
Working from home

BCS Wiltshire Branch

Understanding the technology we all rely on

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Introduction

This talk is based on having an office at home for nearly 25 years, with a lot of collaborative remote working on systems around the world.

The intention is to help other people who are having to adapt to working from home. I hope it's useful.

My business has been the technical leadership of systems and infrastructure projects. It's been technically complex and demanding work with a high level of responsibility.

Technology at home

- How we use technology at home has changed enormously, partly as a result of the Covid-19 pandemic.
- There has been a huge shift in the way that people and businesses work. Remote working is here to stay.
- We are all now utterly reliant on computer systems and digital communications. I.T. has become mass-market.
- There is a need for better understanding of the technology we all depend on.

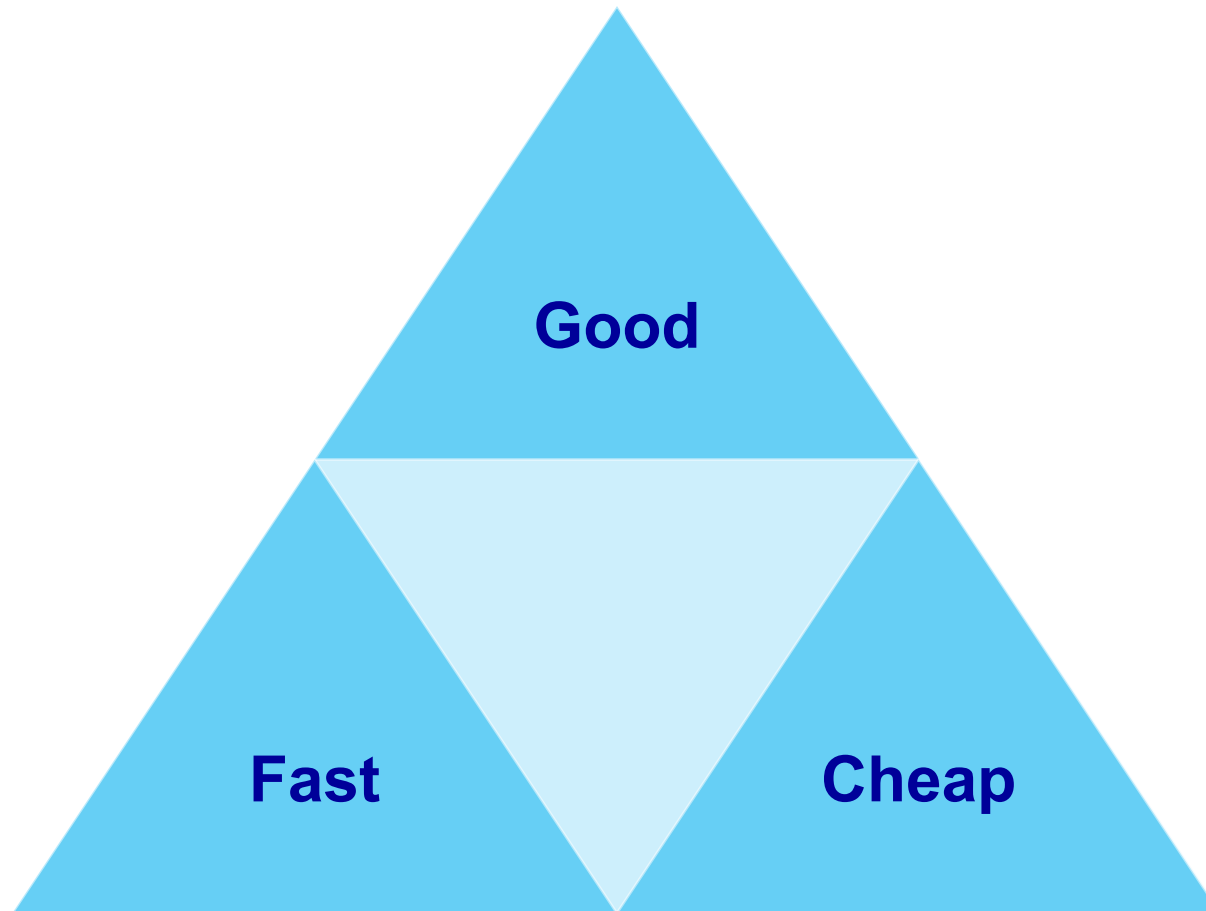
People and behaviours

- The distinction between work and non-work is less clear
- Working hours can become a lot more fluid
- People can become more lax
- Less social interaction with colleagues
- Harder to communicate clearly – if in doubt, use the phone

BYON (Bring Your Own Network)

- No longer BYOD (Bring Your Own Device)
- It's all about the connection quality
- Your link to the Internet (broadband, mobile data)
- Your internal connection to your router (WiFi, wired)
- Who / what else is also using the connection ?

