Technology Trivia

Words of caution: This document, comprising a smorgasbord of technical topics, has been produced for the Ivybridge U3A members in the Science & Technology Group. However those of you who do not have a deep technical understanding of electronics, computers and communication networks might find the contents of this document too hard to digest in one sitting. It is recommended that you read and digest only one section at a time (preferably one section per month) and then raise questions to seek clarification and better understanding at our monthly meetings, where each topic will be covered for up to 30 minutes in our Technology Trivia section.

Acknowledgements: My thanks to Bob Poppy, Paul Jones and Simon Hill (an ex colleague) for taking the time to digest version 1.0 of this document, make comments and suggest minor changes to the contents. I believe their valuable inputs have made certain parts of the document not only easier to understand and digest, but also more complete.

Change History:

Version	Date of issue	Change/addition
2.0	17th April 2012	Section 1 sub-paragraph f.ix - description of ports/buses added.
		Section 1 sub-paragraph k.i - last sentence added.
		Section 1 sub-paragraph k.ii - description of USB port added.
		Section 2 - section added on e-mail.
		Renumbered Section 4 - new paragraphs added - on security - a - u refer.
		Renumbered Section 6 - sub-paragraph d.iii added - on location of hub.
		Renumbered Section 8 - sub-paragraphs s.i & ii - Terminology of SCART and HDMI explained.
		Renumbered Section 9 - paragraph l added - on Sky Anytime+.
		Renumbered Section10 - sub-paragraph a.xiv added - on safe web browsing with Apple Safari.
		Renumbered Section 10 - sub-paragraphs a. xxv & xxvi added on smart phone and tablet security.
2.1	20th April 2012	Complete document - normal text used for body of document (rather than emboldened text) to reduce number of pages.
		New Page 4 - Section 2 - paragraph d added on fat clients to correct last sentence of paragraph c on thin clients.
		Various minor edits throughout body of text to correct, where noted, typographical, grammatical and tautological errors.
2.2	22nd April 2012	Page 18 - Section 10 - paragraph a, sub-paragraph xxx added on Barclays trails on NFC payment methods.
		Page 18 - Section 10 - paragraph a, sub-paragraph xxxi added on using smart phones and tablets to monitor and control home systems.
		Page 18 - Section 10 - paragraph a, sub-paragraph xxxi - Facts 1 and 2 added - on increasing unreliability with increased complexity.
2.3	30th April 2012	Page 15 - Section 9 - paragraph f amended on reported delayed launch date for YouView.
		Page 16 - Section 9 - paragraph h amended - Amstrad added for set top box.

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Version	Date of issue	Change/addition
2.4	2nd July 2012	Page 15 – Section 8 - paragraphs g and h amended for clarification.
		Page 16 – Section 8 – new paragraphs added - i to o refer - on Freeview transmitters, poor signal strength and problems with auto tuning in some local areas.
2.5	12th Nov 2012	Pages 11/12 – Section 5, paragraph j amended to clarify VDSL2 bit rates and latest VDSL2 service offerings from openreach.
2.6	13th April 2013	Page 3 – Section 1 – paragraph e and Page 7 – Section 3 – paragraph b, both amended to include Windows 8.
		Pages 10 & 11 – Section 4 – paragraphs s & t amended, paragraph u added on making content on Facebook more secure. Note on Page 11 added on test results of Internet Security software packages.
		Page 18 – Section 9 – paragraphs f, h, i and k - all emended for the latest information on YouView (TV from Freeview and TV and video/audio over the Internet).
2.7	18th May 2013	Pages 15, 16 & 17 – Section 8 – paragraphs a, d and t – all amended for latest information on digital switch over, spectrum sales and number of HD channels on Sky.
		Pages 17 & 18 – Section 9 – b, e, h and I – all amended to clarify sustained and rate adaptive bit rates and range of YouView services.
2.8	11th June 2013	Page 16 – Section 8 – d amended and e added to describe why there is likely to be interference between 4G and Freeview signals.
		Pages 24 & 25 - Open Systems Interconnection (OSI) Model - tables added.
2.9	27th June 2013	Page 16 – Section 8 e amended to include URL of at800 secure web site for information on potential interference between 4G and Freeview signals.
3.0	12th November 2013	Pages 3 to 5 – Section 1 – numerous paragraphs amended to reflect latest specifications for PC's, the integral sub-systems and software (both OS and application).
		Pages 19 to 22 – Section 10 – most paragraphs amended to reflect latest information on smart phones and tablets.
3.1	8th February 2014	Page 3 – Section 1 – paragraph 1, d Fact 1 amended and fact 2 added. Pages 12/13 – paragraph k added on superfast (fibre/VDSL2) broadband service provides and sub-loop unbundling.

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1. **<u>Main functions and features that affect PC power and speed of operation:</u>**
    a. Type/number of core processors [e.g. single or dual core - not common today, or multi core (quad - common today).
    b. Clock speed per processor, or per core (now up to 4.4GHz under over clocking for boost performance).
    c. Precision of each processor (e.g. 16 bit & 32 bit (not available today, or 64 bit common today).
    d. Amount of buffer memory/cache (e.g. 4MB to 8MB common today) and Random Access Memory (RAM) for temporary storage of data from Operating System (OS) and all applications - e.g. 2GB, 4GB, 6GB.
        i. Fact - larger cache and RAM improve speed of operation when using data intensive applications as they reduce CPU overhead and frequency of hard disks storage/retrieval functions when performing file swaps to/from virtual memory allocated on the hard disk.
        ii. Fact – Latest generation PC's running Windows8.x and with at a sizeable cache, 4GB (or more) RAM and Solid State Storage (SSD – flash memory devices) do not compromise performance compared to earlier generation PC's with mechanical hard disks.
    e. Performance is governed also by size, overhead and type of operating system [e.g. single thread/single task (early generation), or multi thread/multitask (current generation of OS platforms)] typically Windows 8.x (latest 64 bit Microsoft OS), Windows 7 (under mainstream support to January 2015) - Vista (under extended support from Microsoft to April 2017) - XP (in obsolescence mode - support to expire in April 2014) - Windows 98/95 (very old and now obsolete Microsoft OS platforms) plus Linux for some PC's and for work stations and servers, or Unix/AIX, etc.). Also bit resolution of operating system [e.g. 16 bit (early generation of PC's) or 32 bit, or 64 bit (current generation of PC's)] - will dictate level of performance.
    f. Number of software and hardware driver processes that are open and running concurrently within the kernel of the operating system (e.g. Windows 7) and each application (e.g. Word, Power Point, Access, Internet Explorer, Outlook, Adobe) - both in the fore and background. Plus corresponding demand on CPU resources.
        i. What is CPU? Central Processing Unit/s - the core processor, not the graphics processor.
        ii. Difference between cache and RAM - cache memory is made up of static RAM (memory) and sometimes can be on the processor chip so as to speed up memory access. The Static RAM (cache memory) is used first by the processor as this memory is faster to access than the entire RAM. The main RAM is dynamic memory (different and lower cost chip technology than static RAM) that requires a refresh process during each memory cycle to ensure that data is not lost when power is removed. Static RAM is thus faster than Dynamic RAM.
        iii. Terminology - Driver - device or software driver is a dedicated computer program that allows all other programs to interact with the device (e.g. sound, or video graphics card/processor, printer, wireless chip, etc)
        iv. Terminology - the processor clock is used to ensure that each function (instruction and related process) is carried out within a period. This clock rate

controls speed of executing the instructions of all the programs and actions within the PC. The processor clock is controlled by a crystal oscillator.

