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*Computer buyer's guide for small business*

# *Network Connectivity*

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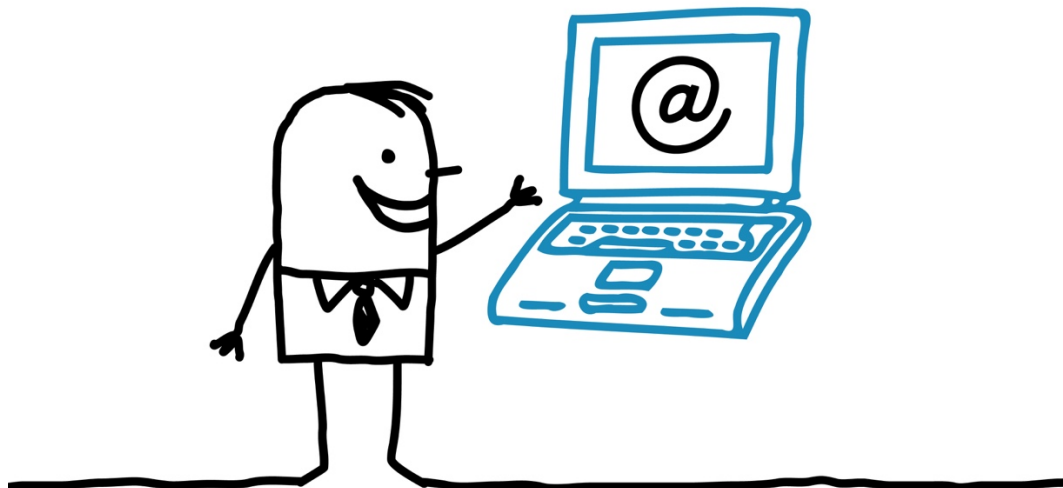
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## 1 Introduction

*The ability to share, in real time, information with other computers requires a computer network (I'll just say "network" from now on).*

Sending email, surfing the Internet, video chat, or using Internet based file storage services all depend on your network connection.

*In terms of selecting a computer, the options to consider are directly determined by the types of network that you want to connect with.*

Thus, before describing the connectivity options we need to cover the key network types.

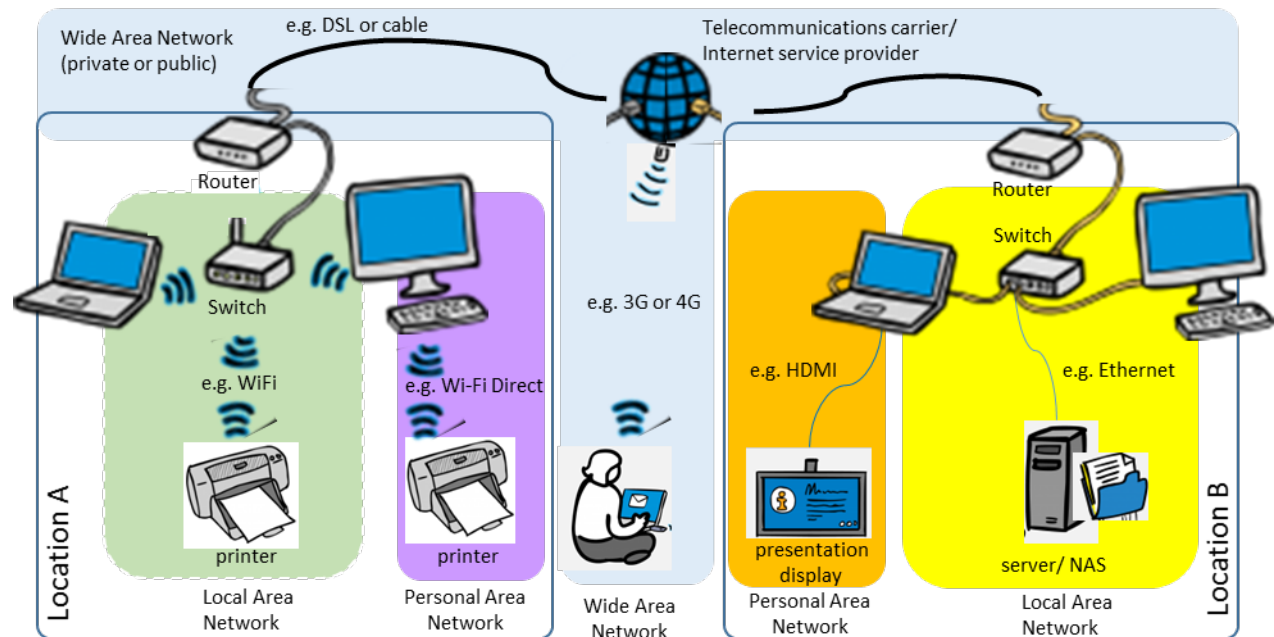


Figure 1-1: Network connectivity types (Source: deBaffle.net).

