



Preparing Your Home for Next Gen NBN Services

Infocomm Development Authority of Singapore

With the optical fibre installed in your home, you are getting closer to enjoying the superior bandwidth, richer online content and other benefits of Next Gen NBN.

To make Next Gen NBN's superior broadband connection available to more users in your home, it is best to install a home network. This reference guide will explain all you need to know about it: what is home networking, what are its advantages, what are your options in installing it, etc.

Setting up a home network will require some planning, but with the help of this guide, you can manage the costs and the effort. Once you enjoy the higher quality services over Next Gen NBN, you will see that it will be worth it.

Should you need more assistance on the installation of your home network, please consult your respective Retail Service Provider (RSP). The RSP contacts can be found at the end of this document.

Acknowledgements:

IDA would like to thank OpenNet Pte Ltd and Nucleus Connect Pte Ltd for providing information and the rights to use digital images in this reference guide.

Disclaimer:

The purpose of this guide is to explain the home networking solutions available for you. Please consult your Retail Service Provider on the most suitable form of home networking for your needs.

Please note that all images in this guide are for illustration purposes only.

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Introduction

An overview of Next Gen Nationwide Broadband Network (Next Gen NBN)

Part of the Intelligent Nation 2015 (iN2015) masterplan by Infocomm Development Authority (IDA), the Next Gen Nationwide Broadband Network (Next Gen NBN) project aims to bring ultra-highspeed broadband to Singaporeans by delivering optical fibre Internet connection to homes and businesses all over Singapore.

Capable of delivering speeds of 1 Gbps and above, Next Gen NBN can provide a richer broadband experience at more affordable prices. Just imagine being able to download huge files up to 100 times faster than what your Internet connection used to deliver, view higher resolution content on your PCs and TVs, play online games in real time, and more!

Next Gen NBN is the broadband connection of the future. To make the most of Next Gen NBN, you need to install a home network so that members of your household can enjoy it through multiple devices.

Preparing your home for Next Gen NBN

What are the devices needed for Next Gen NBN?

1. The incoming optical fibre and the first Termination Point (1st TP) (**Figure 1**), will need to be installed by OpenNet in your home.



Figure 1: First Termination Point

- The Optical Network Terminal (ONT) (**Figure 2**) is a powered device which will connect to the TP (using an optical fibre patch cable) (**Figure 3**) and convert incoming optical signal from TP to an electrical signal for your RG and home network.

The ONT usually comes with an optical port and 4 network ports. These network ports allow multiple RSPs to share one ONT, with each RSP delivering its services via one or more ports. Note: Some RSPs may choose to use separate ONT from your existing RSP.

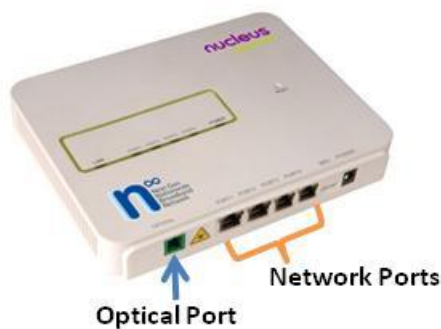


Figure 2: Nucleus Connect's Optical Network Terminal (ONT)



Figure 3: Optical Fibre Patch Cable

- The Residential Gateway (RG) (**Figure 4**), which also functions as a router, is a powered home networking device used to connect your home to the RSP's network. A network cable (**Figure 5**) will connect the ONT to the RG.

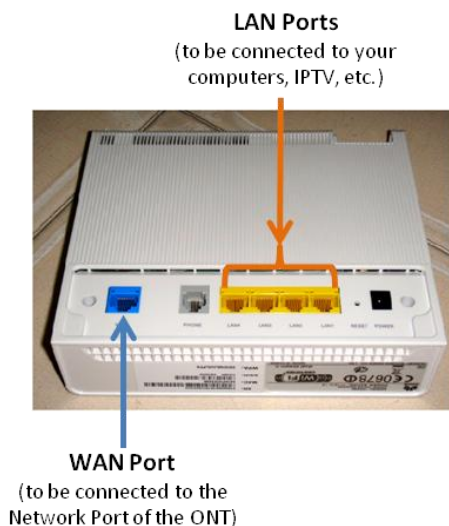


Figure 4: Residential Gateway (RG)



Figure 5: Network Cable

Figure 6 below illustrates a typical home network, showing how the TP, ONT and RG are connected to each other, to enable delivery of services over Next Gen NBN to your home.

