Info-Point
Guidance on Wi-Fi Range and Capacity

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Wi-Fi coverage from one unit

Let's start with what happens in an open space that has no obstructions between the unit and the visitor.

Our standard antenna included with the unit (commonly known as an aerial) will produce a universally usable signal out to 150m horizontally from the unit. It will go further for some phones that have good internal Wi-Fi engineering. The universal horizontal signal can be improved out to 250m with an optional high-gain antenna. The high-gain antenna is not physically much different from the normal one - just a bit longer.

If there are walls in the way, then the Wi-Fi signal will be weakened to some degree. How much depends of the material and on the thickness and also the dampness, as water molecules absorb radio signals in the Wi-Fi wavelength.

Glass, plastic and wood are radio transparent, so an Info-Point can be put in a window to cover outside and inside, or to link between buildings. It can also be put in a wooden or plastic box for security or weather protection without any problem.

Dry and thin plaster, brick or stone walls will not weaken the signal much, and it is sometimes possible to cover a multi-room building of about the size of a large house with one centrally placed unit. The thick damp stone walls of a castle will absorb most the signal and little will get through.

Steel-clad buildings reflect the signal back, intensifying it, so one unit will cover extremely well inside a metal transport museum of 1,000 sqm (10,000 sq ft) or more.

The Wi-Fi signal tends to find its way through apertures. This means that windows and doorways are good for letting the signal through, just as they are for letting light through. Placing an Info-Point in a central stairwell with openings to rooms leading off it is often an ideal location.

Downloadable content

For remote and outdoor locations, where you only want to install one Info-Point unit.

Information, maps and trails are best produced as pdf documents that are universally downloadable and can be saved on the visitor's phone for use when out of range.

While rich media, and even native apps, can also be offered for download by an Info-Point unit, some phones, especially iPhones are locked to the official Apple store so would not download them from a local web. Rich media, such as videos and sound, will always play within the page, but if you provide a 'download and keep' button some phones will refuse to save it.

Extending coverage via Hot-Spots

For big outdoor spaces or multiple independent buildings

Multiple Info-Point units can be placed around a site such that there are Wi-Fi 'hot-spots' with gaps in between. The user can connect to any unit and use it. They can then move to the next 'hot-spot' and continue browsing, although they cannot browse while they are between hot-spots.

As each Info-Point is an independent unit the content and any changes needs to be copied across all the hot-spots. There is a facility in the Content Management System to help do this.

Note: Info-Point is designed so that if a user is already reading a page or playing a sound track or video, that item they are using will continue to work as they move out of range.

Extending coverage via networking

For complex buildings or multiple buildings close together

An Info-Point can be combined with any number of Access Points (sometimes called 'Master' and 'slave' configuration). This can form a contiguous network so the user will have continuous service as they walk through the area.

The units are arranged in a chain and each must be able to receive the Wi-Fi signal from its neighbours in the chain. An advantage of this configuration is that you only have one master unit on which to manage the content.

Using the high-gain antennas we have demonstrated that outdoors, under ideal conditions, adjacent units in the network chain can be over 1 Km apart. This is further than the range to the average phone, so could be similar to hot-spots, in that coverage is only available within 250m of an access point.

Increasing capacity

For high traffic areas.

The traffic capacity for an Info-Point is determined by the Wi-Fi connection rather than the internal server. The master unit Wi-Fi can carry about 40 active users after which it will slow down significantly.

The master/slave configuration adds more user capacity by adding more Wi-Fi access points. A sensible overall capacity of an Info-Point network is around 200 simultaneous users. It would be possible to build a bigger system, but this would be best done as a permanent wired installation, whereas an Info-Point network is completely wireless.

Specialist antennas

For underground or unusual sites

The power of Wi-Fi is restricted by law, so you cannot simply increase it.

There are a variety of antennas that will change the signal coverage. For example it is common to amplify the signal in one direction at the expense of others in order to ‘throw’ it a greater distance.

Another example is a ‘leaky cable’ antenna which is designed for use in tunnels or radio-opaque spaces, where a long cable can be threaded through the space and all the users will be within a few metres of it.

Radio wave propagation is a complex subject. Installing specialist antennas involves on-site testing, and may involve specialist installation, both of which carry a cost. However, it does open up additional possibilities, and once an installation has been tested it will work consistently providing the environment is not changed.

Useful Tips for optimising signal

Height above the ground

You will maximise the range by siting the unit above head height. Generally the higher the better. Putting an Info-Point on the ground will shorten its range. It is useful to envisage this like sending a jet of water horizontally from a pipe. It will have a maximum range when the pipe is high up. Put the pipe on the ground and the water jet immediately disperses onto the ground.

Adding a reflector

You can make the signal more directional by incorporating a simple flat metal reflector behind your unit's antenna. This can be anything suitable, such as a metal plate, a mirror tile, or just a piece of aluminium cooking foil, which can be hidden behind a piece of wood, plastic, or glass.

If you are positioning the Info-Point next to a damp wall, where some of the signal will be sucked into the wall behind, this will strengthen the signal in front by around 4 times.

This technique is also useful if you need to position your info point at one edge of a site rather than centrally, as it creates a more directional effect from the standard antenna.

Horizontal position

The signal from a standard antenna can be visualised as looking like a doughnut with the antenna going through the hole in the middle. The high-gain antenna is similar, but is more of a squashed doughnut or frisbee that extends out further but is flatter.

With the antenna vertical the best signal is horizontally across the ground. If you are trying to cover a tall building with multiple floors then it is sometimes better to put the antenna horizontal and thus stand the doughnut on its edge.

The antenna has a 90 degree elbow and can be turned to be horizontal or vertical no matter what orientation the Info-Point unit is in.

Technical information

Info-Point uses 2.4 GHz Wi-Fi on channel 1
The standard and high-gain antennas are dipole
The unit has a female RP-SMA connector (ie. the pin is on the unit)