The above diagram illustrates the three common network types, personal area network (PAN), local area network (LAN) and wide area network (WAN).

There are many technologies, both wired and wireless, that can create each network type, and we will cover the most common in the sections that follow.

## 2 Personal Area Network (PAN)

*PANs provide direct connectivity between two devices, usually in the same room.*

Two common PAN examples are connectivity to a printer (as highlighted in purple in Figure 1-1), or connectivity to a presentation display (as highlighted in orange in Figure 1-1).

A PAN operates independently to a LAN (LAN is described next). Thus a PAN can provide a network option if a LAN does not exist, or if you want to provide access to a device without providing access to a LAN (the latter is an important advantage for the security conscious when providing access to guests).

Please see [debaffle.net/guides](http://debaffle.net/guides) for the computer connectivity options when considering PANs for connecting external displays, keyboard and mouse, printers and external storage.

### 3 Local Area Network (LAN)

*LANs provide a solution for connecting all computers in the same building.* This is made possible by a network device called a switch, which is usually part of the router or modem provided by an Internet Service Provider (ISP).

For example, a LAN connected printer can be used by all computers on that same LAN (as highlighted in green in Figure 1-1).

As another example, a LAN connected server/ NAS can provide common file storage for all computers on the same LAN (as highlighted in yellow in Figure 1-1).

A LAN can be wireless or wired as described in the sections that follow.

#### 3.1 Wi-Fi LAN

Wi-Fi provides an obvious advantage of cable free LAN connectivity. This removes the need for physical network connections. In addition, Wi-Fi is the de-facto network standard available in public locations such as hotels, airports and coffee shops.

Wi-Fi speed varies dramatically by interface standards from 11Mbps to 1,300 Mbps. However, please note that all Wi-Fi standards reach a fraction of their maximum theoretical speeds due to practical considerations such as walls, interference from other wireless signals, and the number of concurrent users.

Wi-Fi networks rely on physical devices called “access points” that transmit and receive wireless signals. The access points are usually connected by a LAN, which in turn provides Internet or WAN connectivity.

*All computers come with Wi-Fi as standard, thus from a small business perspective, the key consideration is having a suitable Wi-Fi network available for use.*

A small office may only need one access point, which will most likely be built-in to the provided router or modem. Larger offices will require multiple access points, in which case cabling will be required to each access point location.

#### 3.2 Ethernet LAN

Ethernet is the de-facto standard for wired LAN connectivity (via an RJ45 connector).

The RJ45 connector is found in almost all Windows based laptops and desktop computers. Notably, Apple laptops no longer include RJ45 connectors, in favour of wireless connectivity, and USB Type C connector (see [debaffle.net/guides](http://debaffle.net/guides) for connector details).

*Ethernet LANs provide network connections which effectively guarantee data throughput. This is the key advantage when compared to Wi-Fi signals which can significant degrade due to uncontrollable factors.*

A physical cable and an outlet with an RJ45 connector is required at each location that a connected computer is required. Installing this cabling for any more than one or two users can be a difficult often requires professional cable installers.

*When selecting a computer, your need for Ethernet connectivity will influence whether you have a wired LAN in your office location.*

## 4 Wide Area Network (WAN)

*WANs provide network connectivity between physically separate locations such as different offices and/or remote workers. A WAN provides the same benefits as a LAN, but between greater physical distance.*

The Internet can be used to facilitate WAN connections between discrete locations, and in many cases, the same WAN connection will also be used to provide access to the Internet. In general, WAN connections can only be provided by telecommunications carriers or ISPs as highlighted in pale blue in Figure 1-1.

As with LANs, WANs can be wired or wireless.

### 4.1 Fibre, Cable and DSL

Fibre, cable and DSL provide wired WAN connectivity, enabling multiple office locations to share computing resources such as printers and file storage.

In the case of a single office location a more accurate description is just “Internet connectivity”.

These services are delivered via a router or modem, which will usually have an integrated wired and wireless LAN. Thus, local computer connectivity is available for a limited number of wired connections, and for wireless connectivity within a short range.