You usually get what you pay for



Being seen to be professional

- What you have and how adept you are at using it is part of your professional appearance
- Your data and your systems are your responsibility
- Your ability to function depends on your equipment being fully functional when you need it to be
- Think about security and confidentiality

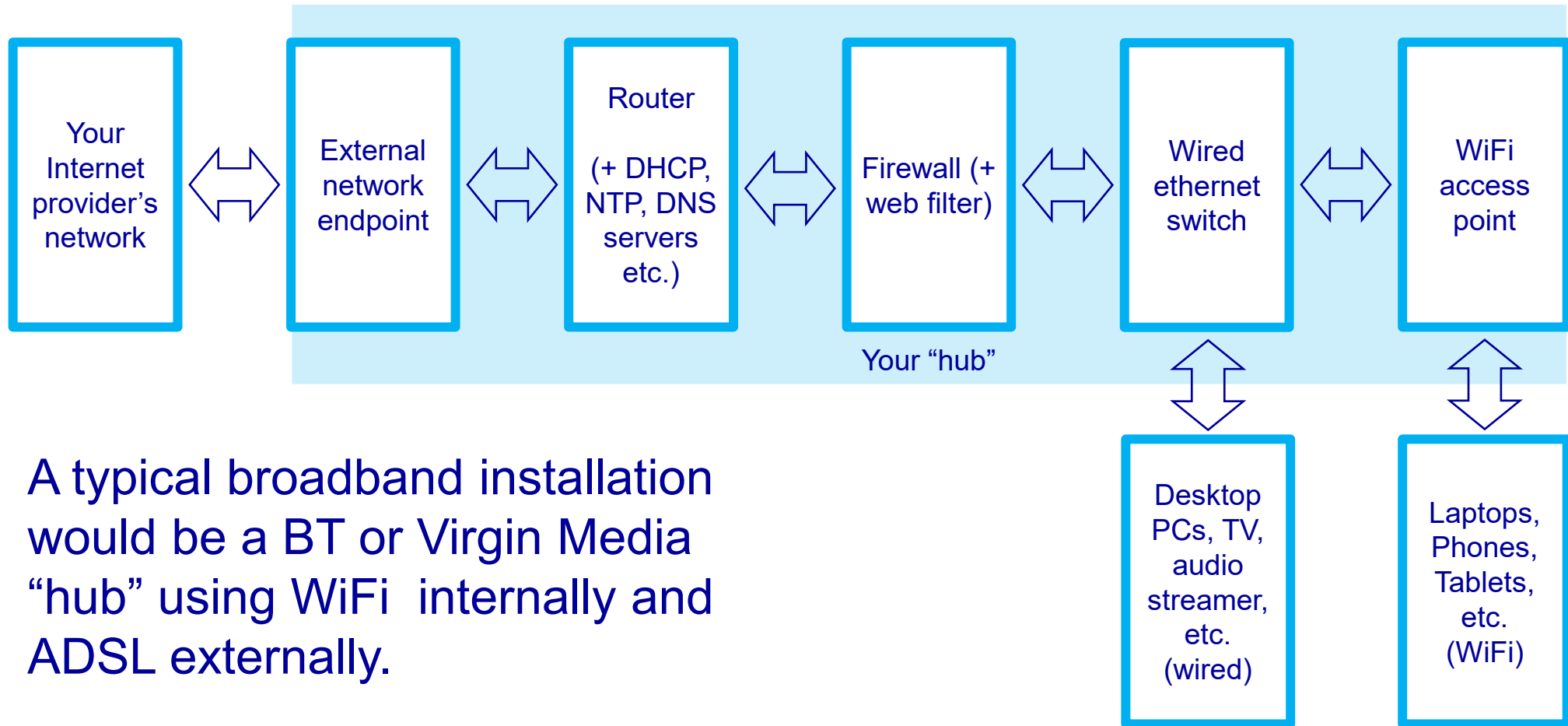
Minimising risk and hassle

- Things will fail. It will never be convenient. Be prepared. Have a “Plan B”. Murphy was an optimist.
- Minimalism is good. Avoid complexity wherever possible.
- Know enough to back up and recover your stuff, with help if needed. Know where to go for help.
- Make the effort to understand more and thus improve your ability to describe a problem.

