

MODULE 1: MOBILE DEVICES

A+ CORE 1 220-1001

13/03/2019

Your fastest way to learn. Guaranteed.



CORE 1 220-1001

Exam: Core 1 220-1001

Max 90 questions

(Multiple choice & performance based)

90 minutes duration

Pass mark 675/900

A+ 220-1001

CompTIA A+ Core 1 220-1001 covers Mobile devices, hardware, networking, peripherals, printers and troubleshooting hardware and network connectivity issues.

6 to 12 months hands-on experience in the lab or field

EXAM BREAKDOWN

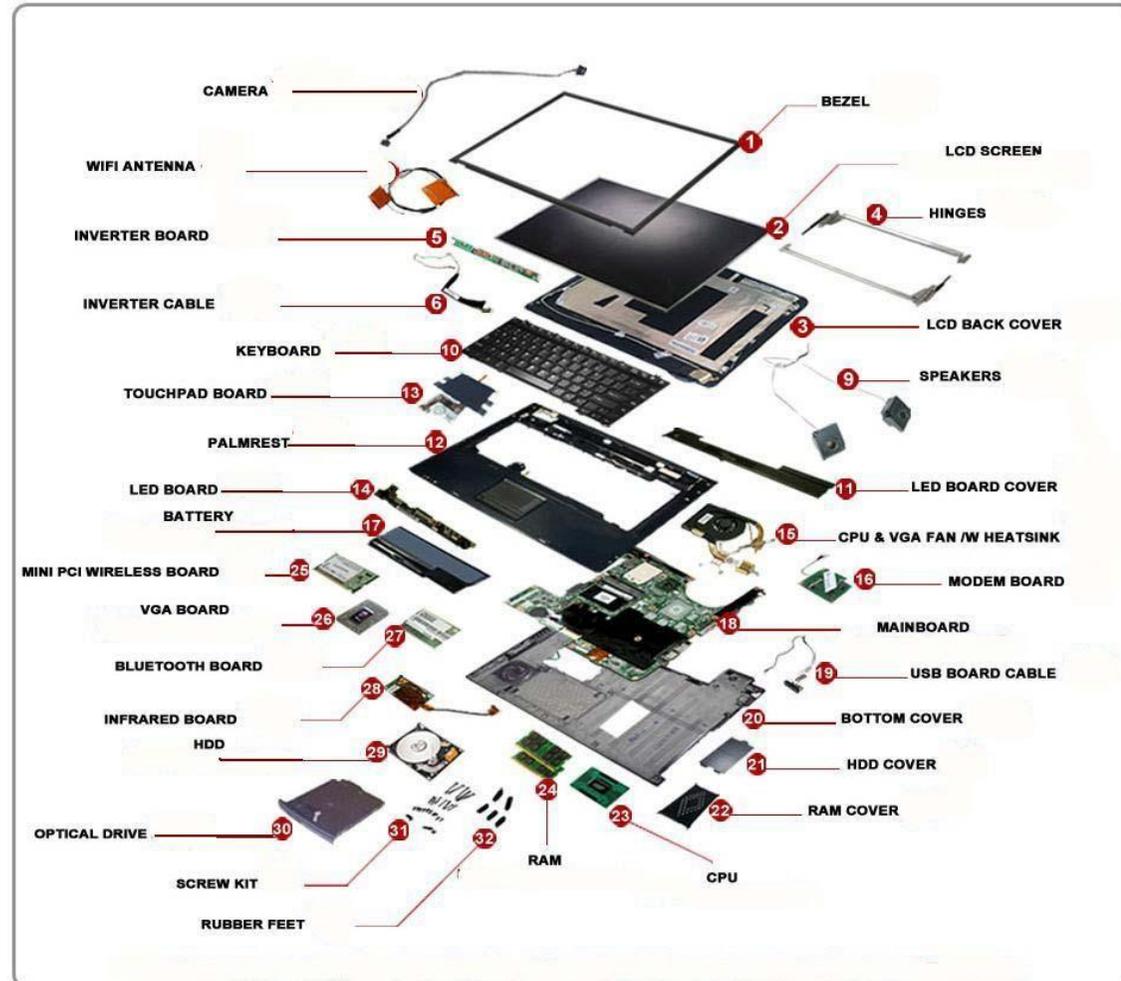
Domain	Percentage of Exam
1.0 Mobile Devices	14%
2.0 Networking	20%
3.0 Hardware	27%
4.0 Virtualization & Cloud Computing	12%
5.0 Hardware & Network Troubleshooting	27%

LAPTOPS - COMPONENTS

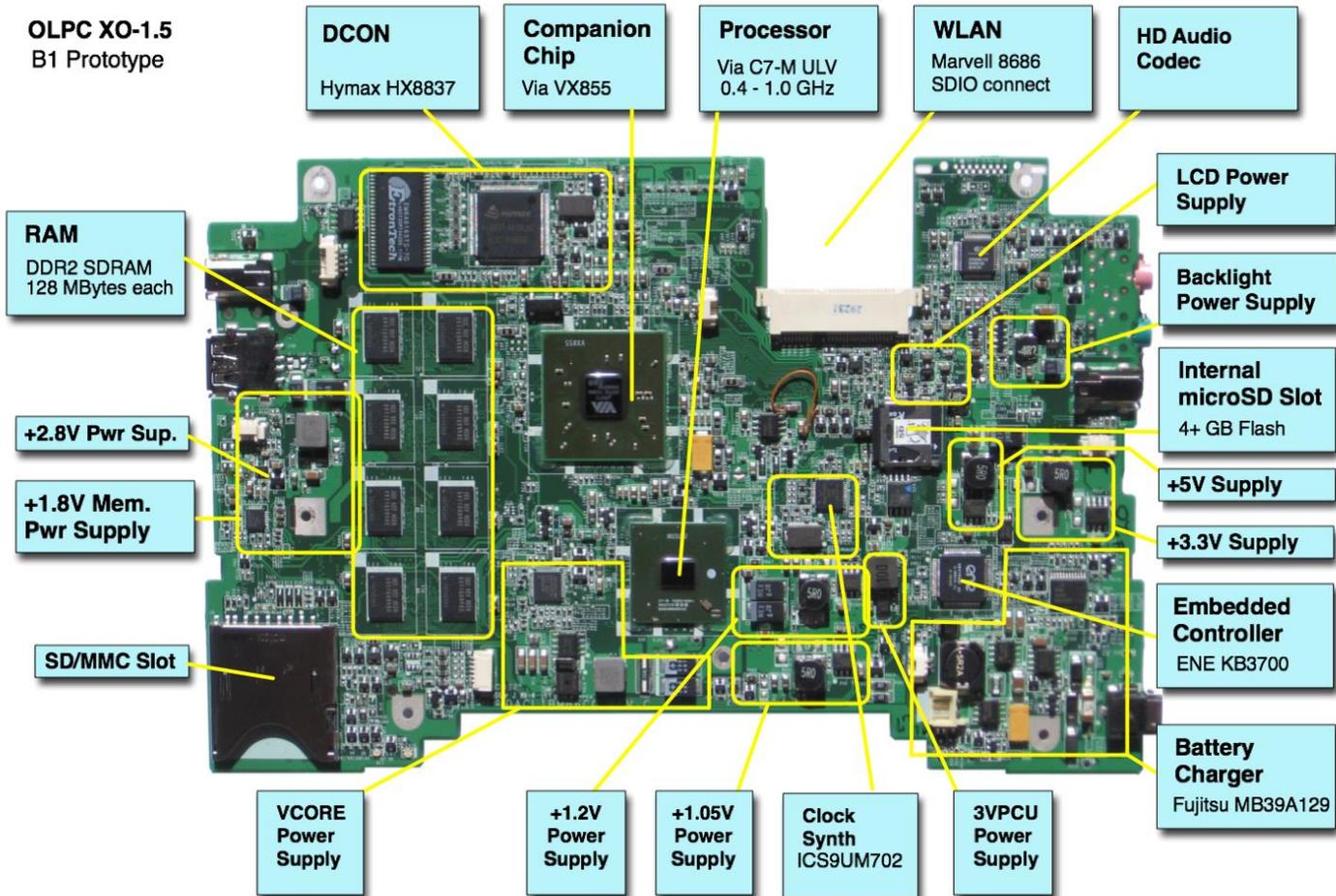
- HDD/SSD/SSHD
- SODIMM - Smaller form factor RAM
- Card reader - SD, Micro SD
- Optical drive - DVD-RW/CD-RW
- Wireless Card
- Graphics - often integrated into CPU
- Can have separate GeForce/Radeon GPU for gaming laptops
- CPU - Mobile version lower power consumption smaller form factor

LAPTOPS - COMPONENTS

- Lithium ion battery
- Plastic or metal frame
- Onboard stereo speakers
- Microphone - built in
- System board - motherboard
- Keyboard - built in sometimes lit
- Mouse - built in mousepad
- Camera - webcam built in
- LCD screen - size/type
- AC adaptor - power + charge



LAPTOP SYSTEM BOARD



LAPTOP DISPLAYS

LCD (Liquid crystal display) requires a backlight to shine through liquid crystals. The light source is more often LED but can also be fluorescent. Black is not as good as OLED and if the backlight LED/florescent fail can be hard to replace. Inverter (DC to AC) required to power florescent LCD.

OLED (Organic Light Emitting Diode) Use an organic compound to emit light when it receives an electric current. Thinner and lighter and flexible as no glass is required so ideal for mobile phones and thin devices. A backlight is not required although OLED uses more power. OLED displays also degrade over time.

LAPTOP DISPLAYS

- Touchscreen to use your fingers to interface with device
- Digitizer enables screen interaction such as using a stylus or pen
- Dual display to use projector/screen with built in display



LAPTOP CONTROLS

- Screen brightness/contrast
- Volume control
- Wireless on/off
- Screen orientation
- Touch pad
- Keyboard
- Location - GPS/wireless
- Docking station



MOBILE DEVICES

- Smartphone
- Phablet
- Tablet
- Wearable Tech
- E Reader
- Smart Camera
- GPS



LAPTOP FEATURES

Special Function Keys FN

- Dual Display
- Wireless On/Off
- Bluetooth On/Off
- Volume
- Brightness
- Keyboard Backlight
- Vendor specific



OTHER MOBILE DEVICES - CONNECTIONS

- Micro/mini USB
- USB-C
- Lightning
- Bluetooth
- IR
- Hotspot/Tethering
- NFC



MOBILE DEVICES - ACCESSORIES

- Headphones/earphones
- Speakers Bluetooth/wired
- Docking Stations
- Battery Charger
- Covers and cases
- SD card
- Micro SD Card
- Gamepad
- External optical or HDD

MOBILE DEVICE CONNECTIVITY

Wireless/cellular

- Data
- Airplane mode - turn off wi-fi/Bluetooth/cellular
- Hotspot - connect other devices to share the internet
- Phone updates OTA (Over the Air)
- IMEI - International Mobile Station Equipment Identity
- IMSI - International Mobile Subscriber Identity
- VPN - becoming popular to aid in mobile security - secure connection on free wi-fi

CONFIGURING MOBILE DEVICES

Setting up email

- Pop3 port 110 Secure - 995
- SMTP port 24 Secure - 587
- Microsoft Exchange - enterprise mail
- S/MIME email encryption
- IMAP - online email port 143 secure 993

Email Providers

Gmail

Yahoo

iCloud

Hotmail/Outlook



MOBILE SYNCHRONIZATION

A mobile can be synchronized to the cloud, via a USB link, in the case of Apple devices via iTunes or other vendor specific management software

Data types:

- Email
- Contacts email/telephone numbers
- Personal data - passwords, notes
- Applications
- Media - videos, pictures, music
- Location data
- Documents
- Calendar

MODULE 2: NETWORKING

A+ CORE 1 1001

13/03/2019

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NETWORK MEDIA

- CABLE
- WIRELESS
- SHARING
- INTERNET

INTERNET PROTOCOL - IP

IP address (IPv4)

- 32-bit binary
- Broken down into four 8-bit octets separated by a . (dotted decimal notation)
- Subnet mask to make more efficient use of IPs on a network

Reserved address ranges

- Private - A, B, C
- Loopback - 127.0.0.1
- Multicast (Class D)
- Reserved (Class E)
- APIA 169.254.0.1 - 169.254.255.254

PRIVATE IP ADDRESSES (RFC1918)

CLASS	Private Address Range
A	10.0.0.0 - 10.255.255.255
B	172.16.0.0 - 172.31.255.255
C	192.168.0.0 - 192.168.255.0

IPV6

- 128 bit address scheme
- Hexadecimal
- Separated by :
- Secure
- Eg: 3045:0000:2336:e378:0006:63bf:3fff:fdd2

Lead zeros or zero sections may be removed or shortened

- Eg: 3045::2336:e378:6:63bf:3fff:fdd2

IPV4 VS IPV6

	IPv4	IPv6
Loopback address	127.0.0.1	::1
APIPA	169.254.x.x	FE80::
Private addresses	10.0.0.0	FEC0::
	172.16.0.0	
	192.168.0.0	

IPCONFIG

- IPv4 Address + Subnet Mask
- IPv6 Address
- Default Gateway
- DHCP Enabled
- MAC Address
- Interface ID

```
Wireless LAN adapter Wi-Fi:
```

```
Connection-specific DNS Suffix . : home
Description . . . . . : Marvell AVASTAR Wireless-AC Network Controller
Physical Address. . . . . : B4-AE-2B-CB-83-50
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::d402:1ecc:3330:560e%9(Preferred)
IPv4 Address. . . . . : 192.168.1.78(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : 01 February 2016 10:34:34
Lease Expires . . . . . : 02 February 2016 17:56:39
Default Gateway . . . . . : 192.168.1.254
DHCP Server . . . . . : 192.168.1.254
DHCPv6 IAID . . . . . : 62172715
DHCPv6 Client DUID. . . . . : 00-01-00-01-1D-F5-10-90-B4-AE-2B-CB-83-50
DNS Servers . . . . . : 192.168.1.254
NetBIOS over Tcpi. . . . . : Enabled
```

STATIC V DYNAMIC IP

Static IP is a fixed IP, and is usually changed manually. A common use is for servers where hosts would not be able to see it if the IP kept changing!