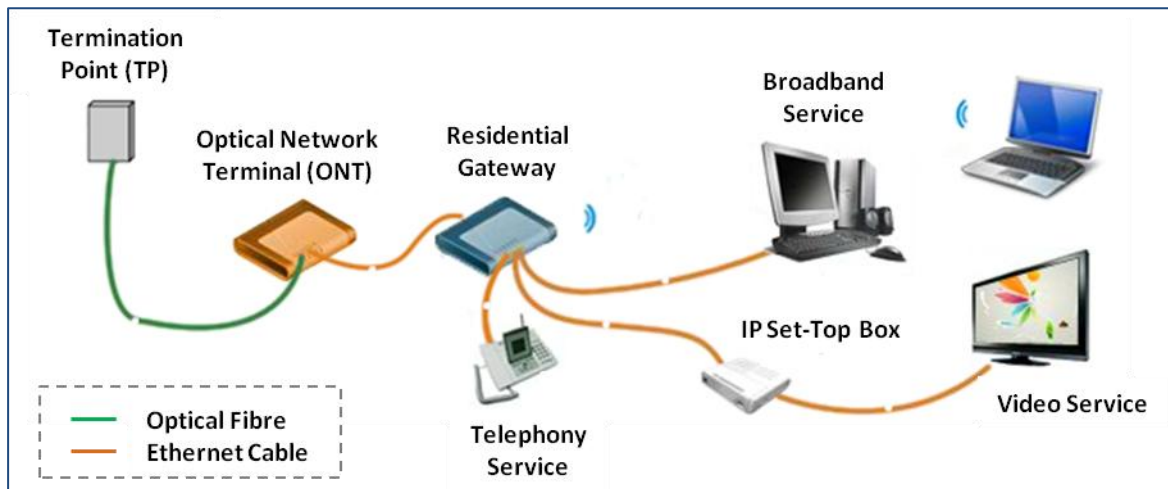


Figure 6: Typical Home Network Connectivity

Tips on preparing your home for Next Gen NBN

1. The location of the Termination Point (TP) is important, as this is the point from where your home networking solution will distribute services throughout your home. It is recommended to install the TP in your living room, beside your existing SCV/TV point, with a nearby power point. For homes where there is a pre-laid network cable running from the service closet to the living room, the TP may also be placed in the service closet.
2. If you already have Structured Network Cabling at home, you can also install the TP beside the network distribution panel with a nearby power point. For more information on the network distribution panel, please refer to page 10.

Home Networking

What is Home Networking

Home networking is the set-up that connects different digital devices – your computer, your printer, etc. - so that multiple users can take advantage of broadband and other services at the same time, with just one Internet subscription.

More than just sharing Internet access, home networking also delivers other benefits:

- Home Entertainment. Watch your favourite movie on your High Definition TV (HDTV) screen by accessing content on the network-attached storage (NAS) or through a networked TV media player.
- Gaming. Take advantage of the integrated wired or wireless networking functions in the gaming consoles to enjoy online gaming.
- File Sharing. Access files (document, music, video, photos) from different computers or devices in your home quite easily, even without a USB flash drive.
- Peripheral Sharing. Different users in your home can use your printer, scanner, storage device and media server at any time.
- Remote home monitoring. Install webcams in different areas of your home, so you can monitor the activities at these areas while you're away.

IMPORTANT!

Take time to plan your home network thoroughly. As this may involve installation of cables and other devices, it's important to study the best home networking solution for your home – one that will be future-proof or, to put it simply, one that will serve your needs well into the future. As you plan your home network, think of it as a long-term investment.

Tips for planning your home network

Ask yourself and members of your household:

1. Are we going to add more computers/other devices in the future?
2. Are we going to subscribe to IPTV, play online games, work from home, and do other tasks that will require a reliable and fast broadband connection?
3. Are we going to install the right and proper cabling once and for all? Or are we willing to spend time and money to change it again, when we decide to upgrade our home network in the future?

What are the different Home Networking Solutions?

There are several home networking solutions, such as Wireless, Structured Network Cabling, Coaxial and Powerline Networking.

Note: The transmission speeds listed in this section are theoretical, achievable only under ideal conditions. Speeds may vary, depending on differences in hardware, setup, environment factors, quality of infrastructure, etc.

Wireless Home Networking

Wireless Home Networking transmits data over the air. There are many standards of wireless networking, but 802.11a/b/g/n, which is more commonly known as Wi-Fi, is the most commonly used standard worldwide. **Figure 7** illustrates a typical wireless home network.