Data flows and performance

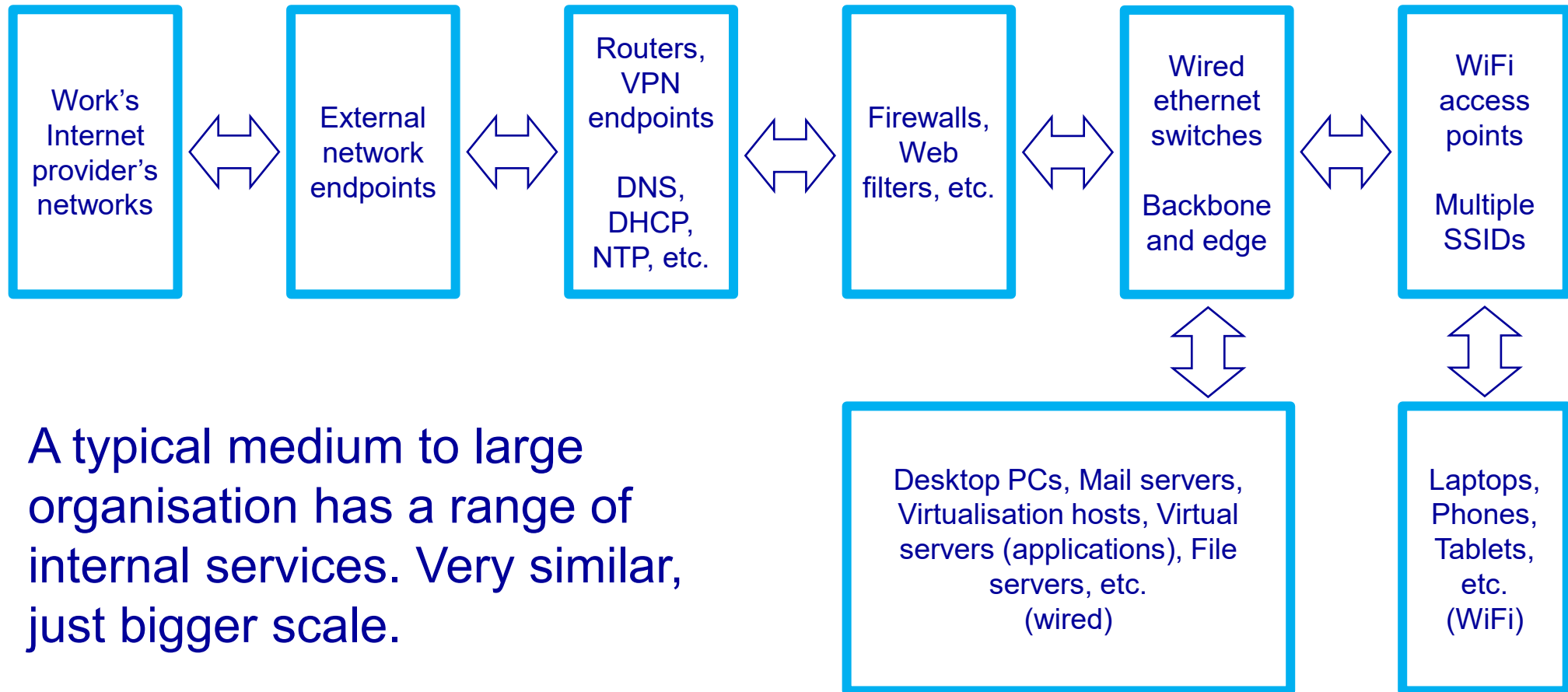
- Bandwidth – the “size of the pipe”
- Latency – the end to end delay
- Data flow direction:
 - Broadband was designed to be predominantly download from Internet to a recipient (video streaming etc.)
 - Voice calls and online meetings are bi-directional, so need good upload bandwidth

Your network at home



A typical broadband installation would be a BT or Virgin Media "hub" using WiFi internally and ADSL externally.