Dynamic IP is where the IP can change each session or is allocated only when it is required by the host.

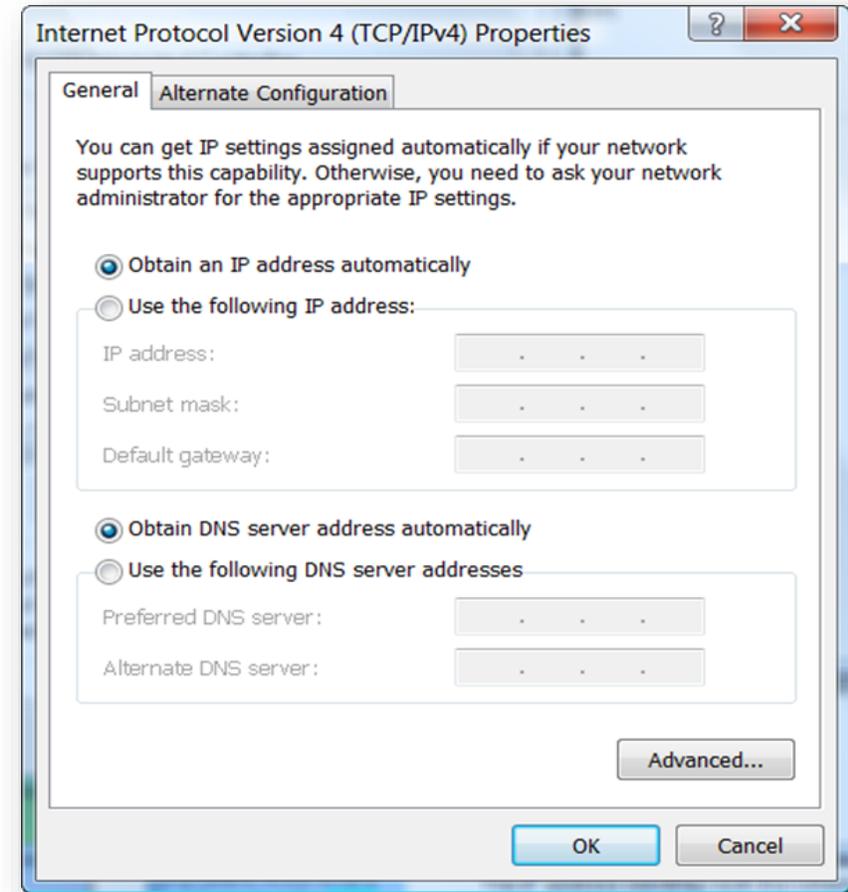
DHCP - APIPA

Dynamic Host Configuration Protocol

Offers out temporary IPs to client using Discover, Offer, Reserve, Acknowledge

APIA (Automatic Private IP Addressing)

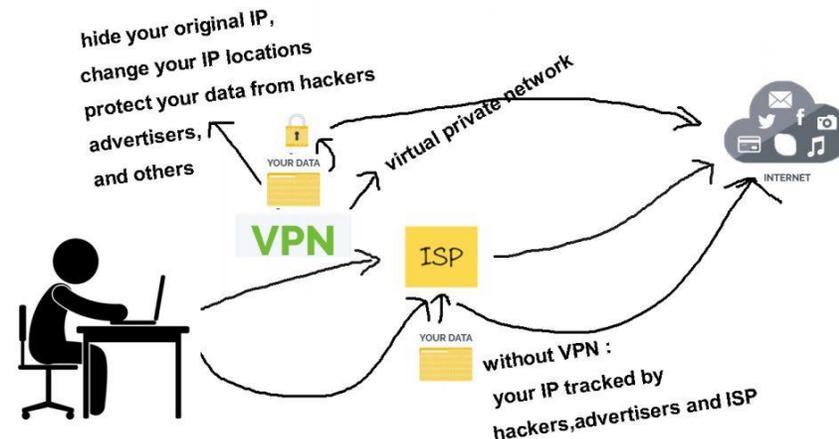
a sign that DHCP might not be working as a private 169.254. address is allocated internally by the OS.



VPN GATEWAYS

VPNs - Virtual Private Networks are widely implemented to allow availability for remote workers

- Users log in from anywhere with the benefit of a secure connection over the Internet. Useful on open or free wi-fi or unsecure connections
- The remote VPN connections are terminated at the destination on a VPN concentrator or gateway.



PERSONAL VPN EXAMPLE

The screenshot displays the ProtonVPN desktop application interface. At the top, it shows the user is connected to a server in Australia (AU#2) with IP 185.161.201.11. The interface includes a sidebar for server selection, a main map view, and a traffic statistics panel.

Connection Status: CONNECTED

Server Information: Australia » AU#2, IP: 185.161.201.11, 16% Load, 0.00 B /s ↓, 2.00 KB /s ↑

Server List:

Country	Server	Status
Australia	AU#1	Sydney
Australia	AU#2	CONNECTED
Australia	AU#3	Sydney
Australia	AU#4	Sydney

Session Traffic:

Metric	Value
Session	13s
Down Volume	79.00 KB
Up Volume	61.00 KB
Down Speed	0.00 B/s
Up Speed	2.00 KB/s

Speed Graph: Shows a peak speed of 16.00 KB/s over a 60-second period.

DHCP - DORA

DHCP Process

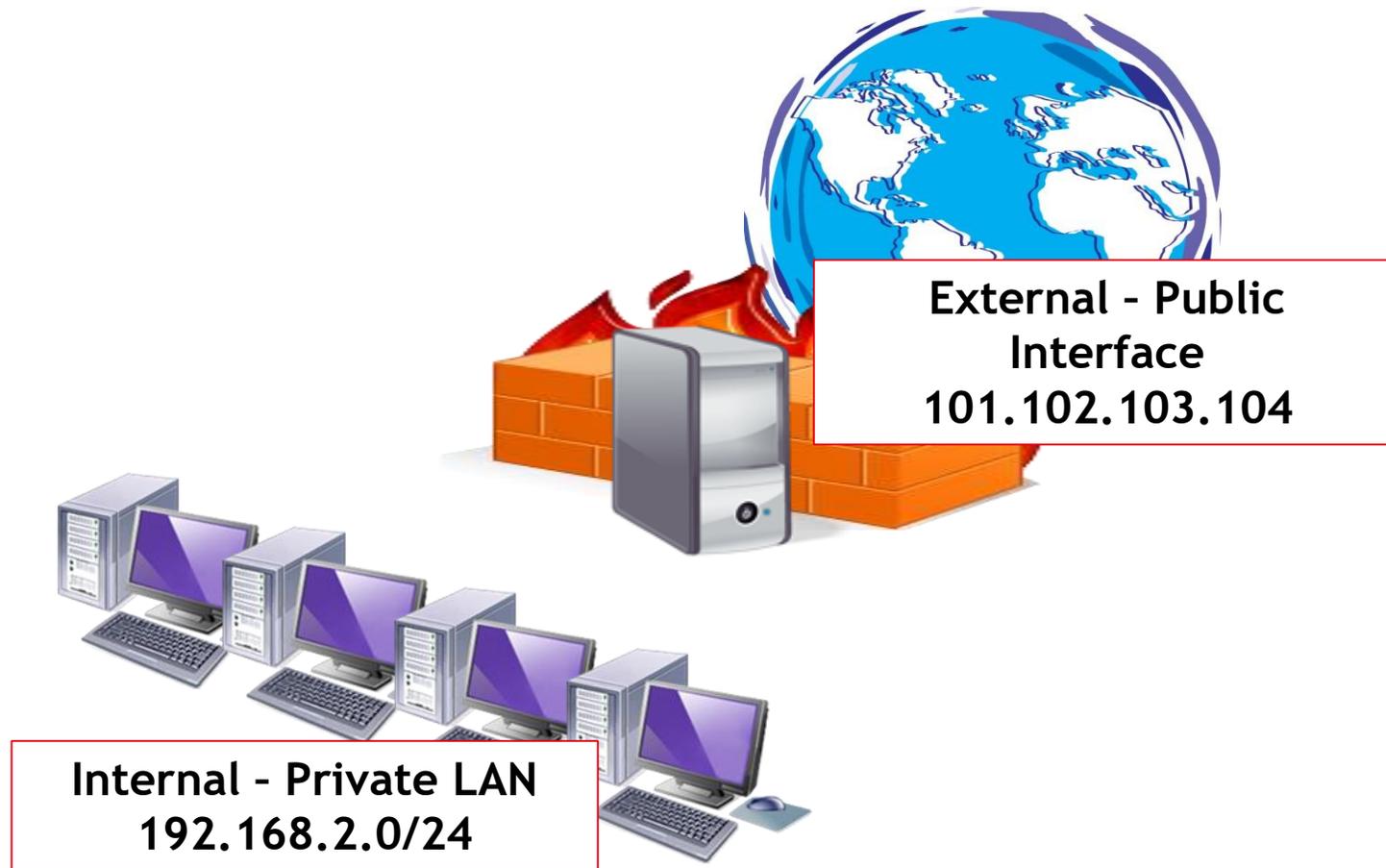
Step 1: Discover

Step 2: Offer

Step 3: Request

Step 4: Acknowledge

NAT - NETWORK ADDRESS TRANSLATION



TCP / UDP

TCP Vs. UDP

No.	TCP	UDP
1.	Connection Oriented Protocol	Connection-less Protocol
2.	Connection in byte stream	Connection in message stream
3.	It does't support multicasting and broadcasting	It supports broadcasting
4.	It provides error control and flow control	Error Control and Flow control is not provided
5.	Supports full Duplex	Does not support full Duplex
6.	TCP packet is called as Segment	UDP packet is called as User Datagram



PORTS

Port Number	Process Name	Description
20	FTPDATA	File Transfer Protocol - Data
21	FTP	File Transfer Protocol - Control
22	SSH	Secure Shell
23	TELNET	Telnet
25	SMTP	Simple Mail Transfer Protocol
53	DNS	Domain Name Service
80	HTTP	HTTP
110	POP3	Post Office Protocol version 3
139	NetBIOS	Session port
143	IMAP4	Internet Mail Access Protocol
443	HTTPS	HTTP Secure

DOMAIN NAMING SYSTEM

- DNS (Domain Name Server)
- IP address to people human friendly FQDN - www.bbc.co.uk
- Domain Name Structure
- Top Level Domain
- Subdomain(s)
- Hostname

Domain Name	Description
edu	Educational and research institutes
gov	Government agencies
mil	Military institutions
net	Network companies (ISPs)
com	Commercial organizations
org	Other organizations
uk	United Kingdom
au	Australia
jp	Japan

NETWORK COMPONENTS

802.2

- Logical Link Control
- Media Access Control

802.3 Ethernet

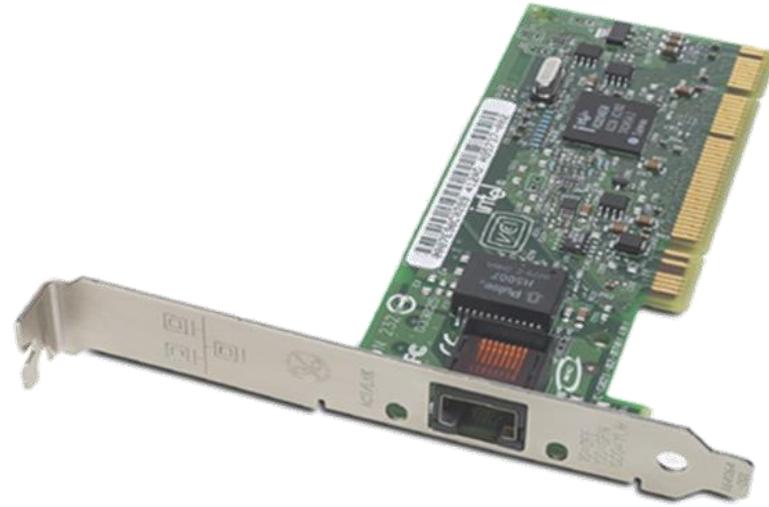
- CSMA/CD access method
- 10 Mbps
- 100 Mbps (Fast Ethernet)
- 1 Gbps (Gigabit Ethernet)
- Different media (copper and fiber-optic)

Network adapter

- Layer 2
- MAC address

Hubs and switches

- Layer 1-2
- Star topology connectivity
- Switches reduce contention



POE

Power over the Ethernet (PoE) is where power is sent down an Ethernet cable, common use is powering VOIP phones. This can also power other low power devices such as low power CCTV and wireless access points.