v. Terminology - Bit and Word Length - all processors within PC's execute instructions in words made up of multiples of 8 (hexadecimal) binary bits (the word length - e.g. 32 bit, or 64 bit currently). A bit is the lowest resolution of the processor word. All data comprises words and bits that are eventually stored on the hard disk. Binary bits can be either a 1 or 0.

vi. Terminology - Byte is used to describe the word length of a computer word, or storage media. For storage media one byte corresponds to an 8 bit word length (a binary rather that decimal word length).

vii. Terminology - Mbps stands for mega (or million) used to describe data rate in million of binary bits per second. That is not the same as 16, 32, or 64 bit bytes.

viii. Terminology - GB - storage media (PC hard disks, external USB memory, etc.) are sized in Giga Bytes (1024^3 or 2^{30} binary bytes). RAM memory (graded also in bytes) is sized as binary bytes. Note Windows 7 (and other operating system software) reports total storage size of the PC hard disk lower than that by hard disk and computer manufacturers.

ix. Terminology - ports & buses - most PC's use both serial and parallel buses (internal data communication highways) to transfer digital binary data - both internally and externally (e.g. internally between processor chip and memories and externally on I/O ports). Data is output or input via external ports (input/output connections on the back or sides of PC's). These ports are used to set up communication to and from external devices, using serial data transfer schemes.

g. Display type (e.g. CRT, LCD) size (e.g. 14" to 27") and resolution (e.g. 800x600, 1024x768, 1360x768, and 1368x768 – now some with 2560x 1400.).

i. Different displays - CRT Cathode Ray Tube (mostly defunct); LCD - Liquid Crystal Display (very common for PC displays); LED - Light Emitting Diode/s (some with back lighting); OLED - Organic Light Emitting Diodes (usually without back lighting).

ii. What is a touch screen? LCD or other displays that use either resistive, or capacitive membranes on the front layer of the screen which can measure the same parameters of fingers when placed on, or moved across the screen to activate a small electronic signal.

iii. What is a touch pad? Similar to a touch screen but used on lap tops and note books to detect finger movement and taps. Used instead of a mouse, or joy stick pointing/tracking device.

iv. What is display resolution? Number of pixels (display cells/smallest activate elements in a display) in each plane (horizontal and vertical), that can be addressed (by use of coordinates) and controlled by the graphics chip/controller. High resolution displays (up to theoretical maximum of retinal resolution) provide sharper and clearer images. Resolution is quoted by two numbers with a multiplication sign between them. The lower number is vertical resolution and the higher number horizontal resolution.

v. What is display aspect ratio? The proportion of width to height of a screen that dictates quality of the image. An old aspect ratio for computer monitors

and TV's was 4:3. A 16:9 widescreen aspect ratio is common for large computer monitors, with resolutions up to 3840 x 2160. The current generation of lap top PC's (with TFT LCD screens) use also a widescreen aspect ratio of 16:9.

h. Power (precision and speed) size of on-board memory of video graphics card and its display scanning/refresh rate.

   i. What is a video graphics card/graphics processor? A dedicated card/chip which is a powerful and separate processor with its own temporary memory (or allocated/dedicated RAM memory) dedicated to producing all images on the screen and updating those in real time. This is also referred to as the Graphics Processing Unit (GPU) in some games consoles.

i. Size and speed of Hard Disk Drive (HHD's are now up to 2 Tetra Byte - TB) and power of direct and indirect memory access controller/channel. Newer PC's are equipped with Solid State Drives (SSD's) for storage. SSD's allow faster read/write of data and improved performance (over Hard Disk Drives) as they are based on semiconductor storage devices (flash memory) and are now available up to 500GB. Some newer top end lap tops and All in One PC's are supplied with both HDD's and SSD's to provide larger but slower permanent storage and faster but smaller storage for working data.

j. Number of unused/non-essential processes running in the background, number of critical errors in the registry, number and size of temporary internet files, management and size of deleted and junk files.

k. Number and type (Ethernet, or USB) of simultaneous input and output ports (serial or parallel) and functions requested (e.g. number of ports connected with devices requiring parallel servicing (e.g. remote display, printer, stereo audio speakers, ADSL hub/router, digital camera, i-Pod or i-Phone).

   i. What is Ethernet? A Local Area Network connection standard for computer network and IP supported devices (e.g. some Set Top Boxes, Play Stations, etc.). Ethernet can support data rates up to 100Gbps (Giga bits per second). 1 Giga bit = 1,000 million bits (10^9). Ethernet connections will work reliably on single cable runs of up to 100 metres.

   ii. What is USB? - Universal Serial Bus (USB) ports are used to connect many devices to and from the PC at distances up to 5 metres (without the use of USB extension hubs). The latest USB 3.0 interface can transfer data at a theoretical maximum data rate of 5 Gbps (currently about 3Gbps in supported in both directions) and also charge the connected devices at the same time - at a nominal voltage of 5V DC and current load of 100mA. However a theoretical maximum current demand of 1.8A is supported (for short periods) when negotiated between the PC and the charging device.

Fact - most of us only use less than 20% of the sustained power/capability of our PC's, so no need to buy a more powerful PC. Nonetheless current generations of operating system and application software are and will be using more resources of the PC - so keep an eye open for the slow function of your PC's with less than 4GB RAM as that may indicate a need for a memory upgrade.

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2. **E-mail - topics & issues:**

    a. There are two methods of setting up and using e-mail clients (software to use applications); either with a web browser (thin) client (e.g. Hotmail) or with a dedicated software application installed in the PC - a (fat) client (e.g. Microsoft Outlook or Outlook Express, Apple Mail, Mozilla Thunderbird, etc.).

    b. There are too many thin and fat e-mail clients (MUA's Mail User Agents) to cover in this document, thus scope and capability of these are not addressed.

    c. Thin web clients rely on the host server to store and forward e-mail (or for that matter receive and send e-mail) and will have therefore restrictions on size of Inbox and number of messages in folders - especially those with attachments. These thin clients have a minimum number of features and functions required to send, receive and manage e-mail.

    d. Fat clients have many more features than thin clients. For example they can be used to send and receive invitations, add them to your schedule, create "to-do" lists per hour/day, manage larger number of e-mails and folders, set up auto archive and track status of sent e-mail. However these software applications require more memory space.

    e. Web mail hosts do not carry out full virus checking of all e-mail content for each thin client. The host relies on the remote user to download their specific e-mails (with or without attachments) and carry out virus checking at download.

    f. Web based thin clients are therefore more vulnerable to virus attacks - some to capture personal contact lists for use for "spoofing" purposes, where an e-mail, purporting to be from your address, is sent to the e-mail address of the recipient. These false e-mails usually contain malware.

    g. There are a number of E-mail protocols for use with the different applications:

        i. Internet Message Access Protocol (now IMAP4) is used for most (fat client software applications) to transfer e-mails between the host server and the e-mail client at the remote location. IMAP supports both on line (connected) and off line (disconnected) modes of operation and provides more features than the simpler Post Office Protocol (POP). These include status indication of message state (e.g. read by recipient) among other advantages for multiple users. However there are some disadvantages of the IMAP protocol - again too complex to cover here.

