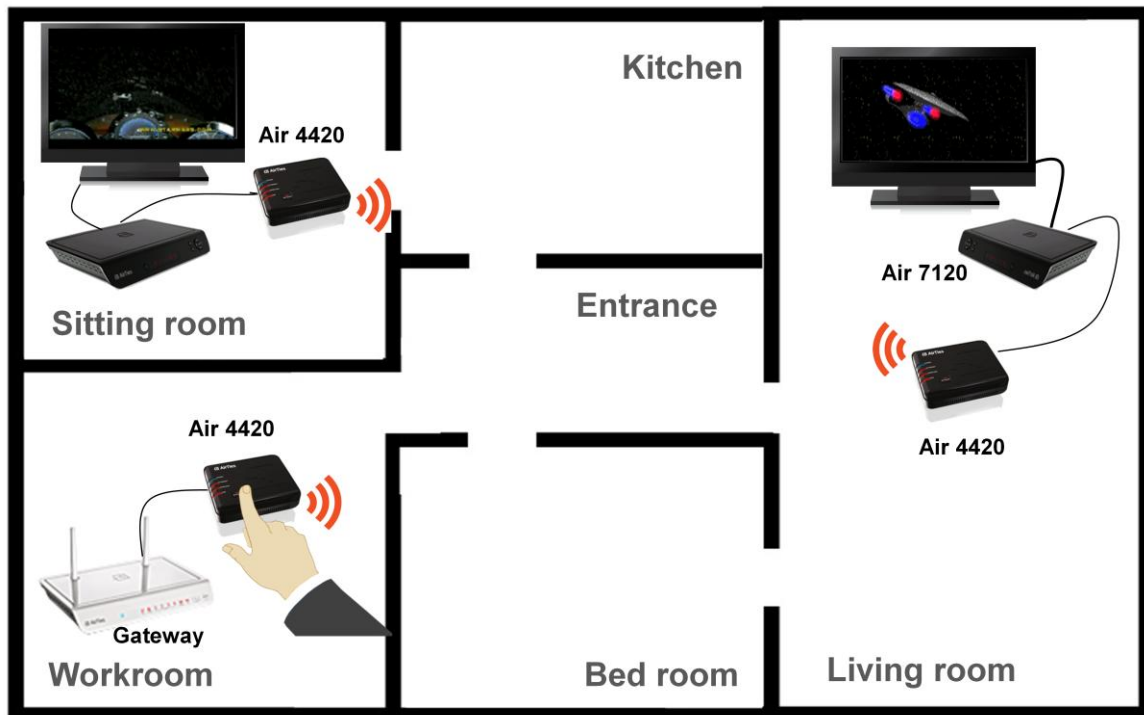


## Overview

Even in situations where there is a relatively slow Internet connection the speed and performance of the local home/office network is very important. Delays or response time from action/key in a video game console or online game can have a major impact on the game. New applications such as streaming Web TV content, or sharing files, movies, music, photos locally on shared drive, streaming movies between TV's, and access business applications such as accounting programs all require a fast local network.



All vendors including AirTies claim to achieve up to 300Mbit per second performance with 802.11n technology. Although this type of performance is achievable under the right circumstances, it is rarely achieved. To achieve their potential 802.11n devices need 2 of the 3 channels available at 2.4GHz to be clear. In typical high density living prevalent throughout Europe the probability of finding two clear channels without seeing neighbouring devices is very low. Operating on one channel brings the rate down 135Mbit. If there are other Wi-Fi devices the channel and bandwidth is shared, if these devices are older 11g technology then the network slows down further. If there is interference from other devices such as DECT phones or Bluetooth devices the performance is further reduced. As physical distance increases between devices or if there are walls in between the connection rates are sequentially dropped to as low 1Mbit.



## Available Solutions

**Old:** 54Mbit 802.11g: This is low cost older technology, operates on one channel at 2.4GHz and is lacking many of the new use ability features.

**OK:** 1X1 802.11n 67 Mbit to 150Mbit: This technology is a good alternative for cost sensitive customers looking for good enough products. It utilizes a single stream of 11n capability. It delivers at 67 Mbit performance using one channel at 2.4GHz, or 150Mbit using 2 channels at 2.4GHz.

**Good:** 2X2 11n 135Mbit to 300Mbit: This technology uses full two streams of 11n. It delivers 135Mbit performance with 1 channel at 2.4GHz and 300Mbit with 2 channels at 2.4GHz.

**Best:** 2X2 11n at 5GHz + MESH + channel change: AirTies achieves real high-speed performance through a series of technical innovations that operate together, which are...

**5 GHz:** There are 22 wireless channels at 5GHz versus only 3 at 2.4GHz. All new AirTies products support the 5GHz band. The probability of finding 2 clear channels to achieve the 300Mbit throughput is much higher at 5GHz. Furthermore there are fewer devices in the band and 5GHz WiFi devices are mostly the latest 11n technology.