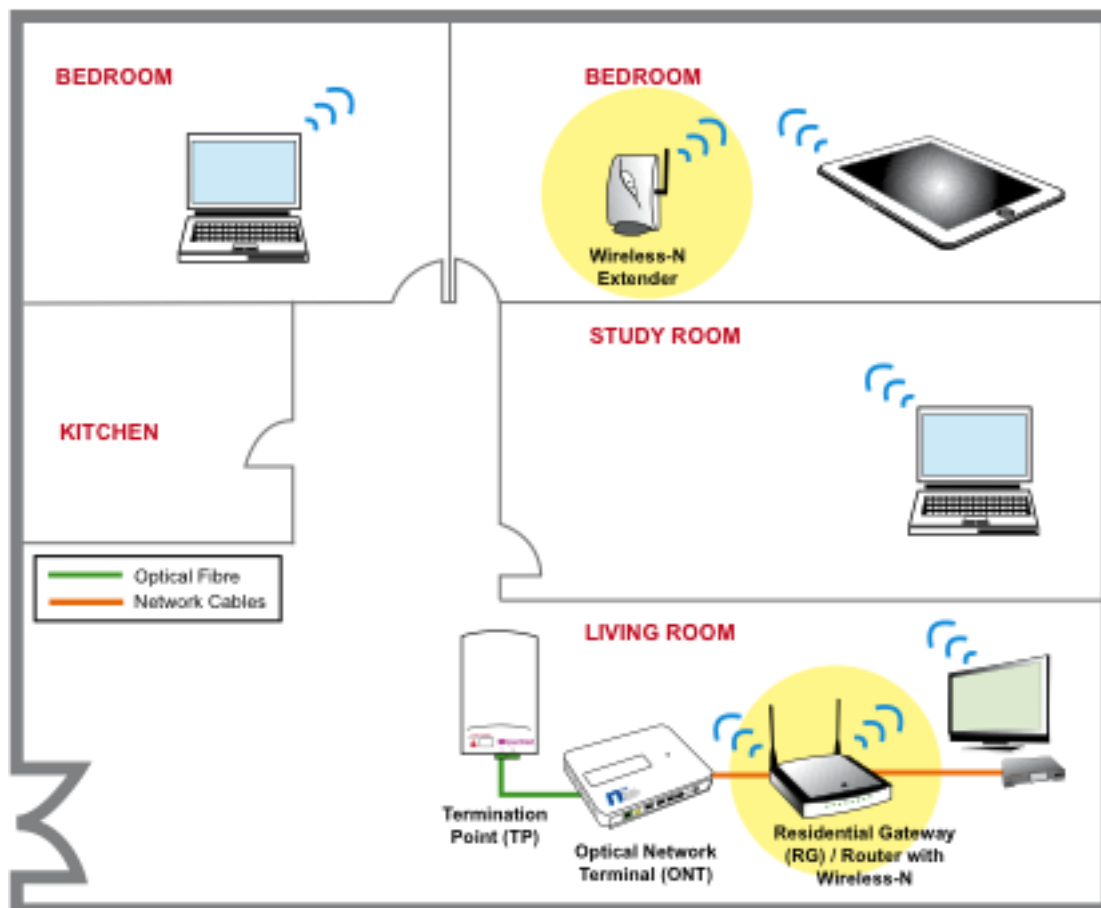


Figure 7: Wireless Home Networking

Table 1 summarises the advantages and disadvantages of using wireless as a home networking solution.

PROS +	CONS -
Additional trunking and cables are not required	Wi-Fi is susceptible to interference from other nearby Wi-Fi networks
Wi-Fi is a standard feature in Residential Gateways, routers and portable devices	Wi-Fi network is shared among all users. The speed that each user experience will reduce as the number of devices in the network increase
Freedom to use your laptop, tablet device or smartphone anywhere in the house	Wi-Fi signals tend to weaken when passing through obstacles such as walls

Table 1: Pros and Cons of Wireless Networking

Recommendation

This option is appropriate for Wi-Fi-enabled devices, and if you wish to enjoy greater mobility without being tied to physical wires.

Tips for installing

For best results, always position your Wi-Fi-enabled router or a Residential Gateway (RG) with built-in Wi-Fi capability in an unobstructed location, preferably in the central location of your home, to maximise the wireless coverage of your entire home.

- To eliminate “blind spots”, and to increase the reach of the Wi-Fi signal, you can use wireless range extender, which picks up and rebroadcasts signals from the wireless RG/router. Do note that the network performance of a device connected through a range extender will generally be lower than if the device were connected directly to the wireless RG/router.

Structured Network Cabling

Network cables are laid to different rooms within the home, and then terminated into network access points. These cables can be laid on wall surfaces and covered by plastic trunking, or concealed within walls, false ceilings and cornices. Cat5e and Cat6 network cables are commonly used, which allow transmission speeds of up to 1,000 Mbps and 10,000 Mbps respectively. **Figure 8** illustrates an example of how structured network cabling can be laid out in a home.