        ii. Post Office Protocol (now POP3) - this simple protocol (generally used by smart phones and tablets, or thin clients) allows the e-mail client software to download all recently received e-mails from the e-mail server of the Internet Service Provider (ISP). Once the e-mail is downloaded, it is deleted from the e-mail server and the link disconnected.

        iii. Simple Mail Transfer Protocol (SMTP) is used to transfer an e-mail from the client on your PC, to the ISP e-mail server (within the service provider environment) and then to transfer the email/s between the e-mail server of your ISP and that of the handling ISP, responsible for the recipient user with a remote e-mail address at the other end. This protocol will ensure that the correct message is delivered to the right destination.

        iv. Data transfer (including the packets of all e-mails) between the servers of ISP's, is managed by the Transmission Control Protocol (TCP).

      v.   The recipient client software (fat or thin client) then uses either IMAP, or POP3, to download from their ISP e-mail server, the e-mail you sent them (regardless of when it was sent).

      vi.   There are other proprietary e-mail protocols which are not covered here.

h. Common e-mail problems:

     i.   Initial problems are likely to be incorrect configuration at set up of the account, under either the thin or fat client e-mail software.

     ii.   On-going problems may relate to your environment, or that of the appropriate ISP's (either yours, or that of the receiving party).

     iii.   Verifying that the relevant ISP does not have an e-mail size restriction, or volume of data limit, which has been transgressed.

     iv.   Thin clients, or fat clients working at remote locations with poor, or low speed links, are invariably not able to handle e-mails with large attachments, so only the headers may have to be downloaded.

     v.   A large number of e-mails and attachments in an active inbox can cause further problems - not only speed of operation but also data loss.

     vi.   It is good practice, when working in remote locations with unknown network security levels, or poor network connectivity, to prepare e-mail messages off-line (if the client software allows) and then connect to the network only to send and receive e-mails.

     vii.   Good housekeeping will generally overcome most of the minor e-mail issues.

     viii.   These include:

        1. Deleting and then clearing from the deleted e-mail folder all old and not required e-mails.

        2. Not storing e-mails with attachments (regardless of size of attachment).

        3. Removing all attachments, from the important e-mail messages that you want to keep and storing the attachments as files in appropriate document folders on your PC.

        4. Using the auto archive function of the client software to store (if supported by the application) important old e-mails. This reduces size of inbox.

        5. Verifying if your e-mail client software has a size limit (on your inbox) and if you have transgressed that. If you have you will have to delete unwanted e-mails and remove attachments from all messages in the inbox.

        6. Ensuring that the e-mail address of the recipient is correct.

        7. Checking the status of your spam filter and for web mail - your security settings (e.g. high security setting used for web access).

3. **Improving PC operation, integrity and functional speed:**

a. Consider a RAM upgrade. The latest (64 bit) operating system software e.g. Windows 8 and many applications need 4GB and work better with 6GB RAM for data intensive applications.

     i.   Note - older 32 bit operating systems (early versions of XP, Windows 98 and Windows 95) can run well with a RAM of 2GB.

b. Use auto update for Windows and any 3rd party security tool.

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    c. Use a bought in PC tool (price range £15 to £60) and not a freeware tool - to periodically improve speed of your PC - a tool that:

        i. Only fixes the critical registry errors. Be careful in the choice of tool and activation of the related correction process, as some freeware, or uncertified/untested tools can introduce malware and cause more problems to the registry than they cure. For those interested in these tools please assess information on the following (or other) independent web sources: http://softwareindustryreport.com/registry-cleaner/best-registry-cleaner.html.

        ii. deletes junk/redundant files and internet cache,

        iii. Tweaks/corrects other PC functions/errors (e.g. redundant document history and printer queue, temporary and overflow memory).

        iv. Updates device drivers (e.g. video graphics processor, sound module, hard disk controller, Ethernet and USB input/output port controller, touch pad/mouse, etc.).

            1. Cautionary note - One important rule is "if it is not broken, do not try to fix it" There are many stories from people who try to improve performance only to find they make it worse. If you are happy with how your PC is performing leave it well alone - apart from general housekeeping on old files etc.

    d. Use a smart back up tool, or Windows 8/7 backup function (with additional image software - NTFS - New Technology File System as used by Microsoft OS) to back up the entire C drive (hard disk) periodically - once a week if PC is used every day, or less frequently according to PC utilisation.

        i. This must be the entire hard disk and all its partitions.

        ii. Use a large external hard drive, rather than cloud storage (preferably with more storage space than that of PC hard disk - e.g. 300GB to 500GB), for the back-up data.

        iii. This will result in all the latest software (at installation and latest updates) of operating system and applications and the latest data (pictures, documents, music, videos, etc) being stored in the back up files on the separate hard disk. That compendium of content is referred to as an "image".

        iv. This tool can be used to recover and reinstall the image of all software and data (including associated set up parameters, history and indices) in the event of a hard disk failure, or serious data corruption.

            1. Terminology - Cloud Storage - 3rd parties offer remote but time limited storage of permanent data (in all its forms on the hard disk of a PC) within their secure data warehouse (cluster of remote servers managing data storage farms). However you have to rely on: 1) the on-line transfer of data to and from these sites; 2) their data security procedures/schemes to protect your data; 3) their long term function, operation and management; and lastly - most of these sites will not create an entire image of the hard disks of all the PC's in your home - they just back up the data.

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4. **Good practice for PC, smart phone, tablet and Internet security (and all IP enabled devices) :**

   a. Remember all of us get lax and careless when we use, over extended periods our PC's, or other IP (Internet Protocol) enabled devices to connect to the web.

   b. It is a well known fact that the weakest link in any security scheme is the human element and the repeated poor level of care and attention given to computer and internet enabled security regimes.

   c. You should install, upgrade and use automatically a full capability security and virus checking tool, to help set up further firewalls and filter SPAM e-mails on each and every PC in your home to create safe & secure environments for all PC users...

   d. PC based (software) firewalls are the second line in security defence - the first line of defence is the firewall (invariably achieved by use of embedded firmware) in the hub.

   e. The environment between the hub and your PC/PC's should be treated as a De Militarised Zone (DMZ) - one that has a low level of security and can be exposed to attacks.

   f. Both firewalls (hub and PC based) help create a secure PC (or computer) environment - in which you and other PC users in your home should work to access external services.

      i. Terminology - network firewalls, as used in hubs, have packet (specific data) filters and include a set of rules (including network protocol translation) for setting up the end to end connections (e.g. from the home to the exchange) and ultimately to the equipment of the service provider in the exchange. These devices do not carry our virus checking.

      ii. Terminology - software based firewalls, as used on PC's, work at the application level (e.g. web browsers) to verify if specific and all data should either be accepted, or rejected within the secure PC environment.

   g. It is a good idea to verify that your family members have set up sound security schemes for all their PC's.

   h. All internet enabled devices (PC's and others listed below) should be set up at time of purchase with parental controls (if young family members have access to these devices and web services) and appropriate rights given to access only specific web sites and data from those.

   i. It is important to verify that the correct level of access rights and privileges are maintained at the approved level, not only when used over time in the home, but especially when used away from the home, over the mobile and external Wi-Fi networks.

   j. We must not forget the other internet enabled devices, both in our homes (if applicable) and the homes of our families - the internet enabled TV's, games consoles, set top boxes, smart phones and tablets. These devices do not support currently the installation of PC type security and virus checking software to be installed and software firewalls set up - they rely (for security control) only on the network firewall in the hub. Manufacturers of these devices may improve, over time, the security levels of these devices.

   k. PC operating systems (MS Windows and Apple Mac) have a long history of improving in-built security schemes and will continue to improve over time as more frequent virus attacks and security breaches occur.