SOHO

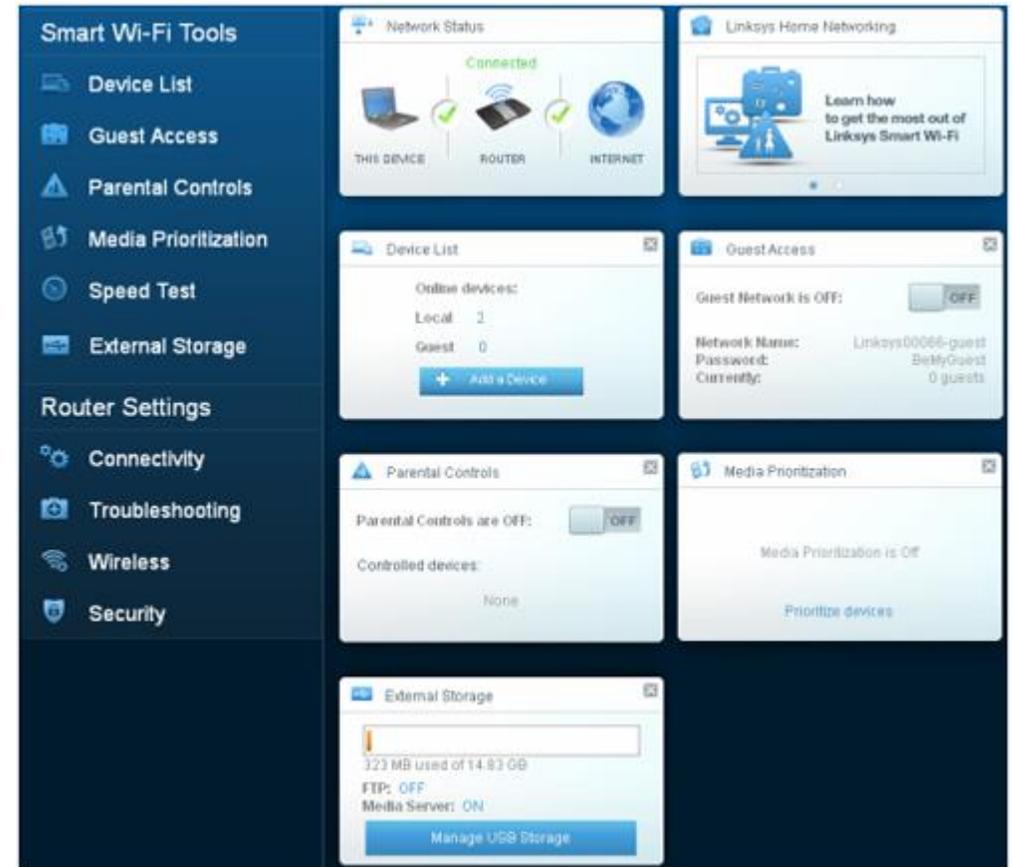
SOHO router all in one device with a built in firewall. Allows routing and switching and is a wireless and wired access point. Has built in DHCP and ability to connect to IoT as well as computers.

- Ring or Arlo security cameras
- Light switches
- Fridge freezer
- Door locks
- Smart speakers & voice assistants



SOHO SETTINGS

- MAC address filtering
- Whitelisting/blacklisting
- UPnP
- Channel settings
- Encryption - WPA2 or WPA
- QoS



802.11 STANDARDS

Standard	Max Throughput	Frequency	Notes
802.11a	54Mbps	5GHz	
802.11b	11Mbps	2.4GHz	
802.11g	54Mbps	2.4GHz	
802.11n	Up to 600Mbps	2.4/5GHz	MIMO
802.11ac	Up to 1Gbps	5GHz	MIMO

SETTING UP A WIRELESS NETWORK

- SSID Broadcast - change from the default SSID or disable the broadcast
- MAC Filtering - this allows you to specify which devices can connect to the wireless network.
- Wireless Encryption - go for the strongest available

SETTING UP A WIRELESS NETWORK (CONTINUED)

- WPS - Wi-Fi Protected Setup. Allows for the automatic configuration of devices on a wireless network through the use of PIN numbers
- DHCP - The wireless router can allocate IP addresses to clients that connect.
- DMZ - Demilitarised Zone. This allows for a separate network security zone where certain public facing devices can be located.
- Firewalls - the wireless router can be setup to block, allow or forward certain types of traffic.

WIRELESS ENCRYPTION TYPES

WPA - RC4 - TKIP. Wi-Fi Protected Access. Not a defined standard, stronger but can be broken if weak passphrase is chosen

WPA2 - AES - CCMP - Implements the 802.11i security standard. Much stronger.

- **RC4** - Symmetric stream cipher which is now considered deprecated.
- **TKIP** - Temporal Key Integrity Protocol. The keys in use can change during the session.
- **AES** - Advanced Encryption Standard. 128 bit encryption key that has become the standard in many areas of encryption.
- **CCMP** - Counter Mode Cipher Block Chaining Message Authentication Code Protocol improves security. CCMP is a block cipher mode using a 128-bit key. Block cipher is stronger than a stream cipher.

WIRELESS TECHNOLOGIES

RFID

Zigbee

Z-Wave

BLUETOOTH

Bluetooth 1.0

- 2.4 GHz (radio-based)
- 1 Mbps
- 10m (30') Class 2
- 1m (3') Class 1

Bluetooth 2.0 (EDR)

- 3 Mbps



TYPES OF INTERNET CONNECTION

- Cable
- DSL ADSL
- SDSL
- Dial-Up
- ISDN
- Satellite
- Mobile hotspot (cellular)
- Fibre to the home
- WiMAX

TYPES OF NETWORK

LAN - Local Area Network

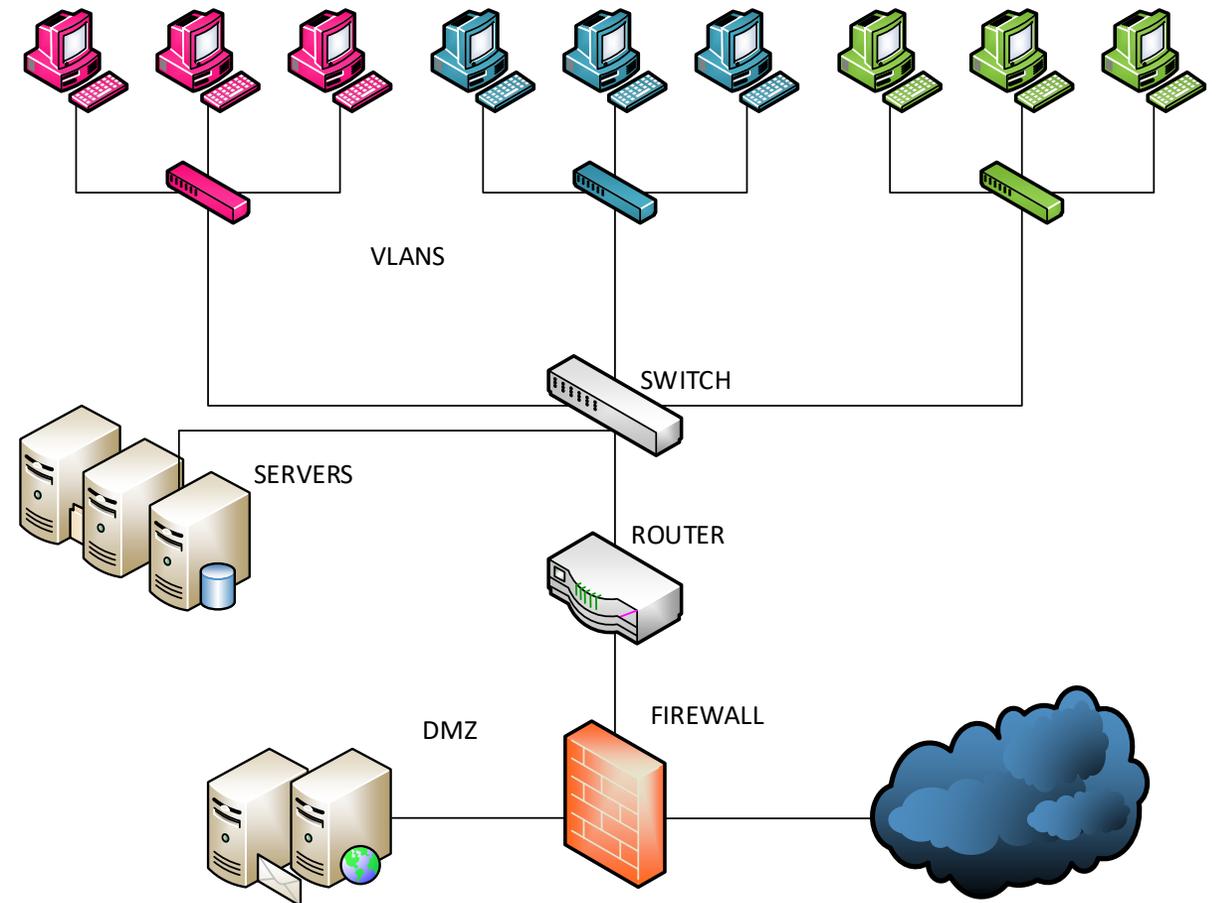
WAN - Wide Area Network (used to connect geographically separate LANs).

PAN - Personal Area Network is a LAN created by using personal devices, e.g. phone to laptop, iPod to tablet

MAN - Metropolitan Area Network is a network covering a physical area such as a town or campus

ROUTING

- Divide a single physical network into multiple logical networks
- Join a network using one type of media with a network using different media



NETWORK SERVICES

- File server
- Mail server
- Web server
- Print server
- DHCP server
- DNS server
- Proxy server
- Authentication server



NETWORK SERVICES

- SIEM
- Syslog
- UTM
- IDS/IPS
- Endpoint management server
- Legacy and embedded systems

CABLING TOOLS



Crimp Tool



Toner Probe



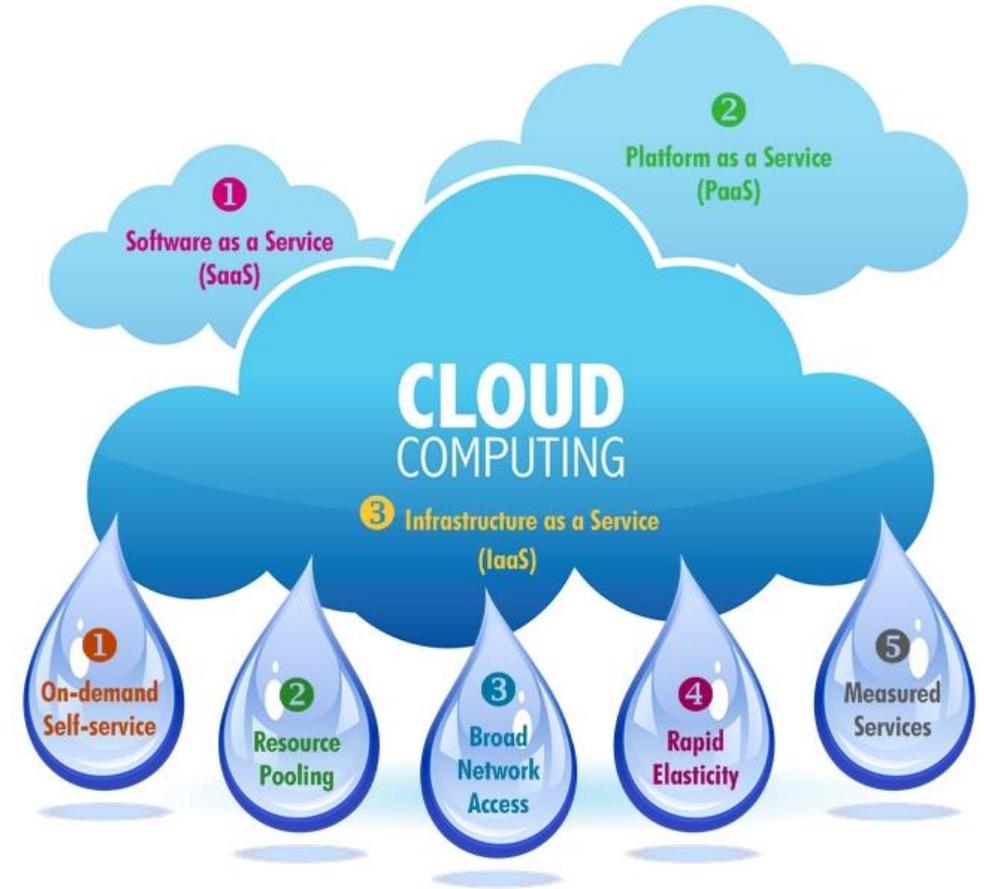
Cable Tester



OTDR

CLOUD COMPUTING

- Private
 - Public
 - Hybrid
 - Community
-
- Platform As A Service (PaaS)
 - Software As A Service (SaaS)
 - Infrastructure As A Service (IaaS)



VIRTUALIZATION

Virtualization - the practice of having a host operating system which runs one or more other operating systems via a hypervisor.