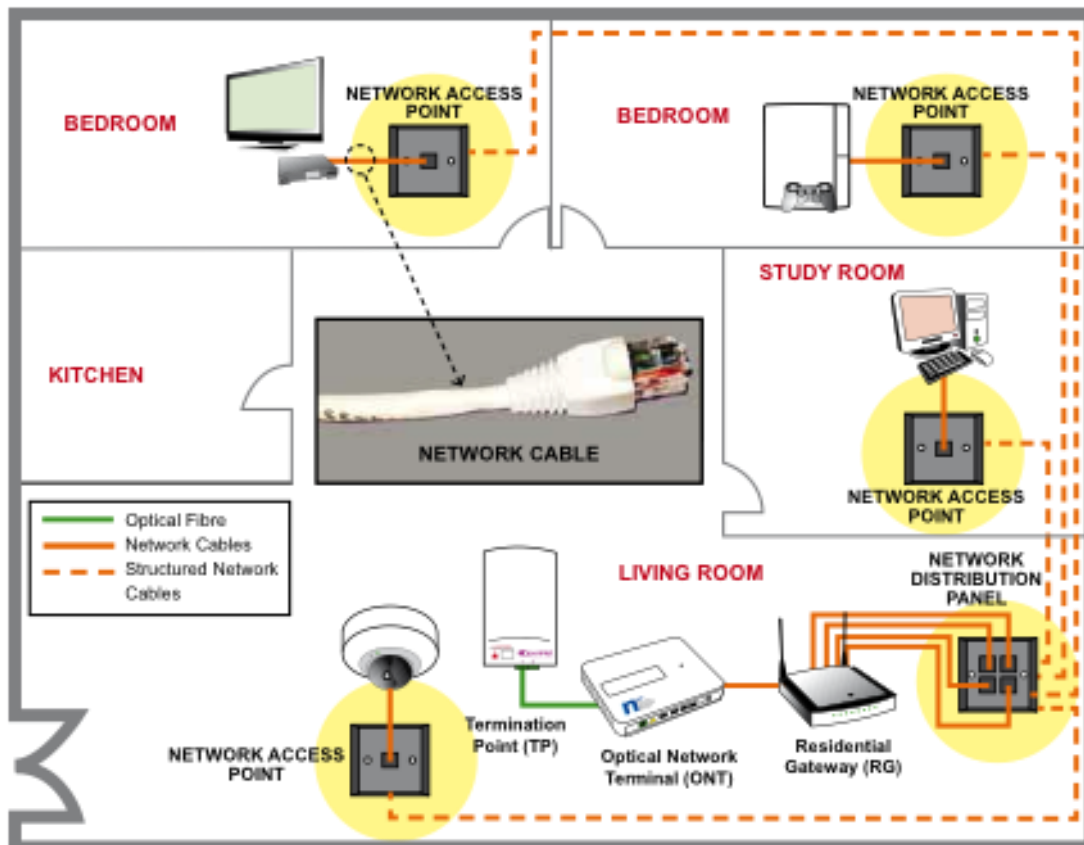


Figure 8: Structured Network Cabling

Table 2 summarises the advantages and disadvantages of using Structured Network Cabling as a home networking solution.

PROS +	CONS -
Provides a reliable and dedicated connection	Requires planning and takes more time for installation
Future-proof, and can adapt to your increasing bandwidth needs	Plastic trunking is visible if structured network cables not concealed. Incurrence of one-time installation cost
No equipment configuration and power required; just plug your device into the network access point	Access to the network is restricted to areas near to the network access points

Table 2: Pros and Cons of Structured Network Cabling

Recommendation

This option is appropriate for services which require highly-reliable connections, such as IPTV, video-streaming and real time Internet gaming, and is a future-proof option.

Tips for installing

- For new homes, this could be done together with your renovation plans while existing homes could plan this as a separate upgrade. Where possible, connect the rooms in your home with structured network cables.
- Different cable types deliver different broadband speeds, as seen in the chart below. Use the higher cable type when possible, in order to get higher connectivity speeds as your demands may rise in the future. The most commonly used cable types are Cat5e and Cat 6 cables, speeds of up to 1,000 Mbps and 10,000 Mbps Both are capable of supporting 1 Gbps up to a distance of 100m, if properly installed. **Table 3** compares the various cable types that can be used for home networking.

Network Cable Type	Speeds (Up to)	Distance
Cat 5e UTP	1 Gbps	Below 100 meters
Cat 6 UTP	1 Gbps 10 Gbps	Below 100 meters Below 37 meters
Cat 6a UTP	10 Gbps	Below 100 meters
Cat 7 UTP	10 Gbps	Below 100 meters

Table 3: Network Cable Comparison

Note: 1 Gbps = 1000 Mbps

- Install wall-mounted faceplates with one or more ports to cater for your future needs. An example would be a port for your IPTV Services, and another for your phone for digital voice services.
- If you are connecting more than two rooms, we recommend setting up a network distribution panel, also known as ‘patch panel’, as the centre of your structured network cabling. See next section on “**Centralising your network distribution panel**”.
- Most renovation contractors provide structured network cable installation services. You can call NTUC Income Home Services at tel. 6788 8788 or visit www.income.com.sg/HAN.

Centralising your network distribution panel

Your network distribution panel is the centre of all your network services. If possible, designate the network distribution panel near the RG.

The network distribution panel serves to distribute your broadband services throughout your home via dedicated Ethernet cables.