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l.   Although some of these devices use the Linux operating system, they rely on the in-built security levels of that platform. To my knowledge Trojan virus attacks have not yet been carried out via these devices when used in the secure home environment.

m. These devices are more difficult to compromise by hackers as they generally do not allow access directly to the root of the operating system (firmware).

   i.   Terminology - firmware - at the higher level this is embedded software (programs) used in micro computers, or micro processors and has to be stored in various memory devices for the processor to access. At the lower level this is micro code stored either in the chip memory, or external - to the processor - flash memory.

n. Smart phone and tablets, that use the Google Android operating system, have been attacked by hackers recently. If a smart phone, or tablet is used frequently and carelessly outside the home they can become infected by viruses, worms and malware and then compromise the security levels in the home when connected to the home network.

o. The bigger risk, when using smart phones and tablets outside the home (or office) is theft and loss of the device and the vital personal data which can then be used for identity fraud - especially if there has been a protracted delay between theft and notification to the service provider to get the device blocked and the data wiped.

p. Invariably dedicated hackers and fraudsters target the big pots of gold, rather than personal computer users. Recently the US State Department, Sony, Pay Pal, Mastercard, Barclaycard and Experian, to name a few, have been attacked.

q. Nonetheless good home, mobile and internet security policies and sound practice is worth developing and using at all times, to avoid complacency taking hold.

r. Additionally it should noted that no software enabled computer, or other internet enabled device, connected to a wide area network, via the fixed (broadband) or wireless (Wi-Fi and mobile) networks - is 100% secure.

s. Another important security risk is the use social media sites - especially when young members of our families use these sites to load images and video clips and other personal information of either themselves, but more importantly other family members, onto those sites. They are likely to disclose too much personal information, not only about themselves but also about other family members and family group activities and additionally not set the required privacy conditions for all content.

t. Social media content enables scam and fraud merchants to target these families by sending some, or all of them, very credible e-mails relating to all these family members (by name) and their recent activities. These e-mails usually contain embedded malware and if opened will install worms, viruses, or custom applications to capture passwords, bank details and PIN's.

u. Facebook is the largest social media web site that collects personal data and managing privacy of personal content is vital. Users must:

   i.   "Lock Down" their Facebook accounts from public view – especially past posts (as they are not automatically included when privacy settings are belatedly activated on new posts).

   ii. Separate Account and Privacy controls using of the drop down menus.

   iii. Prevent search engines (e.g. Google) from being able to access a personal Facebook profile by disabling the Public Search and Instant Personalisation

(region specific) functions within the sections that manage Apps, Games and Websites.

iv. Use the How You Connect settings (on the Privacy Page) to limit how people search for individuals on Facebook.

v. Most of the steps listed below (where applicable) should apply to each of this internet connected devices.

w. Set up and periodically change (say every 3 months) the Windows log in password of your PC and all passwords used with all internet enabled devices. If possible use a combination of alpha (upper and lower case), numeric and special characters (e.g.!"£$%^&*_+?<>).

x. Do not use your and immediate family surnames and Christian names and dates of birth - for your passwords - especially when using on-line shopping.

y. Use good and dedicated security software, or at least Windows 7 Defender, to set up firewall, virus and spyware protection, web and e-mail protection, data protection, home and external network protection and, if required, parental controls.

z. Ethernet (wired) connections are more secure and robust than wireless connections. However if wireless connections have to be used in some parts of the home, ensure that all connected devices (e.g. set top box, smart phone/s, tablets and PC's) are set up with the hub key/password. Protect this information from external sources.

aa. Do not leave the PC on with the wireless hard switch in the "on" state, when away from the PC AND not planning to use the PC for a long duration.

bb. Switch off the wireless hard switch when the PC is not in use, or deactivate the soft key wireless function prior to switching the PC off.

cc. Wi-Fi hot spots (e.g. for use of the internet outside the home) are not secure so do not use unless special/purchased (rather than free) passwords and keys are used to set up the connection. Do not use free Wi-Fi hot spots, or at the very least use these connections only for short periods and not where RF snooping (discrete scanning) can be a danger - (e.g. airports, train stations, shopping malls, car parks, etc). The exception to this is the BT FON system that allows you to share some of your network in exchange for using others when you are out and about. BT FON is free to BT customers.

dd. Set up and use In Private internet browsing (Control + Shift + P to turn on) for all web access. Only open another web page from within the "In private" function and make sure it is turned on. This prevents external web sources storing cookies on your PC to track your web access to their sites; the page accessed and search history.

ee. Remember all free search engines (e.g. Google, Yahoo and others) track all your web searches and so that they and their partners/advertisers can target you with on-line adverts.

ff. All data (personal, credit card and bank details) which is provided on-line and remotely stored by external sources (both government and private organisations) is very easy to sell on, capture, or hack into.

gg. For on line banking use a private key (preferably hardware based) system with multi levels of log in. The private key will be at least 8 digit random numbers (or digits and characters) that are changed after a set short interval.

hh. Set up web addresses of trusted and secure sites, ones used most frequently (https://....) or restrict access to unsafe/un-allowed sites. With Internet Explorer this

menu is accessed via Tools > Internet Options > Security > Trusted Sites, or the same but for Restricted Sites.

    ii. Set up an anti-phishing scheme if you do not have a security system deployed - do not click on embedded and unknown hot links. Under Internet Explorer use the "Tools" menu to access the "Safety" function - then ensure that the function "SmartScreen Filter" is turned on.

Note: - Please ensure that you read the test results of 16 different security software products in the separate and companion document entitled "Internet Security Suites". Report obtained from the March 2013 issue of PC Pro magazine.

5. <u>**Broadband, Superfast Broadband, Rural Broadband, plus current and New Mobile high speed data services (the basics):**</u>

    a. In the UK , residential broadband and phone services are delivered over copper cables to the majority of homes.

    b. BT openreach, with some EU funding, is deploying Superfast broadband in main cities/towns in the UK and some rural areas (especially Scotland, Wales, Northern Ireland and parts of the West Country).

    c. BT Wholesale is upgrading the UK network (core network and major exchanges) to improve level/variety and speed of service to meet the demands of the digital age. This is called the 21C project.

    d. Superfast Broadband comprises new equipment in the network and more street cabinets, connected with optical fibre to the exchanges and copper cable from the cabinet to the home (last mile). Ethernet over VDSL2 is the service delivered to the home.

    e. Currently BT Retail, Talk Talk and Sky (new information from one of my ex colleagues) are the only providers of Superfast broadband over copper to the home.

    f. Virgin Media delivers both broadband and super fast broadband over a hybrid network of fibre and co-axial cable.

    g. The primary broadband service for most customers was ADSL2; more recently this has been upgraded to ADSL2+ (Asymmetric Digital Subscriber Line).

    h. ADSL/ADSL2+ and VDSL means different bit rates up and down stream.