- Virtually any operating system can run on any hardware and the virtual environments consist of a series of files that are portable for backup and resilience purposes
- Virtual machines can have snapshots/checkpoints taken that allow very quick restoration
- Allows for hardware consolidation and each virtual instance is isolated from others running on the same host platform
- Ideal environment for safe testing and evaluation

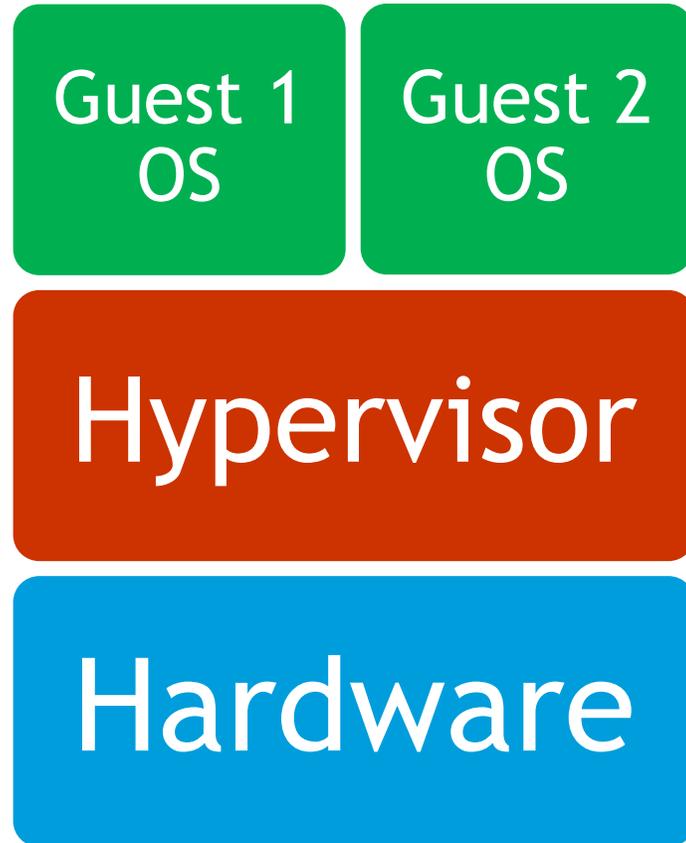
VIRTUALIZATION

- Hypervisor - virtual machine manager
- Resources - memory, CPU, disk
- Networking - Bridged, NAT, Private
- VM Escape is a known vulnerability

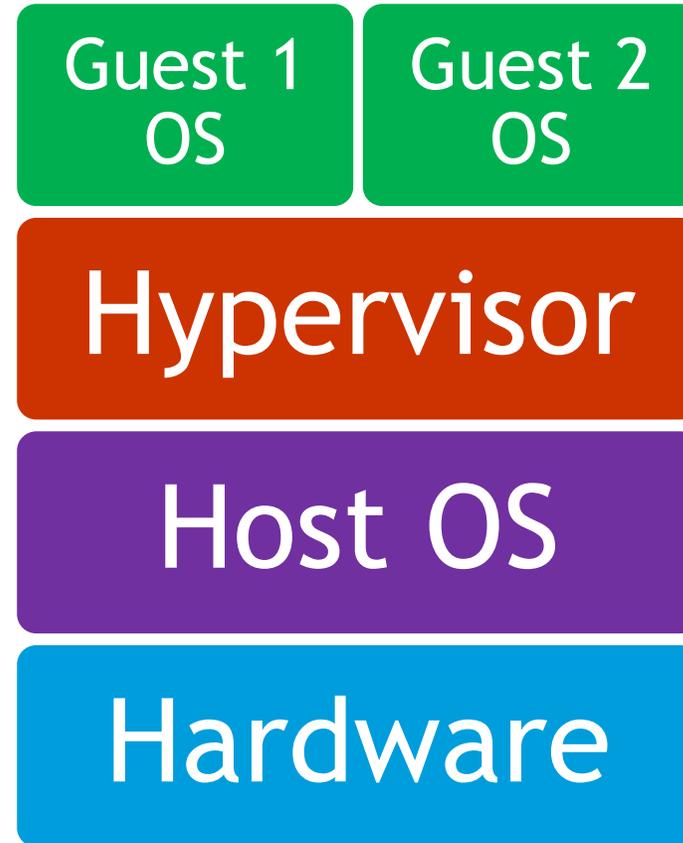


HYPERVISOR

Type I



Type II



MODULE 3 HARDWARE

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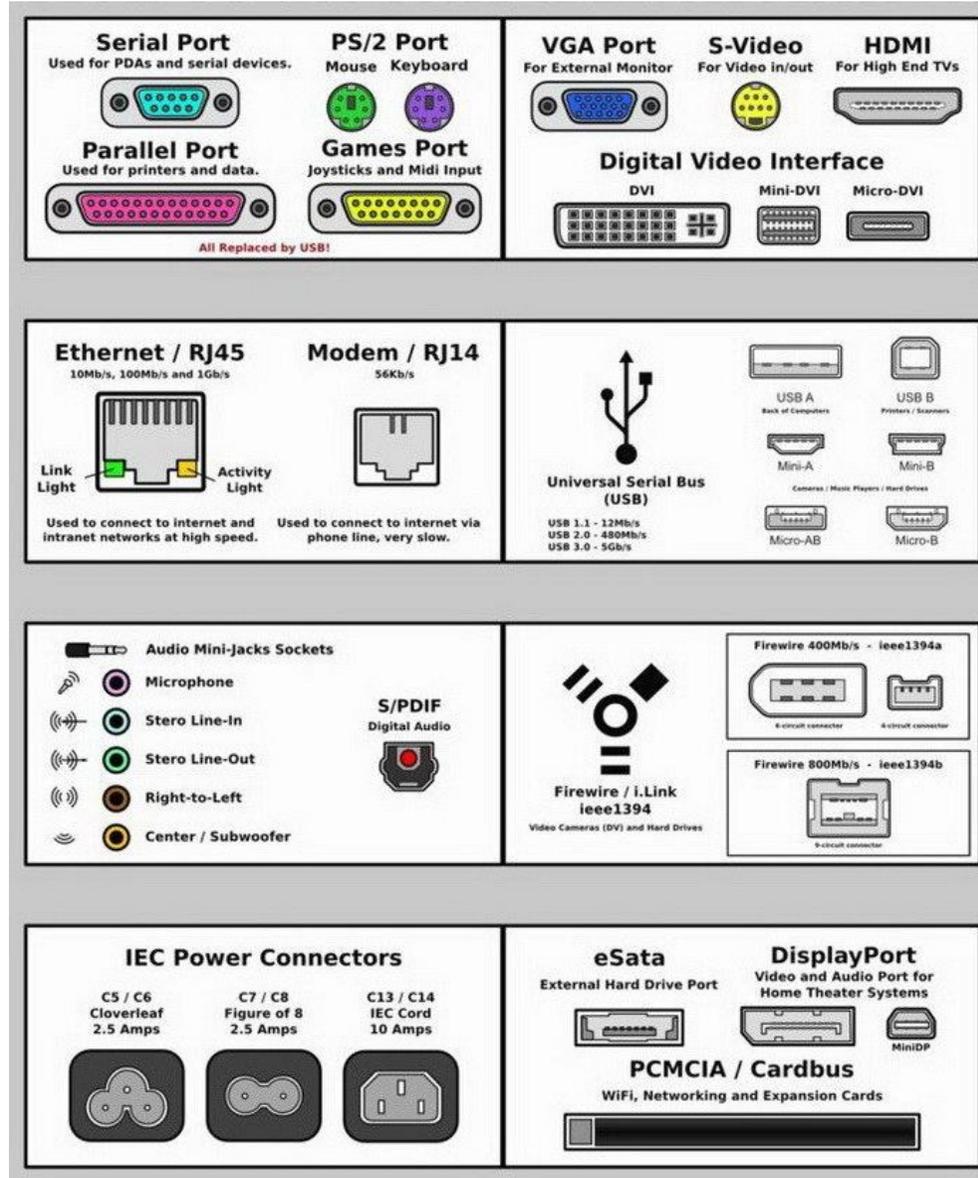
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CONNECTORS

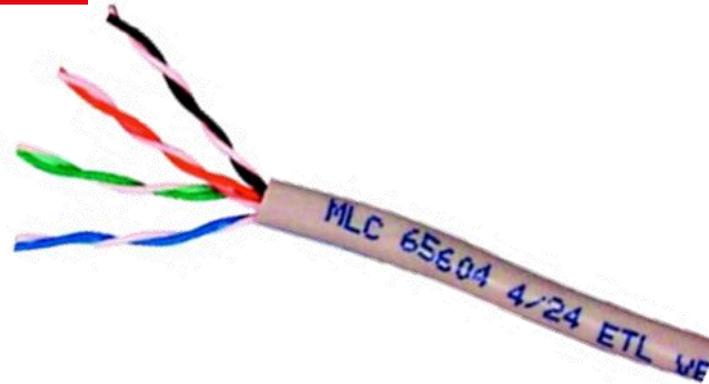
Modern computers and devices have a plethora of ports and connectors as shown in the diagram.

Inside the computer there are Molex power connectors and SATA data and other cables for control and power.



TYPES OF CABLE

- Twisted Pair
- UTP
- STP
- CAT standards
- Connectors



TWISTED PAIR

Unshielded Twisted Pair (UTP)

Performance categories (Cat5e / Cat6)

Connectors (RJ-45 / RJ-11)

Shielded types

Plenum cable



TYPES OF CABLE

COAXIAL



Network Type	Coax Type	Max Distance
Thin Ethernet baseband	RG58	185 METRES
Thick Ethernet baseband	RG8 / RG11	500 METRES
Cable TV broadband	RG6	Variable

TYPES OF CABLE

- Coax connectors
- BNC
- F



CAT TYPES

Cat 5e Four twisted pairs rated for 100 MHz, but can handle all four pairs transmitting at the same time (required for GB Ethernet). Cat 5 is essentially redundant (can you still buy it??).

Cat 6 Four twisted pairs rated for 250 Mhz. A standard from 2002. Used as a riser cable to connect floors, but for future proof best practice to install as standard for a new network.