Choosing the best location for your network distribution panel

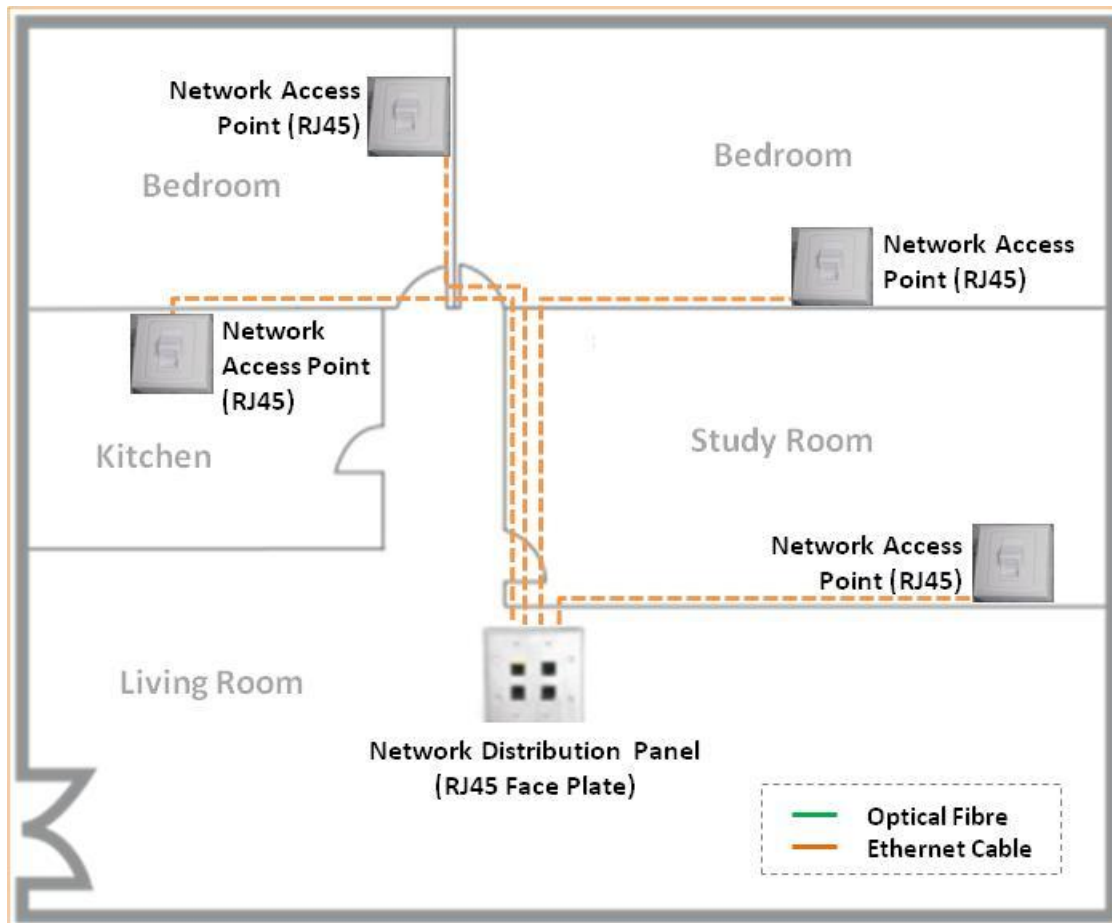


Figure 9: Network Distribution Panel

As in the figure above, your network distribution panel should be in a central location of your home, such as the living room, where structured network cabling can distribute the services to other rooms in your house. The location should have:

- Sufficient power outlets. You are likely to set up multiple devices there as well, so you need enough sources of power.
- Ventilation. The location should be well ventilated for your electronic equipment to function safely and properly.

Coaxial Home Networking

Existing coaxial cables can be used to transmit data within the home. Coaxial adapters can be used to connect residential gateways and computers via TV points.

This option can achieve transmission speeds beyond 100 Mbps and may provide connections to most rooms for basic usage.