    i. ADSL2 can deliver up to 12Mbps downstream and up to 700 Kbps upstream and ADSL2+ up to 24Mbps upstream and up to 1.4Mbps downstream. All subject to distance from the local exchange,

    j. Very High Speed Digital Subscriber Line 2 can deliver a theoretical maximum bit rate of 250Mbps downstream at the source, dropping to 100 Mbit/s at 0.5 km (1,600 ft.) and 50 Mbit/s at 1 km (3,300 ft.). At distances above 1.6km from the exchange VDSL2 will deliver data rates that equate to ADSL2+. Both Asymmetrical and Symmetrical upstream and downstream bit rates are offered by providers. Openreach offers the following Fibre To The Cabinet (FTTC) VDSL2 bit rates to their Communication Providers: a) a peak downstream rate of 80Mbps; b) a downstream prioritising rate of 15Mpbs, or 30Mbps, or line rate whichever is lower and a best effort service for the bit rates above the prioritised rate and c) a peak upstream rate of up to either 2Mbps, or 10Mbps, or 20Mbps.

    k. At the end of 2013 there were nine service providers offering superfast fibre broadband (BT, EE, Eclipse, John Lewis, Plusnet, Sky, TalkTalk, Virgin Media and Zen. Currently they all use the Wholesale offering from openreach but in 2014 the

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larger service providers (e.g. TalkTalk and Sky) plan to use the sub-loop unbundled product offering from openreach and the mount their own VDSL2 equipment in a street cabinet juxtaposed with the openreach cabinet, to offer their own superfast broadband, initially in cities and larger towns.

l. Length, type and integrity of copper wires dictate end bit rate at the home. Remember the connection speed does not mean you can send data to another party at the maximum rate over the broadband link.

m. In addition noise, cross talk and bad joints in the copper path (at the exchange, along the copper cable and at the home) can adversely impact the performance.

n. To extend reach from the local exchange to homes at long distances from those exchanges and improve on the speed delivered to those homes in populous areas, BT has deployed outlying street cabinets with special equipment in them.

o. BT openreach owns all the major and local exchanges (over 5,500 exchanges), plus the copper cable and most (but not all) of the fibre in the UK. This includes the last mile of copper cable up to the master sockets (and them too) in your home.

p. Virgin media owns all the co-axial cable. This includes the last mile of cable up to the master sockets (and them too) in your home.

q. BT Retail sells broadband (phone, data and video) services to end customers and is responsible for providing the end service to your home.

r. The UK offers very competitive broadband services as it was one of the first countries in Europe to deregulate the phone and then broadband services,

s. This allowed other capable operators (than BT) to deploy their own equipment in the BT exchanges and use the BT openreach copper/fibre cables to deliver their own end services.

t. BT Wholesale owns the core BT network and equipment and then sells wholesale broadband services to over 200 ISP's (Internet Service Providers) in the UK; those who do not have their own equipment in the BT exchanges. E.g. Tesco, Sainburys, Waitrose, John Lewis, etc.

u. Mobile operators, with their own networks in the UK, can offer higher bit rate (mobile broadband up to 42Mbps) services over 3G HSPA/HSPA+ (3rd Generation High Speed Packet Access). Although HSPA+ can deliver downstream data rates of up to 42Mbps, these services have currently limited national coverage and are expensive for sustained high data rate usage - over many minutes - with large downloads.

v. New higher speed mobile broadband signal methodologies - called 4G/LTE (4th Generation/Long Term Evolution) are being rolled out and will expand over the next few years. 4G/LTE can deliver up to a downstream data rate of 100Mbps, in good coverage areas.

w. 4G deployments will increase, after OFCOM, on behalf of the UK government, sells by auction, the recently released (and in mid 2012 more so) spectrum used previously for the old analogue television signals.

x. 4G/LTE is under trial in Cornwall, by BT and Everything Everywhere, to establish if high speed broadband can be delivered to black spots "NOTSPOTS" rural areas, over the mobile network, where signal coverage is nonexistent, or poor.

y. See BBC news web site (page link below) for more information: http://www.bbc.co.uk/news/technology-16527490.

z. A further aim for 4G/LTE is to improve mobile phone/mobile data coverage in the UK.

Technology Trivia

6. **Improving internet/network speed:**
    a. Each element in the end to end connection - from your home to your ISP host web server, or hand off server, affects the speed of the upstream and downstream data transfers.
    b. The critical elements in the chain and factors that affect level of service are:
        i. the speed and set up of the main PC (or each PC) in your home and its mode of connection (Ethernet or wireless) to the modem/hub;
        ii. the type of modem/hub and its proximity to all the active PC's in the home - especially the PC's on another floor from the modem/hub;
        iii. the type and method of connection at the master socket;
        iv. the separation of home and phone wiring at the master socket - this ensures that phone wiring is not connected to the broadband (xDSL) cable;
        v. then the integrity and length of the copper loop from your home to the exchange;
        vi. the type of broadband service - ADSL, ADSL2, ADSL2+ from home to the exchange. or a mix of VDSL2/Ethernet in the first mile (home to street cabinet) and fibre from cabinet to the exchange;
        vii. type of service purchased (rate adaptive/best effort) most common for residential customers, or committed bit rate (usually for business customers);
        viii. type, integrity and resilience of regional and core networks (e.g. 40Gbps to 100Gbps) of the network owner/service provider and whether this a fully redundant/dual architecture;
        ix. the sustained bandwidth loads and bandwidth management schemes used within/on the network/s and how they are operationally managed;
        x. lastly and very importantly, the number of local customers using the broadband service from your provider and type of data transactions active at any one time. This increases network congestion and web access contention.
    c. Internet browsing speed can be improved by reducing the number of related "add ons" (e.g. Google, Adobe, etc.) in the Browser but that does compromise ease of use.
    d. Simple steps to improve level and speed of broadband service:
        i. upgrade RAM in PC and use speed up tool to improve PC function (see other statements below on establishing need before implementing an upgrade);
        ii. self-install if you are able, or get your ISP/BT openreach to install, a new master socket in your home. One that separates the phone wiring in the home from the broadband connection;
        iii. locate the hub close to the master socket and do not use a micro filter between the hub and the master socket, Use a direct cable connection.
        iv. use wired (Ethernet cables and direct connections wherever possible) to connect the PC/s to the hub/modem, rather than wireless.
        v. if use of wired connections is not possible then consider using PLNA's (Power Line Network Adaptors);
        vi. the 1st PLNA should be plugged into a spare 3 pin power socket close to the hub/modem. Use an Ethernet cable to connect the PLNA to a spare (LAN) port on the hub;

vii. use another one (or more) PLNA devices, plugged directly into other free 3 pin power sockets and other Ethernet cables to distribute the wired home network to any room in the house;

viii. ensure the micro filter/s is/are connected to every active phone socket and have not failed (verified by a swap with other new filter/s) - especially if your use the Sky set top boxes;

ix. use periodically an off the shelf, or ISP provided, speed test tool to measure, at different times of the day, the achieved downstream and upstream throughput, which is different from the connection (link) speed that mostly remains the same;

x. use the ISP, or tool provider, test site data to compare your average speed with that of other users in your immediate area;

xi. only consider a service upgrade if there is a real problem (after you have carried out all the above) and you still have a substantive need for more bandwidth. Business customers pay more for their service so that there is less contention than the residential service, this means that after 4PM (when schools finish and the kids come home) the broadband performance will degrade. However the link speed remains unchanged;

xii. Do not change from Tesco to John Lewis (They will use exactly the same equipment) consider Virgin Media (if you have cable near your house) or TalkTalk, or Sky - if you are with BT - etc.