RJ45

- RJ45 plugs and sockets are most commonly used as connectors for Ethernet cable (UTP)
- Also known as 8P8C (8 position 8 Contact)
- Eight equally spaced conductors
- Terminated using a crimp tool

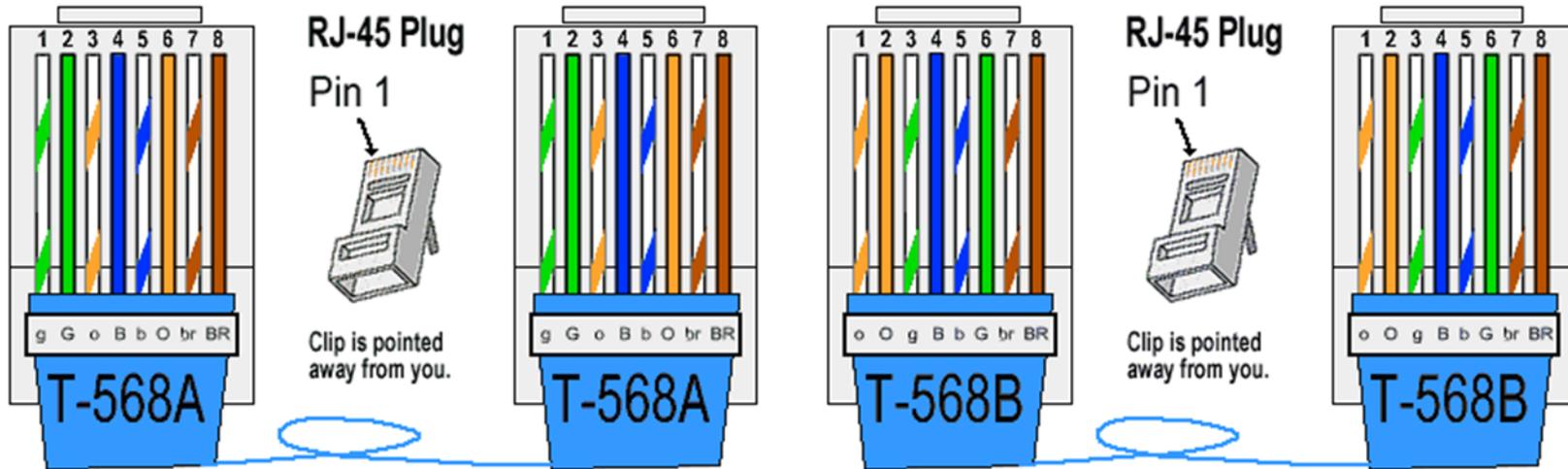


RJ45 WIRING STANDARDS

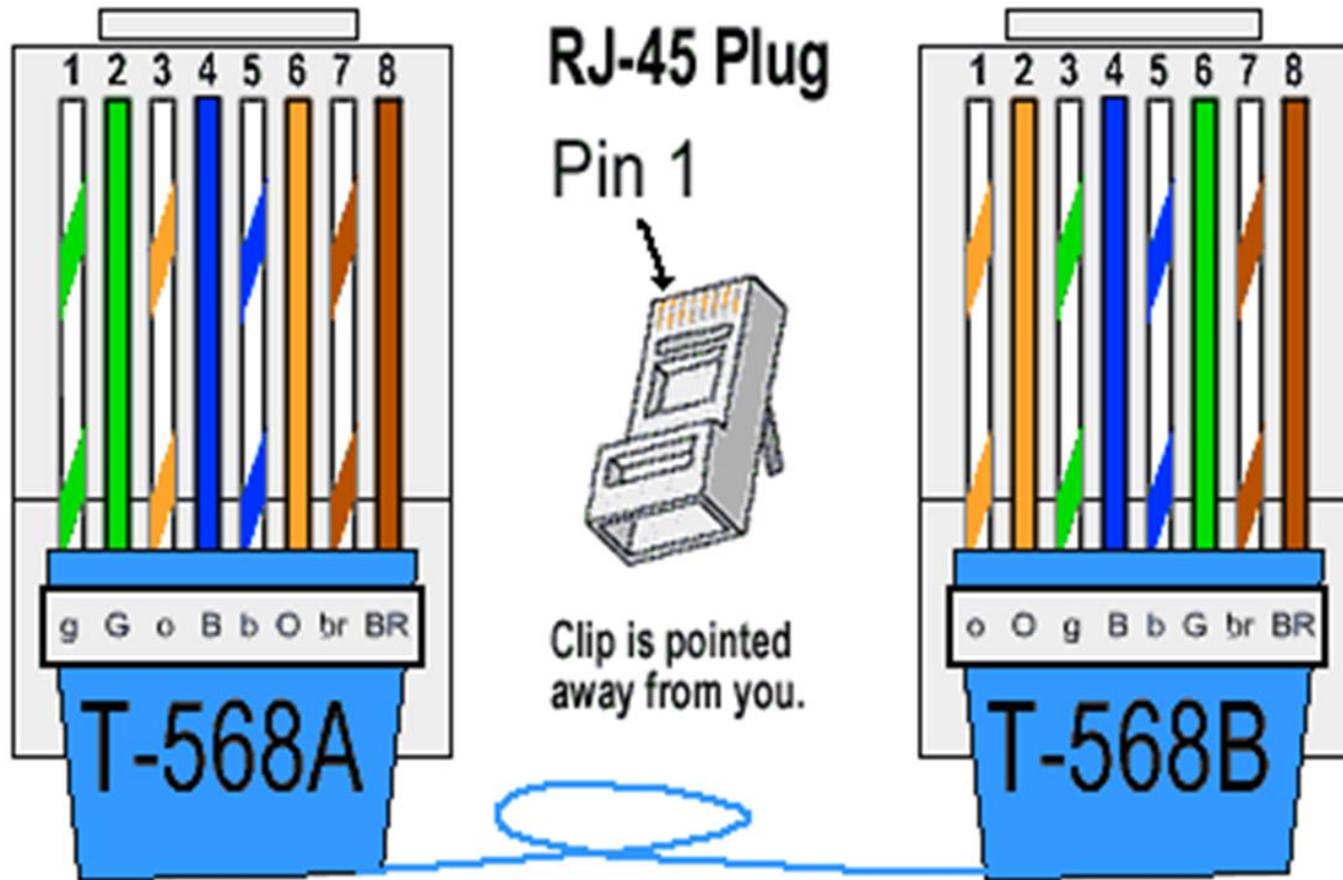
- T568A
- T568B
- STRAIGHT THROUGH
- CROSSOVER
- ROLLOVER
- LOOPBACK

T568A / T568B

T568B is more common



CROSSOVER



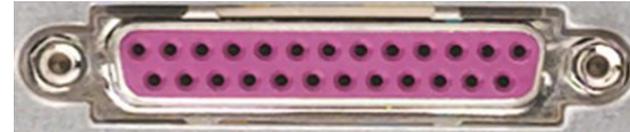
TYPES OF CABLE

Other types of communications cables include:

- **RS232** - old standard commonly used on serial computer ports
- **USB** - Up to 127 devices currently USB 3
- **FIREWIRE** - Developed by Apple
- **THUNDERBOLT** - Intel standard for connecting hardware, v1 & 2 use same connector as mini display port, v3 Uses USB C
- **eSATA** - Standard for external storage but rare to find

PARALLEL PORTS

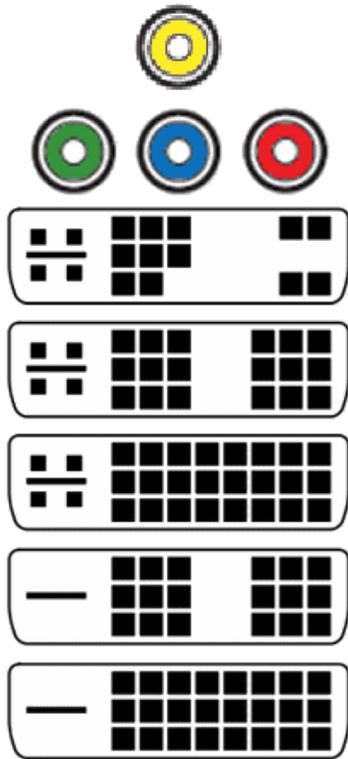
- Printer/Centronics port
- Modes
- Standard (~150 Kbps)
- 25-pin host connector
- 36-pin device connector
- Cable length
- Standard: 5m (15 feet)
- IEEE1284: 10m (30 feet)



USB PORTS

- Maximum of 127 devices / bus
- 5m (16.5 feet) cable length
- **USB 1.1** 12Mbps 480 Mbit/sec
- **USB 2.0** 480 Mbit/sec
- **USB 3.0** up to 5Gbit/sec
- **USB 3.1** 10 Gbit/sec
- **USB 3.2** 10 Gbit/sec and 20 Gbit/sec

VIDEO CONNECTORS



Composite

Component

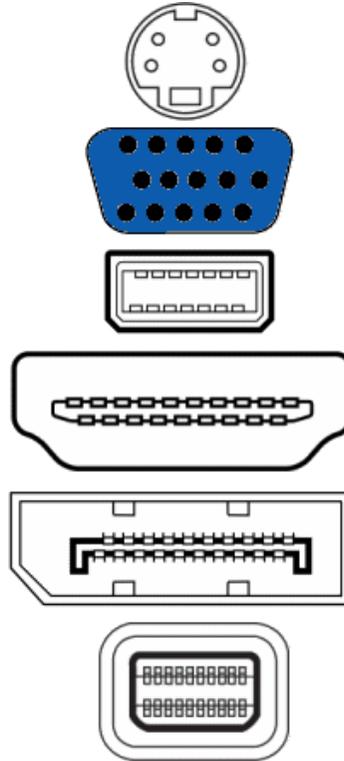
DVI-A

DVI-I Single Link

DVI-I Dual Link

DVI-D Single Link

DVI-D Dual Link



S-Video

VGA

Mini VGA

HDMI

Display Port

Mini DisplayPort

SATA (SERIAL AT ATTACHMENT)

SATA Revision 1.0

SATA 1.5 Gbit/s, 1 meter

SATA Revision 2.0

SATA 3.0 Gbit/s, 1 meter

SATA Revision 3.0

SATA 6.0 Gbit/s, 1 meter

SATA Revision 3.2

SATA 16 Gbit/s, 1 meter



PATA

PATA (Parallel AT Attachment) 1999, was originally called Integrated Drive Electronics (IDE) and very common at one point. Started originally as AT Attachment in 1986. The second generation was called EIDE (Enhanced IDE). It was replaced by SATA from 2003 onwards.

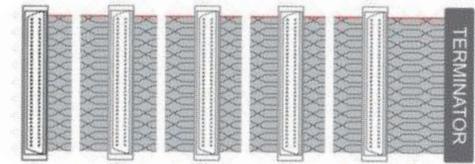


SCSI - SMALL COMPUTER SYSTEM INTERFACE

SCSI is a set of standards of how computers and peripheral devices can connect and transfer data.

Types

Fast SCSI, Ultra SCSI, Ultra Wide SCSI, Ultra2 SCSI, Ultra3 SCSI, Ultra-320 SCSI, Ultra-640 SCSI, iSCSI (SCSI over IP)



ADAPTORS & CONVERTERS

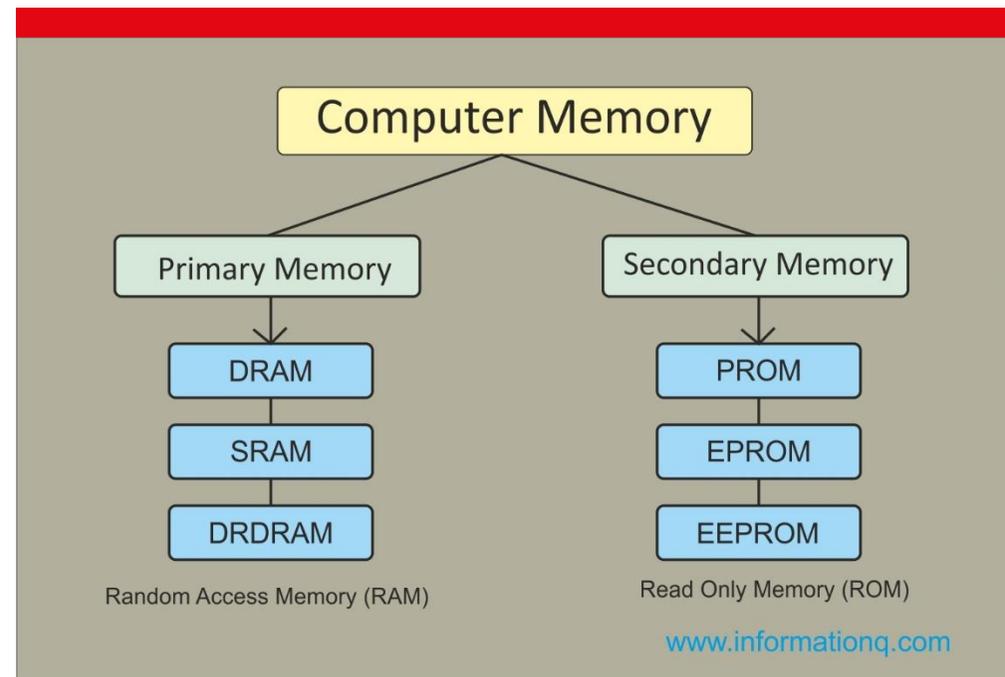
- DVI to HDMI
- Thunderbolt to HDMI
- DVI to VGA
- USB to ethernet



MEMORY

Random Access Memory (RAM) is the most common type of memory. It is Volatile as when the power is turned off all memory contents is lost.