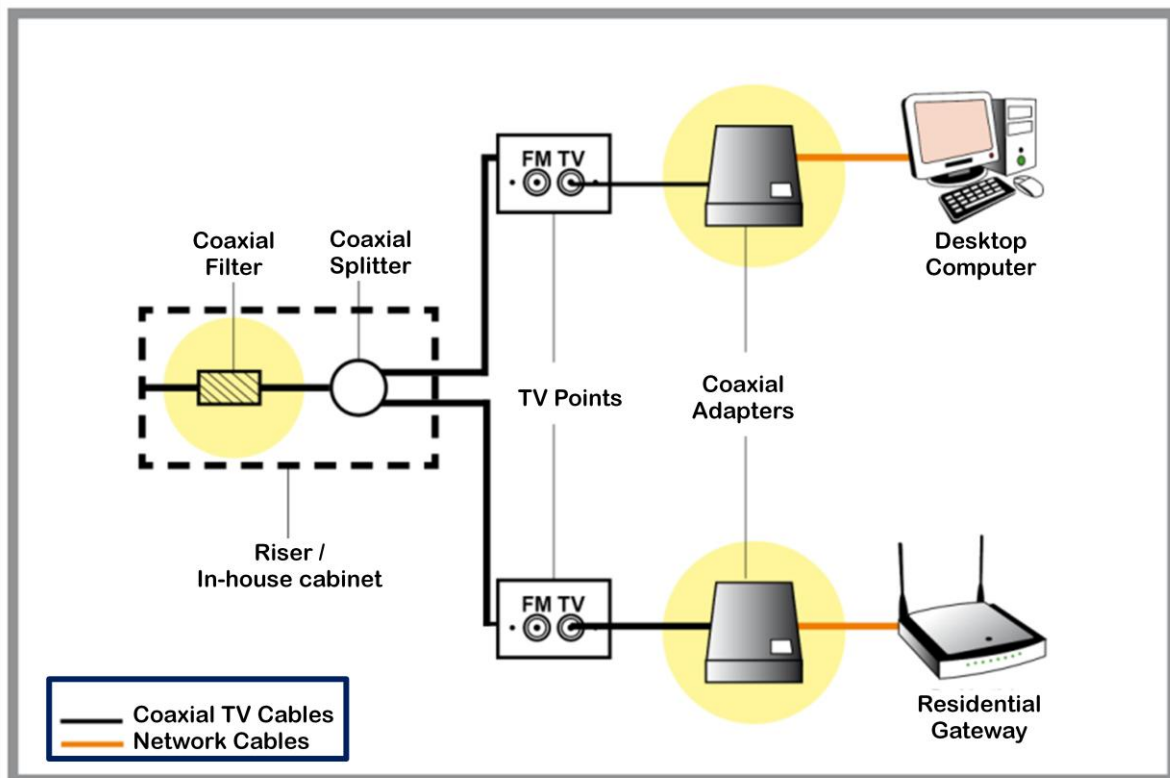


Figure 10: Coaxial Home Networking

Table 4 summarises the advantages and disadvantages of using coaxial home networking as a home networking solution.

PROS +	CONS -
Re-use existing coaxial cables, already present throughout the house.	Need to contact your broadband service provider for the installation.
This option provides a dedicated connection for your home networking.	If there are TV channels being transmitted over the same channels used by the coaxial adapters, you may not be able to receive those TV programs.
	Require power and space to install additional adapters which could be untidy.

Table 4: Pros and Cons of Coaxial Networking

Recommendation

This option is more appropriate if you do not wish to install new network cables in your home as coaxial home networking adapters can provide connections to most rooms for most usage.

Tips for installing

- In order to minimise impact to your existing coaxial services, you will need to engage a qualified installer through your broadband service provider, who will determine the suitability of adopting this option for delivering broadband access services.
- The coaxial adapters will use certain fixed spectrum channels within the coaxial cable network. TV programmes, if any, carried by your provider over the same spectrum channels used by the coaxial adapter, will not be received by you.

Powerline Networking

Existing electrical cables can be used to transport data within the home. Powerline adapters can be used to connect the residential gateway and computers via power outlets. This option can achieve transmission speeds beyond 100 Mbps, but may not be suitable for services that require reliable connectivity such as IPTV services. **Figure 11** illustrates how the connection is done.