7. **Using VoIP (e.g. Skype) to reduce cost of national and international calls:**
   a. VoIP stands for Voice over IP (Internet Protocol over an internet link).
   b. VoIP calls are made across the local and core networks of your and other providers as a low priority, bi-directional data stream interspersed with other more important/guaranteed digital data.
   c. A VoIP call will be successful if the entire bi-directional connection between each party is of reasonable sustained quality;
   d. The advantages are:
      i. low cost phone calls and web cam sessions to large range of UK STD numbers and international calls to many countries, plus free calls to another VoIP subscriber with the same provider;
      ii. you, or another party in your home, can use the normal (PSTN) phone service to make other call/s, at the same time as another party is making a VoIP call (on a different phone, or a soft phone on a PC) and yet another party is accessing the internet.
      iii. you do not need to install and pay for another phone line - one line will suffice - this minimises line rental charges.
      iv. a fixed annual subscription fee will provide for all the VoIP calls - easy to budget and control costs of calls. Note: standard telephone users still have to pay to call a VoIP subscriber;
      v. large corporations, with good high speed private (or virtual private) national, or international networks, sometimes use VoIP schemes to reduce the cost of the majority of internal phone calls.
   e. The disadvantages are:

        i. voice/call quality will vary significantly:
          1. at peak network (home or remote) usage times of the day during the evening and early night increased delay and latency (of the bi-directional end to end service) will cause degradation to the quality of the voice call;
          2. or at times when you, or another party in your home, is sending (on the upstream ADSL2+ link) large files to the VoIP party on the call, or to another external party, at the same time as the VoIP call;

        ii. the degradation is because the upstream speed can reduce to very low levels (sometimes below 50Kbps) if you, or other party, in your home are using the broadband connection to send files;

        iii. calls can be dropped frequently (when network delays are greater than 150ms in any one direction), especially when made to an overseas party;

        iv. VoIP calls do not have a guaranteed end to end connection, or guaranteed rate of data transfer, as the broadband service is a best effort to make the call. This means that if sufficient bits, or packets, of data, of the VoIP transmission (in either direction) are lost, or corrupted, the call quality will be degraded with echo and distortion;

        v. Set up and call management (of VoIP calls) can be complicated with some operators.

8. <u>Digital Television:</u>

    a. Digital television switch over was completed in October 2012.

    b. Digital television video signals are compressed, so 8 times more channels can be transmitted in a given spectrum range than the old analogue television signal bands.

    c. Standard Definition (SD) used the 1st generation compression standard, whereas High Definition (HD) uses the latest standard - this improves transmission efficiencies.

    d. Some of the old spectrum, used for analogue television transmissions, in the VHF (Very High Frequency) and UHF (Ultra High Frequency) bands, has been licensed in spectrum sales by OFCOM, for use in new radio and 4G/LTE mobile broadband services, currently offered by Everything Everywhere (EE) and due to be launched in 2013 by other licensed mobile operators requiring new 4G radio masts.

    e. Severe signal interference, between Freeview television signals and mobile 4G signals is likely if the user is located within 1.5km of a new 4G radio mast (estimated currently to be about 90,000 households in the UK that use Freeview as their primary TV service). This is due to the close proximity, in the radio spectrum, of the digital television and the 800Mhz (4G) mobile signals. In that case the mobile operators are required to provide and install special filters in the home and when required replace/upgrade the Freeview aerial and install low loss co-axial cable between the aerial and television, to overcome the interference issues. In a worst case situation they will have to fund the switchover to Freesat and install and commission the dish and new Set Top Box. Please access the independent TV industry web site (at800) for more information (URL copied>>) https://at800.tv/find-out-more/the-problem/.

    f. All radio frequency signals (including those used for radio and television broadcasts) suffer from various transmission anomalies that cause degradation of the signal.

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g. Generally the higher the frequency (shorter radio waves), the fewer the induced errors due to, geographical, environmental, or atmospheric conditions and less power is required to transmit and receive these signals.

h. However due to these shorter radio waves more transmission repeaters (a.k.a. transponders) will be required to achieve good coverage.

i. Absorption of the signal by the earth, sea, ice, etc. (the terrain) and substantive structures/obstacles (e.g. large rocks/hills, trees especially in full leaf, buildings, etc.) in the direct signal path, between the last repeater, or transmitter and the receiving aerial, and adverse environmental/atmospheric conditions (e.g. heavy rain, thunder storms, strong winds, thick clouds - i.e. low pressure conditions, etc) all combine to cause signal degradation and losses.

j. In Ivybridge and its environs, digital television signals can be received from three different transmitters and their associated transponders. The three main transmitters are at Beacon Hill, Caradon and Plympton. See data on following web site for more details: http://www.ukfree.tv/txlist.php.

k. Ivybridge has two local transponders but these do not support a full service in that they do not transmit all the Freeview channels. Only about 6,000 homes in the Ivybridge area can be serviced from these two transponders.

l. New Freeview (digital) channels are added periodically and that requires a retune of the DVB tuner in each and all digital television/s and recorder/s.

m. Unfortunately due to signal lobe overlap, between the signals from different transmitters and associated transponders, the auto tuning process can result in some low strength signals (below quality level 4) being stored and used by the television and recorder. This can result in poor picture quality and pixelation.

n. In cases of repeated poor picture quality it is important to employ the services of an aerial specialist to verify that the signal strength at the mast head is over 50db. High gain aerials (rather than mast head amplifiers) can be installed to boost signal strength.

o. To overcome the storing of duplicated channels (one of poor signal strength), when carrying out the auto tune process, it is necessary (for devices with older HDTV tuners) to unplug the aerial cable from each television or recorder at the start of the tuning process and only plug it in after about 20% of the tune status indicator (colour coded bar) has been achieved. This will ensure that only channels with a quality level at, or near 10 are used for all TV and radio channels and that low strength signals (at 4 or 5) are deleted.

p. The double channel tuning issues, caused by lobe overlap in the Freeview digital signals from different transponders, is generally not an issue in city centres (e.g. Plymouth) or when these television and recording devices are used in locations close to the aforementioned transmitters.

q. Different error compensation schemes are used with the latest digital television and audio transmissions, when using signal compression.

r. There are two digital television standards in use in the UK: i) Standard Definition (frame size of 780 x 480 pixels) and ii) High Definition (1280 x 720 pixels) and Full High Definition 1080p (progressive) or 1080i (interlaced) (1920 x 1080).

s. Full HD TV has over 2 million more pixels per frame - than standard television - when displayed on the current generation of LCD, plasma, or LED televisions.

t. Freeview, Freesat and Sky services support both SD and HDTV.

u. 6 HD channels are supported on Freeview HD, 5 on Freesat and at the last count 48 on Sky (but off course Sky is at a much higher cost).

v. Freesat signals do not suffer from as many transmission errors as Freeview signals. This is because satellite geographic coverage is greater, and air to ground transmissions are at higher frequencies than terrestrial transmissions.

w. Digital surround sound is supported with HDTV transmissions.

x. Accurate clock signals are required at the transmitting and receiving ends of the digital signal path, to ensure high quality pictures and synchronised audio.

y. A buffer (memory) is used in the Set Top Box to compensate for some transmission delays and loss of synchronisation, but this will not compensate for large signal loss, or significant timing errors, that then cause pixelation and ultimately frame loss.

z. Problems of lip synchronisation (audio is delayed with lip movement) usually imply that the delays in the signal path are beyond the size of the buffer, or there is a clock synchronisation issue, which can be overcome (in most cases) by switch off and restart.

aa. You can observe also that there is a few seconds delay between SD and HD signal transmissions, as a consequence of the more complex compression, encoding and decoding techniques with the latter.

　i. Terminology - SCART - the SCART (French derivation for the Radio and Television Receiver Manufacturers Association) is a multi pin interface, provided at the connection panels of TV's and other devices, and was used to interconnect these analogue type devices (DVR, Set Top Box, Home Cinema system, etc.) bi-directionally to the television. Some SCART interfaces did not support full RGB video so caused complexity.

　ii. Terminology - HDMI - High Definition Multi-media Interface is used currently to interconnect digital enabled devices to and from the TV. There is a lot of confusion (and some miss selling) in the need for very expensive gold plated and high performance cables. Reasonable cost HDMI cables. which are designed and tested to the latest standard v1.4, will suffice? Those who are interested should access the information on Wikipedia.