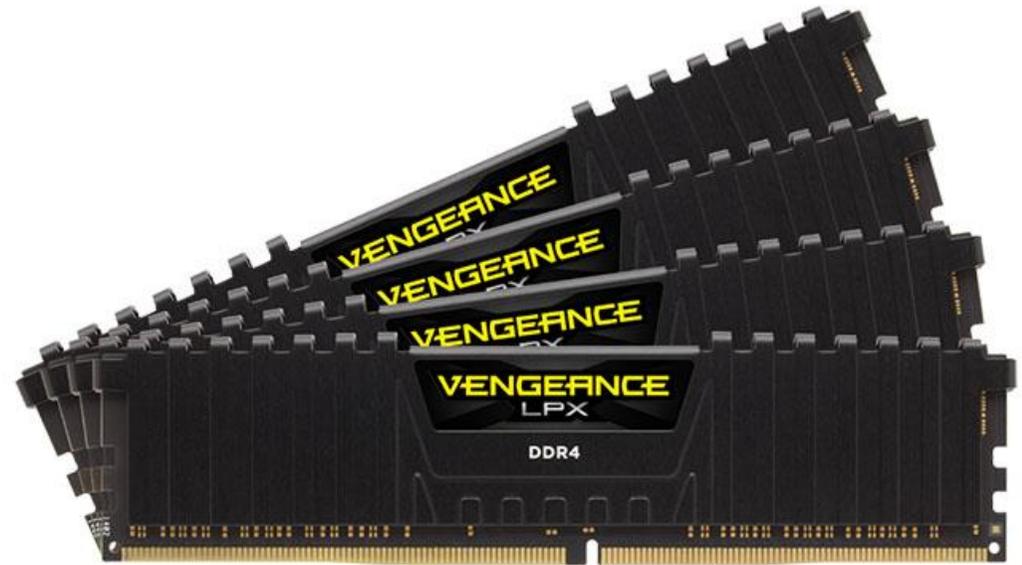
DRAM (Dynamic Random Access Memory) The memory on a DIMM. Dynamic means it requires constant refreshing otherwise the data disappears. Random access means any storage location on the memory module/chip can be accessed directly.



RAM TYPES

Synchronous DRAM (SDRAM), SDRAM is synchronous with the system clock. There are different types which are NOT backwards compatible. Double data means it can read and write in one clock cycle.

- Double Data Rate 2 (DDR2). Twice as fast as DDR.
- Double Data Rate 3 (DDR3) is twice the data rate of DDR2. Maximum 16 GB per DIMM.
- Double Data Rate 4 (DDR4) SDRAM. Speed increases over DDR3. Maximum 64 GB per DIMM.



RAM LAPTOPS

DIMM (Dual Inline Memory Module)

SODIMM (Small Outline DIMM)

STORAGE DEVICES

- Optical Drives DVD, CD
- Magnetic Hard Drives (HDD)
- Removable Storage Devices - USB, SD, external drives
- (Hot Swappable)

OPTICAL STORAGE

Binary storage medium which works by a laser reading small bumps.

- CD-ROM (Compact Disc ROM)
700 megabytes (MB) capacity
- DVD-ROM (Digital Versatile Disc) - 4.7 gigabytes (GB) for single-layer, 8.5 GB for dual-layer
- Blu-ray Disc - 25 GB for single-layer, 50 GB for dual-layer



FLASH / SOLID STATE DRIVES

- SSD
- Thumb Drives
- USB
- SD
- M.2



M.2 INTERFACE

M.2 is a smaller memory module than an SSD and has become more popular due to its size. It does not require cable or power as this is provided via the edge pins on the memory module (like RAM). Can be fitted with another HDD or SSD.

It makes use of PCI Express giving a 4Gbs or faster throughput.



RAID - REDUNDANT ARRAY OF INDEPENDENT DISKS

RAID 0 - Striping

RAID 1 - Mirroring

RAID 5 - Striping with Parity

RAID 10 (1+0) - A stripe of mirrors



MOTHERBOARD FORM FACTORS & POWER

ATX - most used form factor

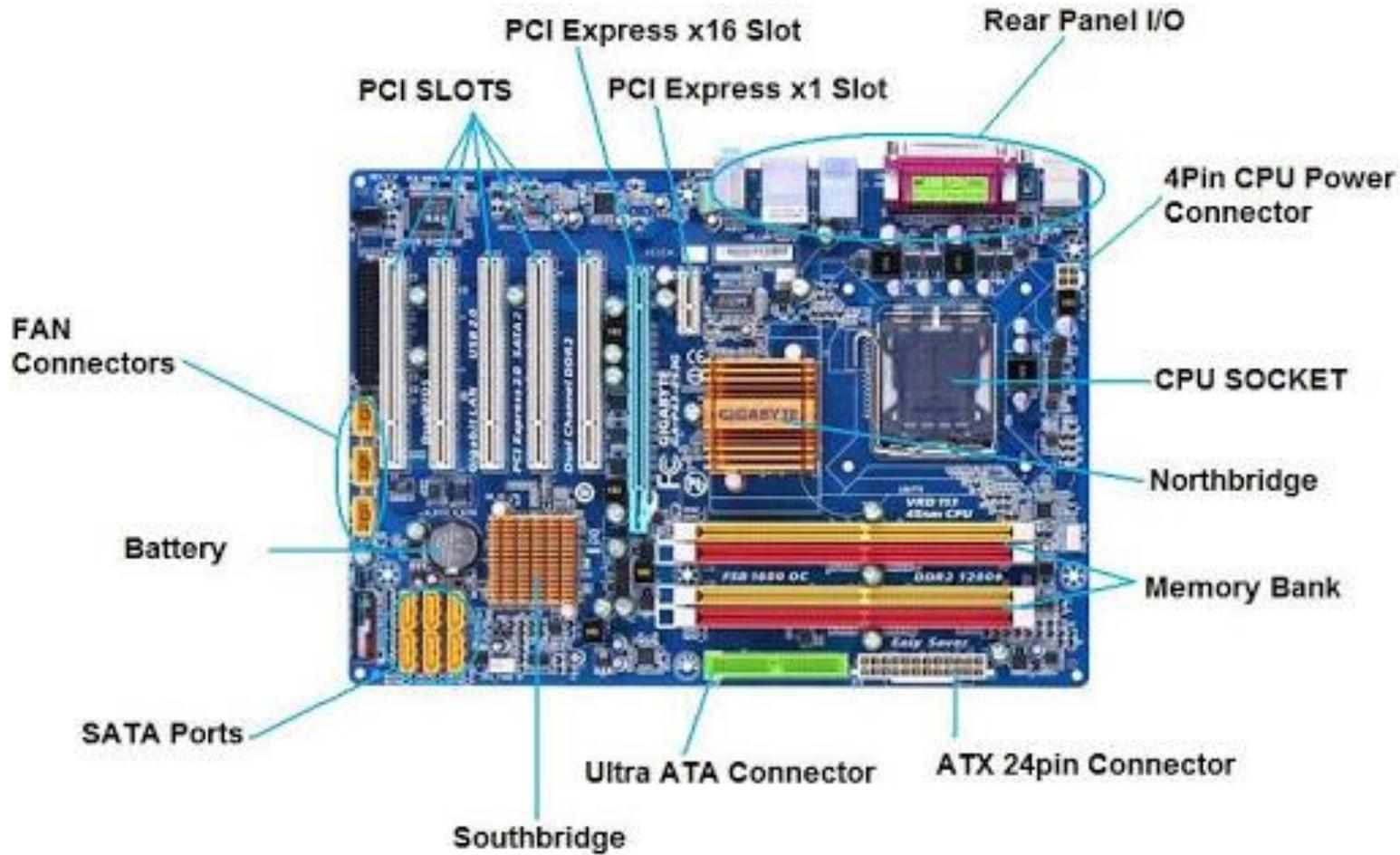
Micro-ATX - smaller footprint

ITX - a range of small form factors for set top boxes, micro PCs

Main motherboard power

- 24-pin motherboard power
- Provides +3.3 V, +/-5 V, and +/-12 V
- ATX was originally a 20 pin connector
- PCI Express required 24 pins

MOTHERBOARD DIAGRAM

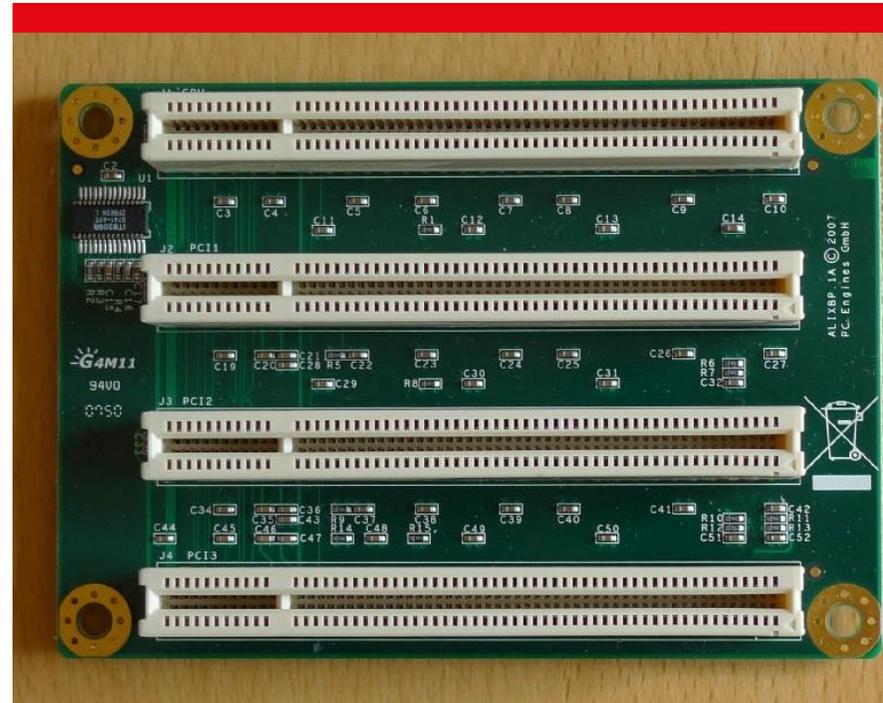


PC EXPANSION SLOTS

PCI (Peripheral Component Interconnect) Introduced by Intel in 1992 originally in a 32 bit version and later 64 bit version. Version 2.0 1993 and version 2.1 1995. Replace largely by PCI Express.

Throughput varies by bus version:

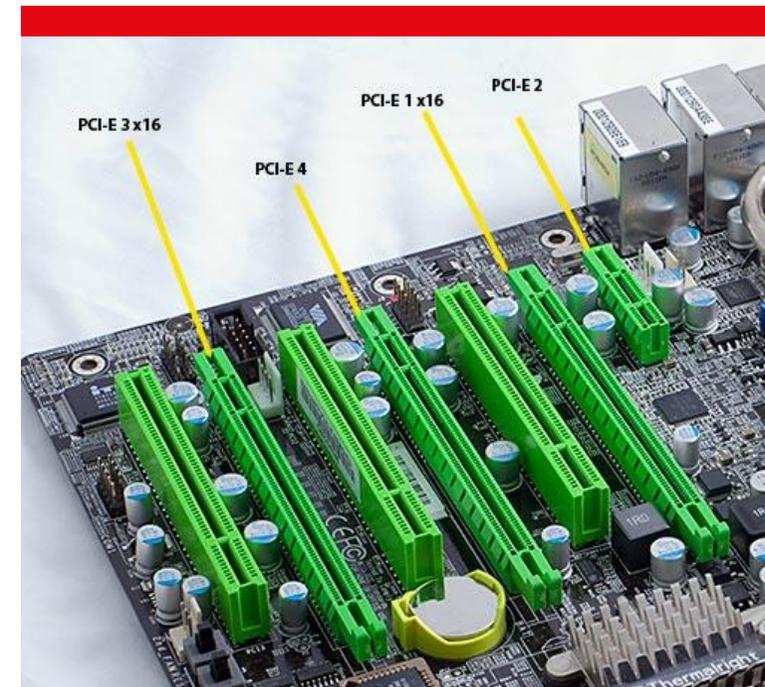
- 133 MB/s (32-bit at 33 MHz)
- 266 MB/s (32-bit at 66 MHz or 64-bit at 33 MHz)
- 533 MB/s (64-bit at 66 MHz)



PCI EXPRESS (PCIE)

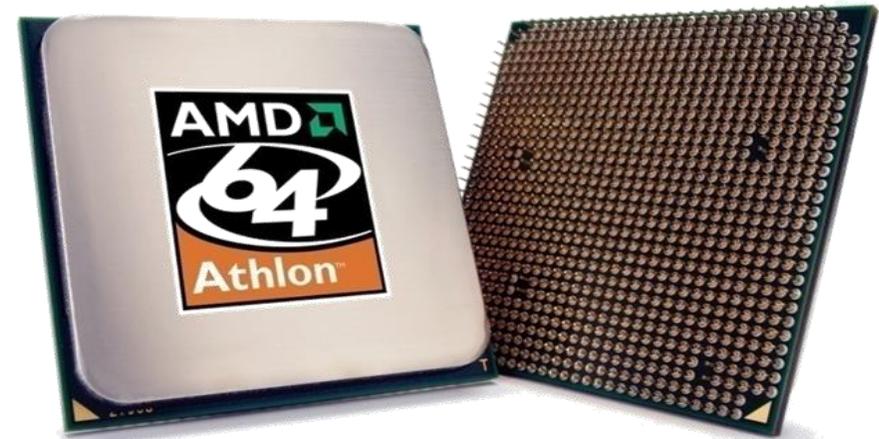
Also known as PCIe, replaced PCI, PCI-X, and AGP (Accelerated Graphics Ports). It was designed for fast serial data transfer and works in a series of lanes. The more lanes the higher the performance. Currently a maximum of 32 lanes which are unidirectional.