The network at work



A typical medium to large organisation has a range of internal services. Very similar, just bigger scale.

Your connection to the Internet

- Broadband:
 - telephone line (low-pass and high-pass ADSL filters)
 - copper co-axial into premises (fibre to cabinet)
 - fibre into premises (ONT = optical network termination)
- Mobile data (4G / 5G, mobile hotspot, etc.)
- What data rates in each direction (download / upload) ?

Your connection to the “home hub”

- Wired ethernet, typically 1 gigabit or 100 megabit
- WiFi, typically 2.4 GHz or 5 GHz
- Wired is faster, simpler and more secure
- WiFi is very dependent on signal propagation and subject to interference. Many buildings need signal boosters or multiple access points to create a “WiFi mesh”.

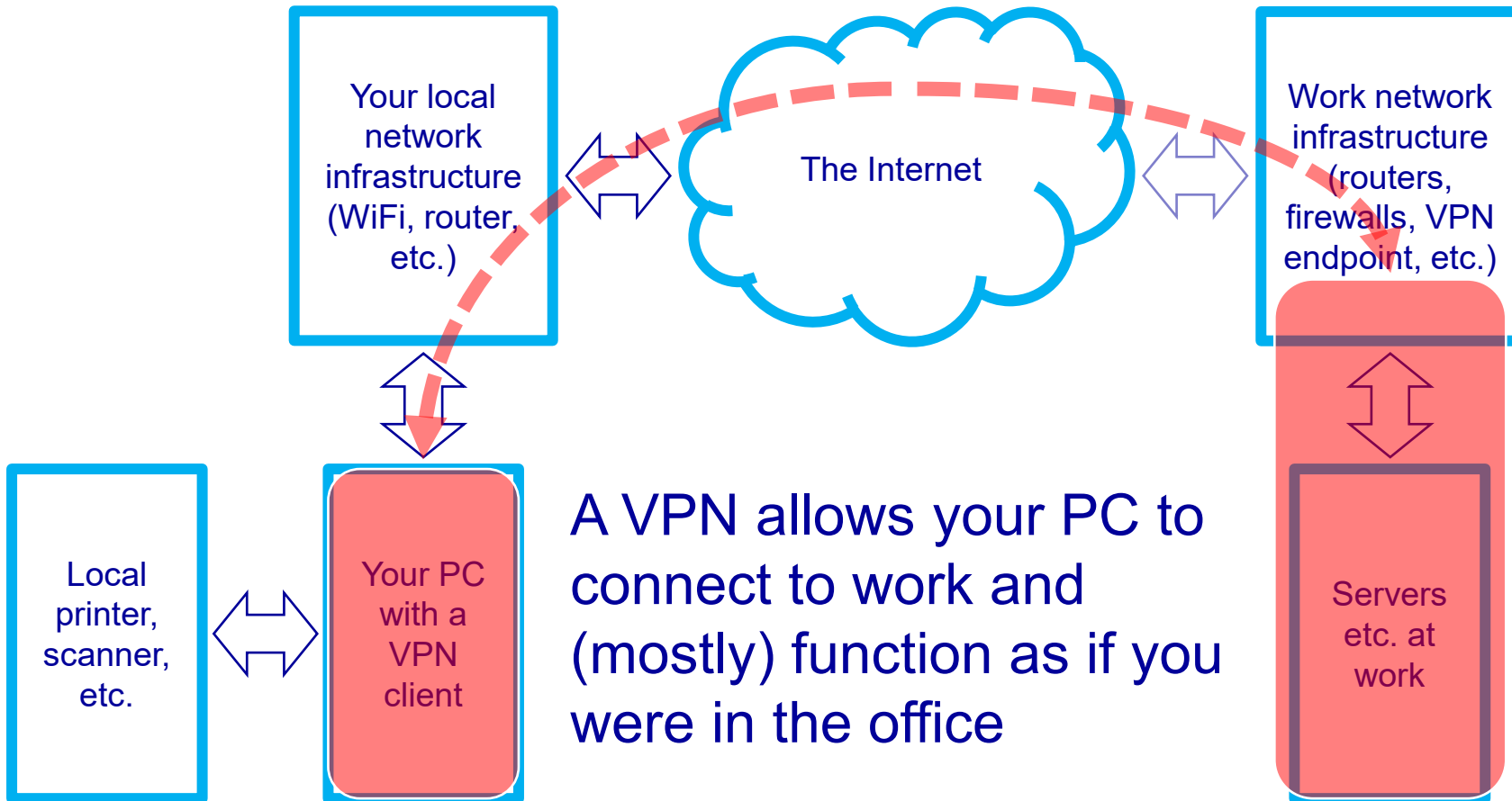
WiFi terminology

- SSID = network name to which your device connects
- SSIDs can be hidden to improve security
- Connecting to a SSID requires authentication for security, typically WPA2 using a password
- Multiple access points can form a mesh, with roaming, so as you move around, the connection should stay up

WiFi issues

- Signal is very low power microwave, so easily absorbed by moisture in walls etc.
- Bandwidth is shared by all devices using the same WiFi access point, so contention can be a problem
- Range extenders or boosters may help with signal propagation
- Multiple access points will do a better job

VPN connection from home to work



Your connection to work (VPN)

- VPN = Virtual Private Network
- VPN server at work
- VPN client on PC / phone / tablet / etc.
- Need to authenticate, typically two-factor: username / password + token generator (app on cellphone, fob)

Common problems

- Poor voice quality
- Out-of-sync video
- Auto-updates of software: introducing bugs, burning up the link when not expected
- Poorly designed applications which don't minimise traffic over the link

Voice (VOIP) and video

- Requires good and consistent latency
- Requires good bi-directional bandwidth
- Try disabling video to get better voice quality – uses less bandwidth and can give better latency
- A landline or cellphone may be a better solution

- VOIP = Voice over IP

Trade-offs

- Local and remote processing to reduce traffic on the link to the Internet
- Cost and availability of bandwidth provision (broadband, 4G/5G data, etc.)
- What is available where you live ?
- Where are the systems you're connecting to ?

What level of quality is acceptable ?

- Affects perception of the organisation by the end customer
- Poor voice quality with bad delays (latency) is very frustrating
- Harder to collaborate with colleagues when everyone is working separately at home