9. **Internet Television (a.k.a. TV over Internet):**

a. The BBC, ITV, Channel 4, Channel 5, Sky, BT Retail and Virgin Media among others offer catch up TV over the internet.

b. This streamed video can be displayed on various internet enabled devices when they latter are connected directly to the internet. These devices can be enabled: i) a Set Top Box and your provider supports catch up TV services; ii) a PC with Wi-Fi connection to the broadband hub/router; or iii) a tablet or smart phone via a specify application (e.g. BBC i-Player) using either a Wi-Fi (preferable) or 3G mobile connection..

c. The catch up TV programmes are stored in one or more remote web host server/s.

d. The speed of the internet link (especially the sustained downstream throughput) will dictate whether SD only, or SD and HD TV streamed video can be watched - in synchronisation with transmission.

e. A sustained downstream throughput between 1.5Mbps and 3Mbps will be required to view a single SD channel and between 5Mbps and 8Mbps will be required per HD channel. Rate adaptive video streaming is used by the BBC for the I-Player resulting

in reduced video quality when the bit rate is low. Time delays (latency) in the end to end connection (between the TV in your home and the broadcasters server than stores and delivers the programme) and high demand at peak times (contention) can cause lock up and picture freezing.

f. A new Freeview & TV over internet service - YouView – was launched in late 2012.

g. YouView is supported by the BBC, ITV, Channel 4 and Channel 5 (and Now TV from Sky), plus three other providers/communication companies (BT, Talk Talk and Arqiva).

h. YouView requires a Freeview aerial a wired Ethernet connection and a new set top box. Prices are about £299 for the set top box, if bought without a new contract, or free when switching to a new provider and subscribing for a TV over internet service, over when buying TV from an existing provider. The YouView set top box has an integral hard disk, for storage of television content.

i. YouView provides television and radio services, on demand services, films, videos and internet content - all on the TV. Catch up programmes from the four BBC channels, the ITV channels, Channel 4 and Channel 5. Both free to air and pay TV content (e.g. films and music videos) are available with YouView. Some live football matches can be purchased using the pay per view model. When required live TV broadcasts can be paused (using the YouView STB) for up to 2 hours and then watched in real time with a corresponding delay in the real time (live) transmission.

j. For more details please assess the YouView web site: http://www.youview.com/.

k. The BBC has entered into an agreement with Sky so that the BBC i-Player was available in late 2012 on the Sky set top box, under the Anytime+ subscription service.

l. Many additional devices now support Internet enabled TV in addition to the TV's. Apple TV, NetFlix, BBC i-Player, ITVplayer 4OnDemand, etc. are all Internet enabled TV services some are free and are available on a variety of equipment. PC's, tablets, PlayStation, Xbox etc.

10. **Smart Phones & Tablets:**

a. The latest generation of smart phones provide many features and functions - some of these are listed below:

   i. This term "Smart Phone" is used to describe more than just a phone with a camera.

   ii. The current generation of smart phones usually have a powerful dual/quad core processor, touch screens with high resolution, between 16 to 128GB memory, and some an 41 Mega pixel rear facing camera with auto focus, multi-element lenses and support capture and storage of short full HD video clips.

   iii. Smart phones can receive different wireless signals ranging from 2G, 2.5G, 3G and now some 4G/LTE mobile phone signals, satellite (GPS) Bluetooth - to Wi-Fi signals. 5G transmission systems are under development in many labs.

   iv. Current generations of smart phones have very sophisticated touch screen displays (between 4 and 5 inch) and use bi-directional scrolling techniques to avoid use of key boards with moving and pointing devices.

Technology Trivia

v. Although Blackberry was first to market with a simple smart phone and small keyboard, Apple launched the first real smart phone and application store.

vi. Apple has expanded the i-Tunes store to not only provide downloads of music, films, videos and podcasts, but also all the applications for the range of i-Phone and i-Pad (tablets). It should be noted that most applications will only run on the Apple 4.0 or later Operating System (iOS).

vii. Apple has entered into agreements with many 3rd party software application developers and they have developed nearly 400,000 applications for the range of I-Phones and the I-Pads.

viii. A largest number of smart phones in use today run various versions of the Google Android operating system (e.g. Google itself, HTC, Motorola, Samsung, LG, Sony Ericsson, etc.). However Google allows each of its partner manufacturers to modify the kernel of Android to suit their own needs.

ix. Google has launched an application store (Google Play) similar to Apple (i-Tunes) and its partners are developing a number of applications. It should be noted that Google does not employ a locked down application development system and certification system as Apple. This places the onus on users to ensure that they buy only applications that have been in use the wider market for many months.

x. Apple uses a proprietary operating system (iOS 7.x to run on the A7 64 bit processor).

xi. Blackberry uses also a proprietary operating system (OS 7 now). However their long term position in the smart phone market is uncertain.

xii. Microsoft launched rather belatedly the Windows Phone 8 operating system (they now own Nokia) and some manufactures have launched smart phones using this OS (e.g. Nokia, Samsung).

xiii. The Apple i-Phones (3, 3S, 4, 4S, 5s and 5C) can be used with nearly 400,000 applications (both free and at a cost). The i-Tunes store can be used to purchase/download music, books, videos, etc. It should be noted however that the older Apple phones run the latest applications and not all applications available today on I-Tunes support IOS 7.x.

xiv. With the i-Phone, the Apple operating system (IOS) ensures that the Safari search engine and the related web and internet services are accessed safely.

xv. The latest Apple i-Phone supports intelligent voice recognition commands using a program called SIRI and "Cloud" (always available on-line) storage and back-up are also supported.

xvi. Many of the latest smart phones from the main manufacturers have a built-in accelerometer, 3 axis laser gyro, and use these for proximity and motion sensing and a digital compass - these enable position sensitive applications such as star gazing applications that annotate the image of the sky (on the screen) with a position sensitive view of the stars.

xvii. These devices support "always on" fast internet access (where the mobile network coverage is good) in that you do not have to power up a PC, log in, launch a browser and wait for the web connection. 3G and now 4G networks offer fastest web access.

xviii. At home and where secure Wi-Fi public networks are available, these devices can be used with Wi-Fi to connect to the home and public wireless hubs, or secure Wi-Fi Hot Spots.

xix. E-mails can be received/accessed (faster than with a PC) and attachments can be opened and viewed. E-mail can also be sent (with or without attachments) to another party.

xx. These devices can be synchronised with a PC and contact details, calendars/appointments kept up to date and in-line.

xxi. Many latest generation smart phones have sophisticated front and back facing cameras – some with very high resolution and complex processing software.

