Working from home

BCS Wiltshire Branch

Understanding the technology we all rely on

Colin Butcher FBCS CITP CEng
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

- Good
- Fast
- Cheap
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

A VPN allows your PC to connect to work and (mostly) function as if you were in the office.
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
Working from home

BCS Wiltshire Branch

Understanding the technology we all rely on

Colin Butcher CEng FBCS CITP