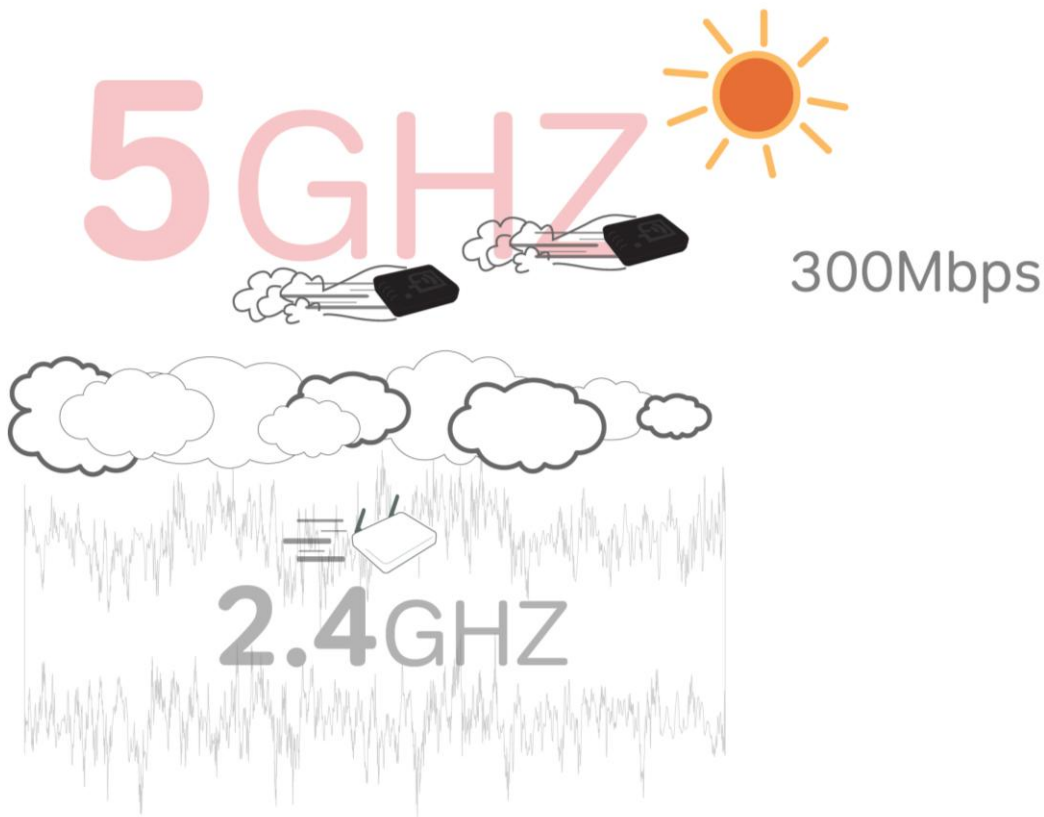
**Dynamic channel change:** AirTies devices constantly scan the available channels for noise and traffic. AirTies devices will automatically change the channel to the best one available.

**MESH technology:** All AirTies devices support our MESH technology, which provides a large coverage range while maintaining high connection rates



## Technical Details

The 802.11 b/g/a/n standard uses 20MHz channels in the unlicensed frequency bands worldwide. There are 3 non-overlapping 20MHz channels available at 2.4GHz and 22 available at 5GHz. There are a significant number of improvements made by 11n standard over the 11g standard. By using 2X2 MIMO and other technology, the physical layer rate has been increased from 54Mbit to 135Mbit on a single 20MHz channel. To achieve the full 300Mbit physical layer rate 40Mhz of spectrum is needed or 2 channels next to each other. 1X1 11n implementations can achieve 150Mbit performance if 40Mhz of channel space is available, they can achieve 67Mbit if only 20Mhz is available.



The business of the available channels also has a significant impact on real speed. If there are any other Wi-Fi devices visible to the specific network they must be given fair access to the channel. So the total available capacity starts to be shared between the neighbours. In addition to the pure physical layer improvements 802:11n has significant improvements at the MAC/ Media Access Control layer to get optimal throughput via the available bit rate. Key among these is getting on and off the network quickly. If there are 11g devices on the same channel they are slower and therefore slow down the total performance of the channel. Another key performance improvement is streaming several packets together them and getting a single acknowledgement for them. This is the primary innovation behind the 11g++ technologies.



As the physical distance increases from transmitter to the receiver slower speed rates with longer reach are used. Since wireless signals travel from point A to point B inside a building with walls by bouncing off of the walls typical range versus performance drops very rapidly. By having a single AirTies device, which acts as a repeater located at the right location, can make high capacity bandwidth available throughout the entire home or office. ([See MESH technology link for more details](#))

Dynamic channel change: One of the best technical solutions to improved performance is to operate in a clean channel. If you are living in an apartment complex this is exceedingly hard to do. Your neighbour can buy a new wireless router and set it on your channel, somebody can turn on a microwave or start drilling holes. Interference is different in different rooms inside the house. Using a DECT phone or a Bluetooth phone or simply moving the furniture can change wireless performance.

In an AirTies network all devices including MESH nodes regularly scan all available channels for noise, interference and traffic. This data is collected from all locations of the network. All of this information is collected and analyzed at the root AP and if necessary a decision to change the wireless channel is made. The exact timing of when the channel change will occur is communicated to all AirTies devices and they change channels at the same time. This can occur every few seconds and occurs without dropping a single packet.

