 Mbps +	150 ft	Bonds Channels for Bandwidth
802.11ac	5.0 Ghz.	Gigabit +	150 ft	Wider, Bonded Channels, MiMo

WIFI: Wireless Fidelity (WIFI) is a certification that indicates products of various manufacturers have been tested to ensure they will work together (interoperate) in a mixed product/manufacturer installation.

Security: Original product designs utilized wired equivelent privacy (WEP) to secure the information being transmitted. This was a 40/64-bit encryption method and found to be very easily "hacked" by intruders trying to gain unauthorized access to the network. The current method is WIFI Protected Access v2 (WPA2) and may use a pre-shared key (PSK) or other protocols in larger installations. Current encryption levels are minimally 128 bits up to 256 bits with available technologies. Security is a critical requirement for any and all WLAN installations and also includes 802.1x and Radius methods. Numerous other means of user authentication and security are available as part of an overall network wide security system of which wireless access is one component and many times multiple methods are used together.

Typical Equipment:

- **Access Points (WAP)** (functions as a shared bandwidth collection point for radio frequency signals from clients and provides access to the wired network), some have external antennas for flexibility in configuration and deployment. Indoor and Outdoor products are available.
- **Controllers (Management Appliances)** provide a central device to monitor, manage and maintain the AP's
- **Power Units** most access points receive power via the unshielded twisted pair (UTP) cable that connects them to the network, This is called Power over Ethernet or PoE. When the network electronics (switch) does not supply this power, it can be supplied through a mid-span power supply or power injector.
- **Bridges** Building to Building (B2B) extensions of wired networks are possible using bridges, these typically consist of a base unit, antenna and cable at each of the location(s) to be connected. These bridges do not normally provide user access but are an extension of the wired LAN via RF signals between points.