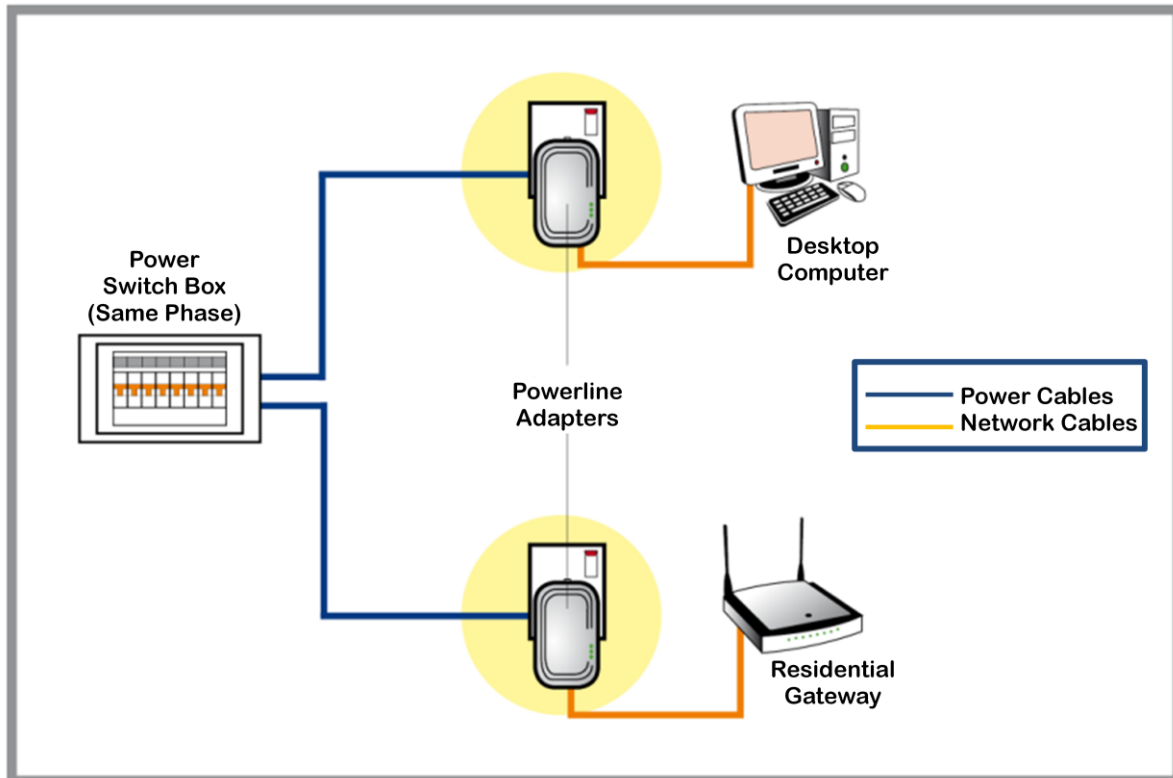


Figure 11: Powerline Networking

There are several standards available in the market, but the most commonly used is the HomePlug AV standard. The HomePlug AV standard is able to transmit data at speeds of up to 200 Mbps.

Table 5 summarises the advantages and disadvantages of using powerline networking as a home networking solution.

PROS +	CONS -
Re-use existing electrical power wiring, already present throughout the house.	Powerline networking may be susceptible or cause interference to home appliances and electronic devices.
New powerline adapters have included features to enable wireless coverage.	Powerline adapters are unable to connect across different power phases/switch-boxes.
	Require power and space to install additional adapters which could be untidy.

Table 5: Pros and Cons of Powerline Networking

Recommendation

This option is more appropriate if you do not wish to install new network cables in your home as powerline adapters can provide connects to most rooms for general usage.

Tips for installing

- You need at least two Powerline adapters to set up a network. However, there is a maximum of eight Powerline adapters on one network. The actual number depends on the adapters' manufacturer.
- Powerline adapters usually do not work well with electrical power extension strips and sockets with surge protectors. For best results, always connect Powerline adapters directly to the electrical outlet. Anti-surge protectors may also filter data signals and thus prevent the adapters to connect.
- Powerline adapters can only connect over the same power phase. For homes with multiple power phases (eg. Landed properties and some condominiums), it is important that adapters are plug into the power outlets from the same phase/power switch box.
- Do verify with your service provider if they support this option for your subscribed service.

Conclusion

There are many ways to set up a home network. Structured Network Cabling is generally recommended if you need highly reliable, high bandwidth connections for services such as video streaming or online gaming. Aside from usage, your decision will also depend on your budget and the size of your home.

For best results, use a combination of home networking solutions. For example, if you want reliable connectivity throughout your home, and also wish to enjoy the convenience of mobility, you can install Structured Network Cabling in all rooms, and complement your set-up with Wi-Fi. Install the network access points for areas where IPTV services or online gaming are required, and use Wi-Fi for casual internet surfing.

Finally, check with your RSP for the home networking option that will work best with your subscribed services.

Additional considerations when setting up your Home Network

While the TP is a passive device (meaning it does not need electricity to operate), both the ONT and RG are active devices that require minimum conditions to operate properly.

The manufacturers of these devices will give you more detailed information on how to set them up, but here are some minimum operating requirements for your home network.

Physical Space

You need sufficient space, such as a shelf or table top, to house your ONT and RG. If necessary, you can also mount these devices on a wall.

Power Supply

The ONT and RG require AC power. Therefore, they should be placed near a power socket.

Ventilation

ONTs and RGs are left on most of the time. Keep them in a cool, dry place with enough ventilation in order to prevent overheating.

Frequently Asked Questions

1. Which home networking solution is best for me?

Deciding the best home networking solution will depend on your broadband needs, and on your budget. If you refer to page 15 of this guide, you will see that a hybrid of Structured Network Cabling with Wireless Home Networking is the most ideal solution – install network access points at locations where you need to download richer online content, participate in online games or other services that will require a faster, stronger broadband connection and complementing it with Wi-Fi, for mobile devices. This can help minimise installation costs.

2. I didn't have a home network before, why do I need one now?

A home network will allow your different devices at home to communicate with each other. It will also allow more members of your household to use the Internet all at the same time, share files without using a USB drive, etc.

Bottom line, a home network will give you connectivity and convenience – and allow you to make the most of the superior broadband services under the Next Gen Nationwide Broadband Network.

3. What if I don't set up a home network, can I still enjoy Next Gen NBN at home?

Even without a home network, you can still use the superior broadband connection of Next Gen NBN. However, it may be limited to just one computer.

4. What is the most cost-efficient home networking solution?

The most cost-efficient solution is Wireless Home Networking. It does not require installing elaborate wires throughout your home, which also avoids messy wiring. However, a wireless connection is vulnerable to interference from other nearby wireless networks. Therefore, it cannot deliver a reliable or strong connection the way a wired connection can.

5. What is the most future-proof home networking solution?

Structured Network Cabling is the most future-proof, as it can deliver higher broadband speeds to meet your increasing broadband needs over time. Of course, it is also best to install higher grade cables, such as Cat 6 cables, which are capable of delivering higher speeds.