- v1.x: 250 MB/s
- v2.x: 500 MB/s
- v3.0: ~ 1 GB/s
- v4.0: ~ 2 GB/s
- v5.0 (expected in 2019): ~ 4 GB/s



CPU SOCKETS - ZIF

Zero Insertion Force used by AMD processors



CPU SOCKETS - LGA

Land Grid Array used by Intel processors



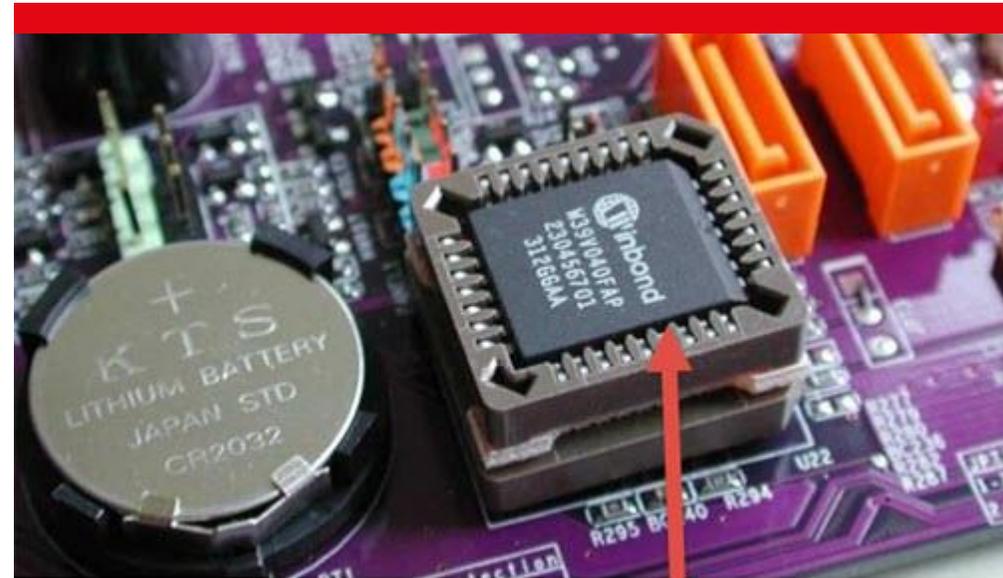
CPU CHARACTERISTICS

- Speed
- Cores
- Cache size/type
- Hyperthreading
- Virtualization support

BIOS

Basic Input Output System is the software used to start a computer. Can be stored on ROM or flash memory.

- POST (Power On Self Test)
- Legacy BIOS for older PCs replaced with UEFI BIOS
- CMOS battery used to maintain date/time
- Reset BIOS via jumper or removing battery



BIOS Chip

UEFI BIOS

Unified Extensible Firmware Interface

- Allows the use of drives greater than 2.2Tb
- Supports FAT and removable media
- Includes a pre-boot environment
- TPM (Trusted Platform, Module)
- Security

Dell Inc Model No.

<p>[+] System System Info Processor Info Memory Info Device Info Battery Health Date/Time Boot Sequence [+] Onboard Devices [+] Video [+] Security [+] Performance [+] Power management [+] Maintenance [+] Post Behaviour [+] Wireless</p>	<p>Boot Sequence</p> <p>This lists the order that the BIOS searches devices when trying to find an operating system. Only devices that are preceded by a number are bootable (the SPACE key controls whether a particular device is bootable).</p> <ol style="list-style-type: none">1. Diskette Drive2. Internal HDD3. USB Storage Device4. CD/DVD/CD-RW Drive Modular Bay HDD Cardbus NIC D/Dock PCI slot NIC Onboard NIC
--	---

Press – to hide the fields in this group.
Press **Up/Down** arrow to select a different field.
Press **Enter** when done modifying this field.

COOLING SYSTEM

Fans
Heat Sink
Thermal Paste
Liquid Cooling
Fanless - Passive



PERIPHERALS

- Printer/Scanner/MFD
- NFC
- Barcode/QR
- Display devices
- VR headset
- Mouse
- Keyboard
- Touchpad
- Gaming input
- Webcam
- Speakers/microphone
- KVM (Keyboard Video Mouse
- Projector



POWER SUPPLY UNIT (PSU)

A PC uses DC voltage to power components. Your wall power sockets are much higher AC voltage. 115v or 220v AC needs converting to 5.5 & 12v dc. Usually connected via Molex connectors to motherboard.

Amp and volt

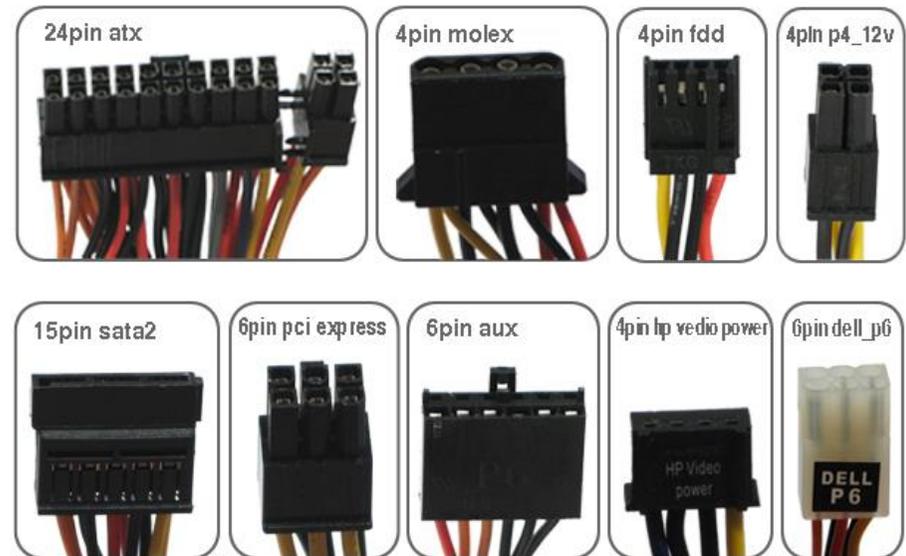
- Ampere (A) is the rate of electron flow past a point in one second
- Voltage (volt, V) is electrical “pressure” pushing the electrons
- Watt (W) is a measurement of real power use

volts x amps = watts

$$120V \times 0.5A = 60W$$



Power Connector



CUSTOM PC - CONFIGURATION

Graphic/CAD/CAM Design Workstation

Multicore CPU (64bit)

High end video cards

Maximum RAM

CUSTOM PC - CONFIGURATION

Video/Audio Editing Workstation

Powerful high end processors for 64 bit software

Maximum RAM

Specialised audio/video card

Large, fast hard drive

Dual monitors

CUSTOM PC - CONFIGURATION

Virtualization Workstation

Maximum CPU Cores

Maximum RAM

CUSTOM PC - CONFIGURATION

Gaming PC

Multicore processor

High-end video with GPUs

Sound card

High end cooling

CUSTOM PC - CONFIGURATION

Network Attached Storage (NAS)
High capacity hard-drives

CUSTOM PC - CONFIGURATION

Thin Client

End point device with minimal resources and applications

Network capable

Thick Client

End point device with sufficient resources and applications installed locally

SOHO

SOHO (Small-office/Home-office)

- Multifunction devices
- Printer/Scanner/Fax
- Network connection
- Phone line connection
- Print from web

INSTALL AND CONFIGURE MULTIFUNCTION/PRINTING DEVICES

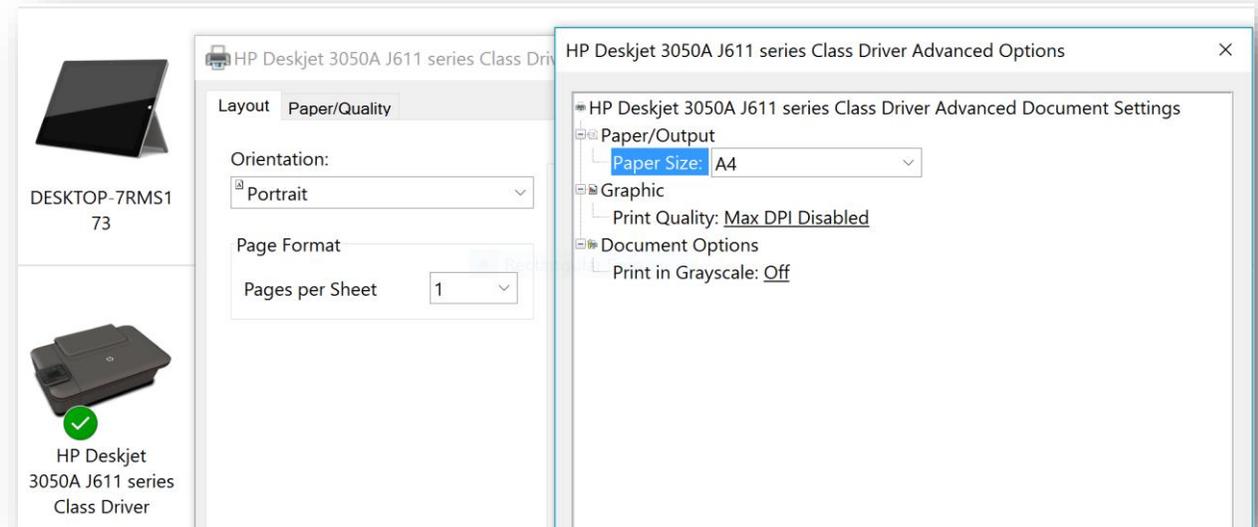
Configurations:

Duplex

Collation

Orientation

Quality

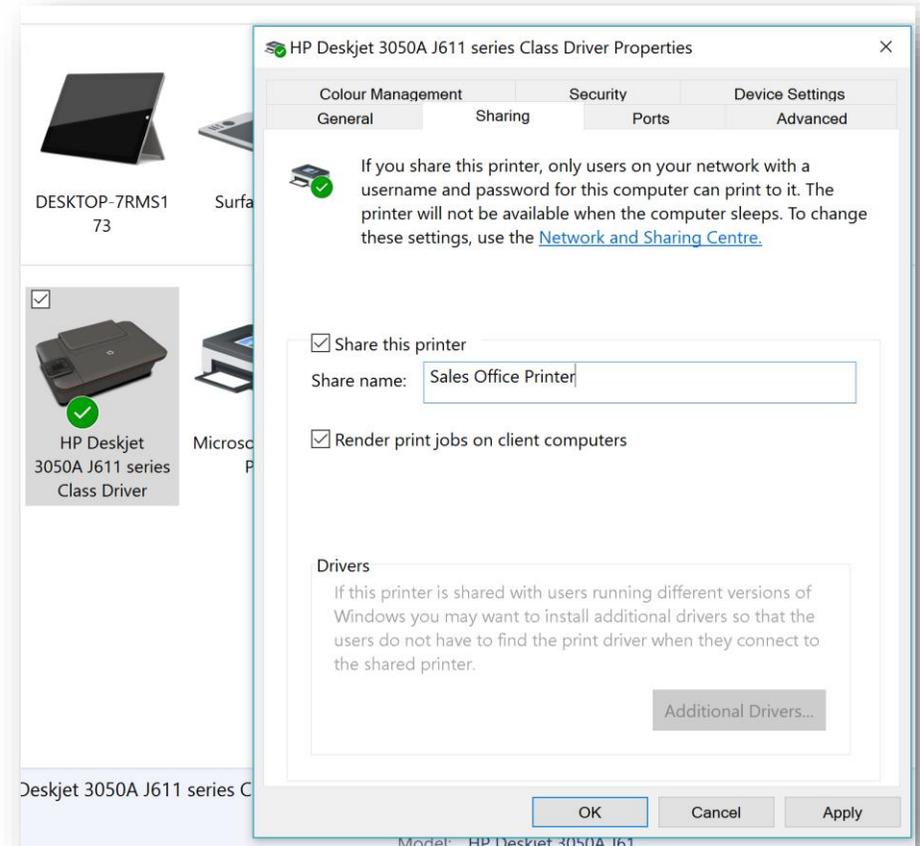


PRINTER CONFIGURATION

Printer Sharing (wired/wireless)