xxii. Tablets - are small mobile computers - they range from the e-book readers which are limited in use, to multiple use small and large screen devices (e.g. Apple I-Pad4 Gen. Google Nexus, etc.).

xxiii. The latest generation of small and large screen tablets are much more sophisticated than smart phones, can support more applications, have larger touch screens - with very high resolutions (e.g. 9.7 inch with 2048 x 1536 pixels - higher resolution than a full HDTV screen, or larger screens e.g. 13.3 inch but with a lower resolution of 1280 x 800) are either provided with more on-board memory, or allow expansion via a micro SD memory card.

xxiv. Tablets currently do not support two way phone calls without the use of additional software. However they can by installing the Skype (or a similar) application. For example the Apple i-Pad will support two way video calls with the Facetime application.

xxv. Tablets generally have a USB port, or micro USB port, or in the case of Apple a custom port (Lightning) port and audio jack connection. Some manufacturers provide port adaptors.

xxvi. As stated above and repeated here, It is important to remember that both smart phones and tablets are internet enabled devices and can be exposed to security risks - especially when connected to the mobile,. or Wi-Fi networks, away from the home.

xxvii. Young people can be very cavalier and lax with security precautions and are vulnerable to cyber bullying and hacking via malware loaded onto these devices. They do need to be educated in sound security measures, including but not limited to, risk of sexual grooming, fraud via the internet and theft of data to support malpractice, or even theft of these new and expensive devices.

xxviii. Using mobile or smart phones to make small payments - this is currently under test using Near Field Communication (NFC) schemes to communicate between the phone and point of sale terminal.

xxix. This NFC technique has yet to be proven as a better and more secure payment technique than cash and credit/debit cards at a chip and pin terminal and we all know those payment methods are not very secure. It is not recommended to use NFC equipped mobile devices to make small payments as most of the these devices are equipped with passive NFC hardware and the devices use only four digit passwords and can therefore the security system can be breached very easily.

Technology Trivia

xxx. The security of this (NFC) payment method could be enhanced by use of password protected digital passports (with embedded signatures) and digital vaults - stored within the device and only accessed after biometric finger print analysis (e.g. Apple i-Phone 5s and 5C) . These make the device harder to access and use if the device is stolen, or lost. It is likely that more manufacturers will introduce biometric or voice verification systems to improve device security.

xxxi. Barclays bank has, in conjunction with some of its partners, released a self adhesive chip card (with the NFC technology built into the card) for use with smart phones. This card needs to be adhered to the back of any current generation of smart phones that do not have the necessary NFC chip within the phone. This system is under trail currently, with some mobile operators and a few retailers that have the required tyre of point of sale terminal. See web site as below for more details: http://www.nfcworld.com/2011/05/20/37535/uk-gets-frst-commercial-nfc-service-with-quick-tap-from-orange-and-barclaycard/.

xxxii. Smart phones and tablets are being used in the UK and in many other countries, with custom applications to remotely monitor and control, fittings, systems and devices in the home (including burglar alarms, heating and ventilation systems, curtains, CCTV, etc.). However these are very expensive and complex to install, set up and use.

    1. Fact - the more sophisticated and complex mobile devices become and the more they rely on remote links for inter communication, they more unreliable they become.

    2. Fact - reliability of these devices at time of purchase, or throughout their life can be poor, especially if they use the current mix of technologies comprising - hardware, software and bi-directional data transmission to communicate between the remote monitoring and controlling/activation systems and devices.. This is so because of the complex testing required of these products and systems to ensure that functional interoperability issues (between these technologies and different releases of the same) and the in-built bugs - are discovered and eliminated, prior to sale of these systems and during operational use.

    3. Fact - the more sophisticated and thus expensive portable/mobile devices become, the more theft occurs as they are very attractive to opportunistic thieves - especially from the young and elderly.

xxxiii. You will know by now that wireless communication between devices is not a secure means of data transmission - so the jury is still out on this methodology. As the man said "watch this space".

P.T.O. for the last three pages>>

Technology Trivia

Different technical terms and notations:

Multiples of bytes				
SI decimal prefixes		**Binary usage**	**IEC binary prefixes**	
Name (Symbol)	**Value**		**Name (Symbol)**	**Value**
kilobyte (kB)	10^3	2^{10}	kibibyte (KiB)	2^{10}
megabyte (MB)	10^6	2^{20}	mebibyte (MiB)	2^{20}
gigabyte (GB)	10^9	2^{30}	gibibyte (GiB)	2^{30}
terabyte (TB)	10^{12}	2^{40}	tebibyte (TiB)	2^{40}
petabyte (PB)	10^{15}	2^{50}	pebibyte (PiB)	2^{50}
exabyte (EB)	10^{18}	2^{60}	exbibyte (EiB)	2^{60}
zettabyte (ZB)	10^{21}	2^{70}	zebibyte (ZiB)	2^{70}
yottabyte (YB)	10^{24}	2^{80}	yobibyte (YiB)	2^{80}

Technology Trivia

Abbreviation	Description
GHz	Giga Hertz (1GHz = 1,000,000,000 cycles per second)
MB	Mega Byte (1MB = 1,048,576 Bytes) memory, 1,000,000 Bytes for storage
GB	Giga Byte 1000 x MB
TB	Terabyte 1000 x GB
RAM	Temporary Memory (slow but inexpensive)
Cache	High Speed temporary memory (expensive with high speed access)
Cookies	Small downloaded code from websites that are used to configure, track and remember preferences on a website.
Phishing	An attempt to acquire user sensitive data by pretending to be a trustworthy website.
Web Cam	Web enabled Cameras. Cameras connected to the internet available to all.

Technology Trivia

Open Systems Interconnection (OSI) model – 7 layers

OSI model
7. Application layer
• NNTP; SIP; SSI; DNS; FTP; Gopher; HTTP; NFS; NTP; SIP; SMPP; SMTP; SNMP • Telnet; DHCP; Netconf; (more)
6. Presentation layer
• MIME; XDR
5. Session layer
• Named pipe; NetBIOS; SAP; PPTP; RTP; SOCKS; SPDY; TLS/SSL
4. Transport layer
• TCP; UDP; DCCP; RSVP; SCTP; DCCP; SPX
3. Network layer
• IP; IPv4; IPv6; ARP; ICMP; IPsec; IGMP; IPX; AppleTalk
2. Data link layer
• ATM; SDLC; HDLC; CSLIP; SLIP; GFP; PLIP; IEEE 802.2; LLC; L2TP; IEEE 802.3 • Frame Relay; ITU-T G.hn DLL; PPP; X.25
1. Physical layer
• EIA/TIA-232; EIA/TIA-449; ITU-T V-Series; I.430; I.431; PDH; SONET/SDH; PON • OTN; DSL; IEEE 802.3; IEEE 802.11; IEEE 802.15; IEEE 802.16; IEEE 1394 • ITU-T G.hn PHY; USB; Bluetooth; RS-232; RS-449

Technology Trivia

OSI Model

Data unit		Layer	Function
Host layers	Data	7. Application	Network process to application
		6. Presentation	Data representation, encryption and decryption, convert machine dependent data to machine independent data
		5. Session	Inter-host communication, managing sessions between applications
	Segments	4. Transport	End-to-end connections, reliability and flow control
	Packet/Datagram	3. Network	Path determination and logical addressing
Media layers	Frame	2. Data link	Physical addressing
	Bit	1. Physical	Media, signal and binary transmission

I hope that you did not get too much indigestion in consuming the above offerings of the Smorgasbord.