6. Right now, every TV in my home requires a cable TV point outlet. For Next Gen NBN, do I need to install a fibre Termination Point for every room with a TV?

With Next Gen NBN, you only need ONE fibre Termination Point to deliver multiple services, including telephony, television and high speed Internet to your home. From the fibre Termination Point, you can choose various networking options (e.g. wireless, structured network cabling or powerline networking) to extend and enjoy this high-speed connection in other areas of your home.

7. Can I connect my computer directly to the fibre Termination Point, in order to access the Internet?

It is NOT possible to connect a computer directly to the fibre Termination Point in order to access Internet.

Computers and notebooks can connect to the Internet through a modem-like device called the Optical Network Terminal (ONT), which is connected to the fibre Termination Point (The ONT will be provided by your RSP when you sign up for a fibre service plan.) Alternatively, computers and notebooks can connect via a Residential Gateway (RG) provided by the Retail Service Provider (RSP), which is in turn connected to the ONT.

As a homeowner, you have to purchase a broadband service package from an RSP to enjoy high-speed Internet access on Next Gen NBN.

Glossary of Terms & Contact Information

Glossary of Terms

Fibre Termination Point (TP)

A passive network point, provided by OpenNet, for the optical fibre network to terminate into your home.

Network Distribution Panel

A Panel that distributes RSPs' services to data points within the home through structured network cabling.

Next Generation Nationwide Broadband Network (Next Gen NBN)

An ultra-fast optical fibre network that will enable new and exciting ways for Singapore residents to work, live, learn and play.

Nucleus Connect

Awarded by IDA as the NextGen NBN Operating Company (OpCo), Nucleus Connect will provide wholesale network services to RSPs over their active infrastructure, comprising switches and transmission equipment.

OpenNet

Appointed by IDA as the Network Company (NetCo), OpenNet is responsible for the design, installation and operation of the passive infrastructure, which includes the dark fibre network and ducts for Next Gen NBN.

Optical Network Terminal (ONT)

Also called Network Termination Equipment (NTE), this powered device connects to the TP, and converts incoming optical signal to electrical signal and vice versa.

Residential Gateway (RG)

A powered home networking device, provided by your RSP, typically used as a gateway to connect devices in the home to the RSP's network.

Retail Service Provider (RSP)

Any business entity providing retail services (e.g. Internet, IPTV, and so on) to end-users using Next Gen NBN or any other networks in Singapore.

Unshielded Twisted Pair (UTP) Cables

A pair of cables twisted together to cancel out electromagnetic interference. UTP cables are commonly used as network or data cables, where a bundle of these UTP cables are used together to transport information between two points.

Contact Information

More information on home networking is available online at:

www.NextGenNBN.gov.sg/HomeNetworking

OpenNet

For more information on OpenNet and network coverage check, visit OpenNet's website:

www.opennet.com.sg

OpenNet Hotline : 6563 4273 (656-FIBRE)
Operating Hours : 9am – 6pm (Mondays – Fridays)
: 9am – 12pm (Saturdays)
: Closed on Sundays and Public Holidays

Nucleus Connect

For more information on Nucleus Connect, visit Nucleus Connect's website:

www.nucleusconnect.com

Next Gen NBN Retail Service Providers

You are encouraged to contact your retail service providers on the preferred home networking options that support their Next Gen NBN services.

M1

Web: www.m1.com.sg/homenetworking

Hotline: 1627

SingTel

Web: www.singtel.com/exstream

Hotline: 1688

StarHub

Web: www.starhub.com/hubtroopers

Email: hubtroopers@starhub.com

Hotline: 1800 333 8888

SuperInternet

Web: www.super.net.sg/ngnbn

Hotline: 3125 8500

Home Network Cabling Services

Looking for home network cabling providers? NTUC Income Home Services is one of the channels you can approach to find network cabling providers for homes.

Web: www.income.com.sg/HAN

Email: referralsvc@income.com.sg

24-Hour Hotline: 6788 8788

Infocomm Experience Centre (iExperience)

Make an appointment with iExperience to learn about home networking options and enjoy hands-on contact with various network devices. iExperience is located at the heart of the city in Esplanade Xchange along the shortest underground linkway between Raffles City and Suntec City.

Operating Hours: 10am – 8pm Daily, Admission is Free

Web: www.iExperience.sg

Hotline: 6820 6880

Email: iexperience@ida.gov.sg



- A** Access via CityLink Mall
- B** Access via Marina Link at Marina Square
- C** Access via Esplanade Station entrance outside Suntec Convention Centre
- D** Access via South Beach
- E** Access via Raffles City Basement 2
- F** Access via Civilian War Memorial



The Infocomm Experience Centre (iExperience) is a showcase for visitors to discover the benefits and possibilities of the Next Gen Nationwide Broadband Network (Next Gen NBN) and Next Gen services through interactive and engaging exhibits.

Visit iExperience to learn how the new nationwide ultra high speed optical fibre network transform the way you live, work, learn and interact.

Visit us to experience the possibilities now!