*The throughput capabilities of fibre, cable and DSL data vary dramatically depending on the service provider, with fibre generally the fastest, followed by cable and then DSL.*

The concept of signal range for fibre, cable and DSL, is only a relevant concern for the ISP delivering you the service.

### 4.2 Cellular wireless

*Cellular wireless connections provide perfect solutions for travelling workers and, also, Internet connectivity to mobile computers such as smartphones, tablets and laptops.*

When combined with a technology called a Virtual Private Network (VPN), a mobile computer can have access to office resources such as printers and file storage.

To create a VPN, the capability needs to be available and configured on your office network and on your computer. The setup is difficult and a computer professional will be needed.

Data throughput for cellular wireless is generally lower than wired WAN connections, and network coverage can be variable. For these reasons, cellular wireless connections for office locations is unusual as wired WAN connections provide more reliable options, and the advantage of wireless mobility does not apply to fixed office locations.

*Please note that cellular wireless standards vary across countries. A 4G laptop in the US will not necessarily work in the UK and vice versa – check your requirements with the manufacturer.*

## 5 Summary and buying recommendations

This guide described the differences wide area network (WAN), local area network (LAN), and personal area network (PAN). The connectivity options for WAN and LAN are summarised below. For PAN connectivity options, please see our separate guides on connectivity options when considering PANs for connecting external displays, keyboard and mouse, printers and external storage.


Network type	Interface	Computer side connector	Signal range within the local area network	Throughput (data speed)
Wide Area Network	DSL (E.g. ADSL, VDSL).	Usually RJ45 via a router.	n/a	Varies by provider, between 5Mbps and 50Mbps
	Cable	Usually RJ45 via a router.	n/a	Varies by provider, generally less than 100 Mbps
	Fibre	Usually RJ45 via a router.	n/a	Varies dramatically by provider, up to 1Gbps (1,000 Mbps)
	Cellular wireless (e.g. 3G, 4G, LTE, HSDPA)	Wireless, or via a USB wireless adaptor.	n/a	Varies dramatically between 5 and 30Mbps
Local Area Network	100BaseT Ethernet	RJ45 connector 	100m	100 Mbps
	1000 Base T Ethernet	RJ45 connector	100m	1 Gbps (1,000 Mbps)
	Wi-Fi 802.11a	Wireless	Through 2 solid walls	Up to 11 Mbps
	Wi-Fi 802.11b	Wireless	Through 2 solid walls	Up to 11 Mbps
	Wi-Fi 802.11g	Wireless	Through 2 solid walls	Up to 54 Mbps
	Wi-Fi 802.11n	Wireless	Through 2 solid walls	Up to 450 Mbps
	Wi-Fi 802.11ac	Wireless	Through 2 solid walls	Up to 1300 Mbps

Table 5-1: Summary and comparison of common network types.

As stated within this guide, the connectivity options you need on a computer are directly linked to the connectivity you want within your office. As such the following recommendations are intertwined with office connectivity recommendations:

- If your business is highly security conscious, and if you want to provide guests with access to printing or the Internet, then you should consider using a separate guest LAN. This is relatively straightforward for wireless LANs, but there are additional enforcement considerations for wired LANs. In either case, the assistance of a computer professional will be required.
- I recommend that your computers at fixed desk locations within your office are connected with a wired LAN connection. This provides dedicated network connectivity that is immune to interference and other degradation issues that are unique to wireless. As such your computers should have an RJ45 connection, or a docking station/port replicator with RJ45 connectivity.
- In addition to wired LAN connectivity in your office, I recommend you provide Wi-Fi connectivity to cover meeting rooms, reception and waiting areas. As such, portable computers should be Wi-Fi capable, and all are these days, but if possible purchase the latest “ac” standard.

The WAN connectivity you require will be dependent on many factors that are outside the scope of this guide. That said, taking advantage of cellular wireless connectivity will be a consideration when you are away from the office and when public Wi-Fi is not available. Cellular wireless coverage and pricing varies tremendously from region to region, as such investigate both these points and make your own value judgement if remote wireless network access is worth the cost.

## About deBaffle.net

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## About the author

Richard is the founder of deBaffle.net. He has over 13 years' experience in the information and communications technology industry and has held senior management roles in both government and the private sectors. Richard has extensive experience working with organisations to deliver technologies that meet business objectives. This includes strategy development, procurement and implementation.

Richard has an honors degree in engineering and a degree in economics from the Australian National University.

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