- Difficult to see if anyone is struggling and needs help

Where might the problem be ?

- Performance related problems are usually transient and difficult to reproduce
- Most difficult problems have a combination of causes and triggers
- Technology at home usually has minimal monitoring and information logging
- Ideally have equipment with some management capability

Beware contention

- Contention for scarce bandwidth is a common problem
- Sharing your WiFi and Internet connection with others will create contention
- On-line games, video streaming, audio streaming, automatic updates, scheduled backups, etc. can all consume bandwidth
- Think of them as background noise, so do what you can to minimise them

Security – attack vectors

- Much easier to attack a home PC, or a home worker
- Home PCs can then cross-infect the systems you connect to (work, schools, university, friends, etc.)
- People working from home are inherently less on their guard, especially late in the evening
- Separate PCs for work use, locked down. Maybe even a separate broadband connection and WiFi SSID

Whose responsibility ?

- Who's responsible for quality of service ?
- Who trouble-shoots and fixes it ?
- Who's responsible for security ?
- Who's responsible for privacy ?
- Who pays for the necessary level of service ?

E-mail – be careful

- The “tone” is set by the recipient, the mood they’re in and the context in which they read it
- Be careful about how you use language, especially for non-native speakers
- Anything you send by e-mail can be forwarded without your control or knowledge
- Beware scam attempts – check carefully if not sure

Web access

- Should you restrict what people can look at (eg: children) ?
- Don't believe everything you read on the web !
- Be vigilant about security (eg: banking, shopping)
- Additional firewall software on your PCs
- Better firewall / router than the free one from your ISP ?

Know people who can help

- Having problems with technology can be very stressful, especially when you're short of time to finish something
- Ideally your employer will provide support and assistance
- If you run your own business, treat technology assistance as you would any other professional assistance
- Know people you can call on for help
- Help others when they need help

Summary

- The technology stack for successful working from home is built on a huge pile of underlying layers at both ends
- Providing seamless high quality voice and video requires appropriate investment
- Trouble-shooting and resolution requires good information
- You're not alone – know people who can help you and help others if you can

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