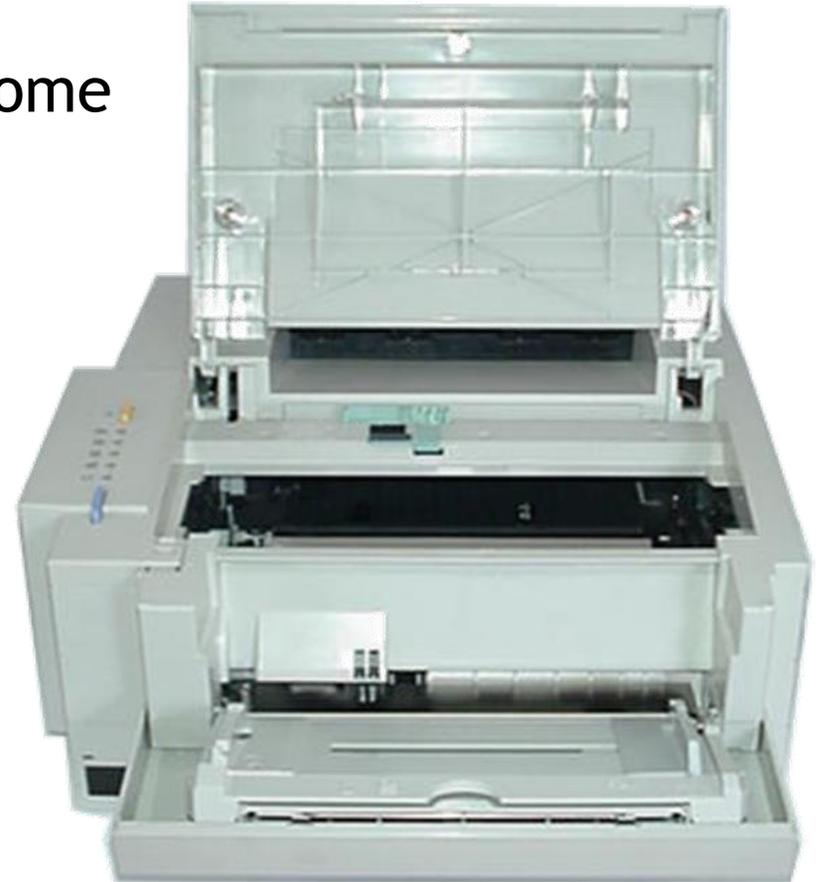
Cloud/Remote printing

Public/Shared devices



LASER PRINTERS

Standard office equipment
Fast, good-quality text and monochrome
Low TCO
Color models more expensive



LASER PRINTER OPERATION

Cleaning stage

- Remove charge and unused toner from the OPC drum

Charging stage

- A negative charge of around -500v
- Conditioning

Writing stage

- Laser selectively removes charge

Development stage

Negatively charged toner is attracted to OPC drum where charge has been removed

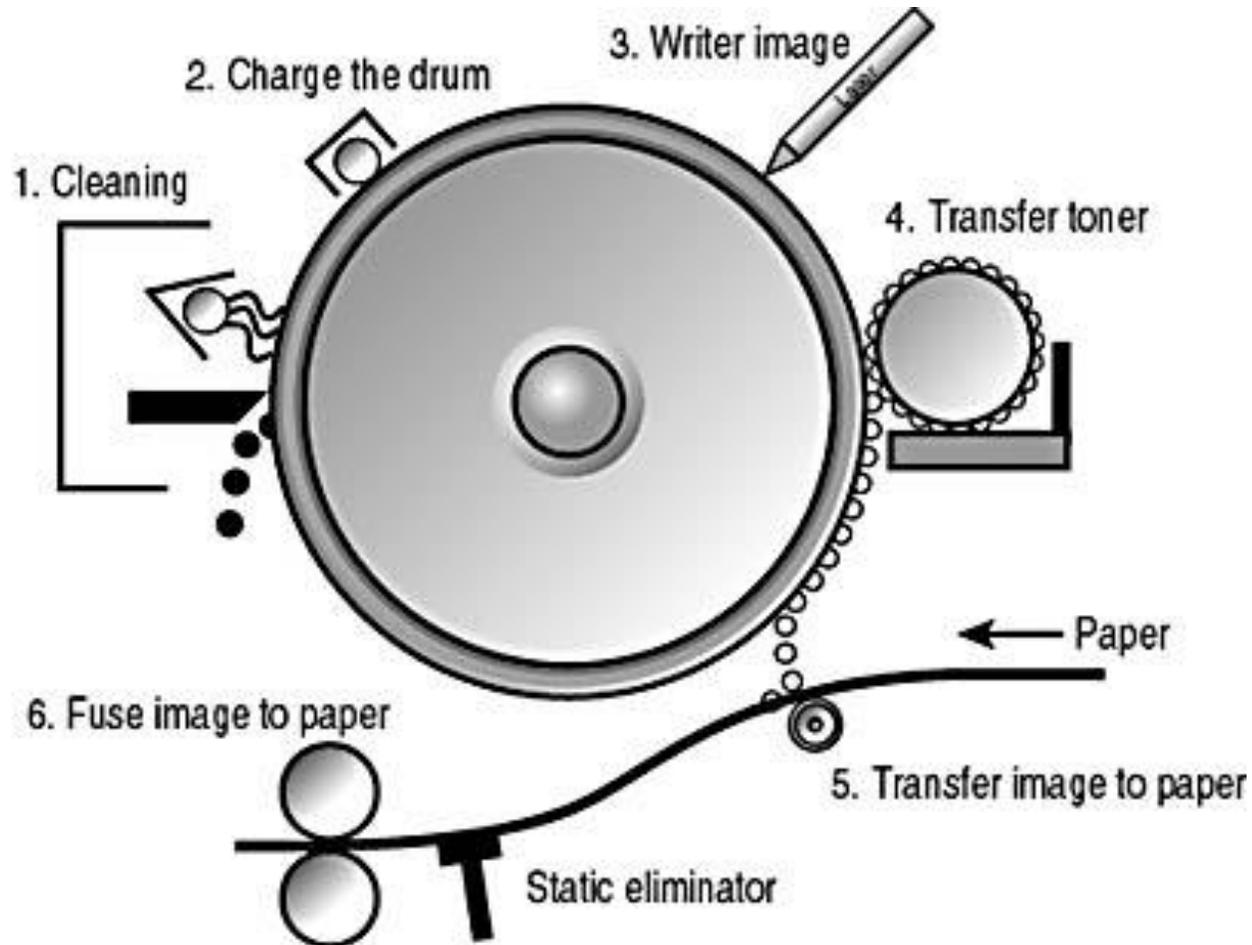
Transfer stage

- Transfer corona applies positive charge to paper
- Positive charge attracts toner from OPC to stick to paper

Fusing stage

- The toner is melted onto the paper using high temperature

LASER PRINTER OPERATION



LASER PRINTER MAINTENANCE

- Disconnect from power
- Components may be very hot so allow to cool first
- Use vendor approved cleaning products
- Vacuum up spills as toner is toxic
- Replace tonner cartridge as required
- Check for packing strips or seal
- Cartridges are often recycled
- Use maintenance kit as directed by usage
- Essential to ensure reliability



TROUBLESHOOTING LASER PROBLEMS

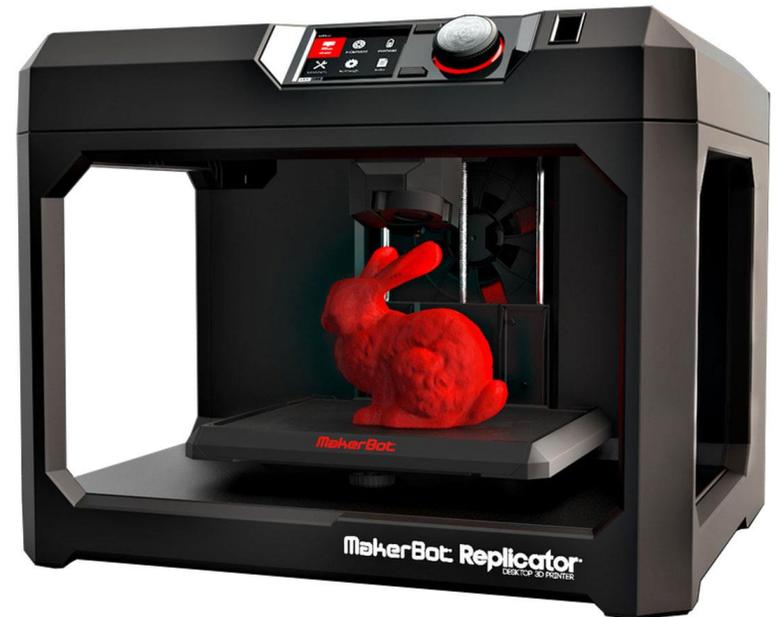
- Print settings (draft mode)
- Low/Out of toner (shake cartridge)
- Toner packing seals not removed
- Transfer corona damaged - replace
- Software problem
- Paper jam
- Check media
- Check rollers
- Static Eliminator Strip
- Printout smudges - fusing unit

3D PRINTER

Print in three dimensions to create a 3D item based on an electronic model/plan. A whole house was recently 3D printed!

One layer is printed at a time building up the 3D image layer by layer. Enables anything to be designed on the computer and prototyped.

Still an evolving technology with wide potential uses as it becomes more sophisticated and cheaper.



INKJET PRINTER OPERATION

Ink from reservoir is directed through tiny nozzles in print head and heated which causes a thermal shock to expand the ink. Piezoelectric uses charge to pump ink onto the paper.

Paper quality will effect the quality of the printout to prevent it looking blurred or smudged.



TROUBLESHOOTING INKJET PROBLEMS

Correct paper loaded correctly, high quality paper used

Gaps, marks or faded printout - clean print head

Check ink both black and/or colour - any warnings ink is low?

Is printer in draft mode?

Ensure correct printer driver has been installed and is working

Lights or display messages on the printer

OTHER PRINTERS

Dot matrix is an Impact printer using a ribbon like an old typewriter. Pins are fired into the printer ribbon which creates the dotted look on the printout. The more pins the higher the quality. The paper was often tractor fed and was very noisy during the printing process.



Thermal transfer is often used to create bar codes or labels and can have one or two colours.



PRINTING

Print Device
Printer
Printer Driver
Spool



PRINTER INTERFACES

USB / Firewire

Wireless

- IrDA
- Bluetooth
- Wi-Fi

Network

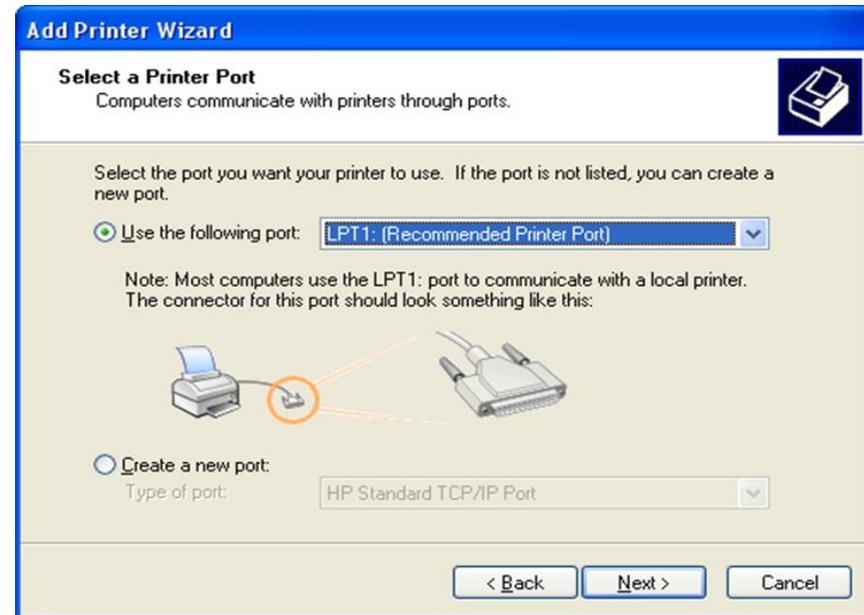
Legacy

- Parallel
- SCSI



CONFIGURING A PRINTER

- Pools
- Priorities
- Schedules
- Security



VIRTUAL PRINTING

- Print to File
- Print to PDF
- Print to XPS
- Print to Image

TROUBLESHOOTING

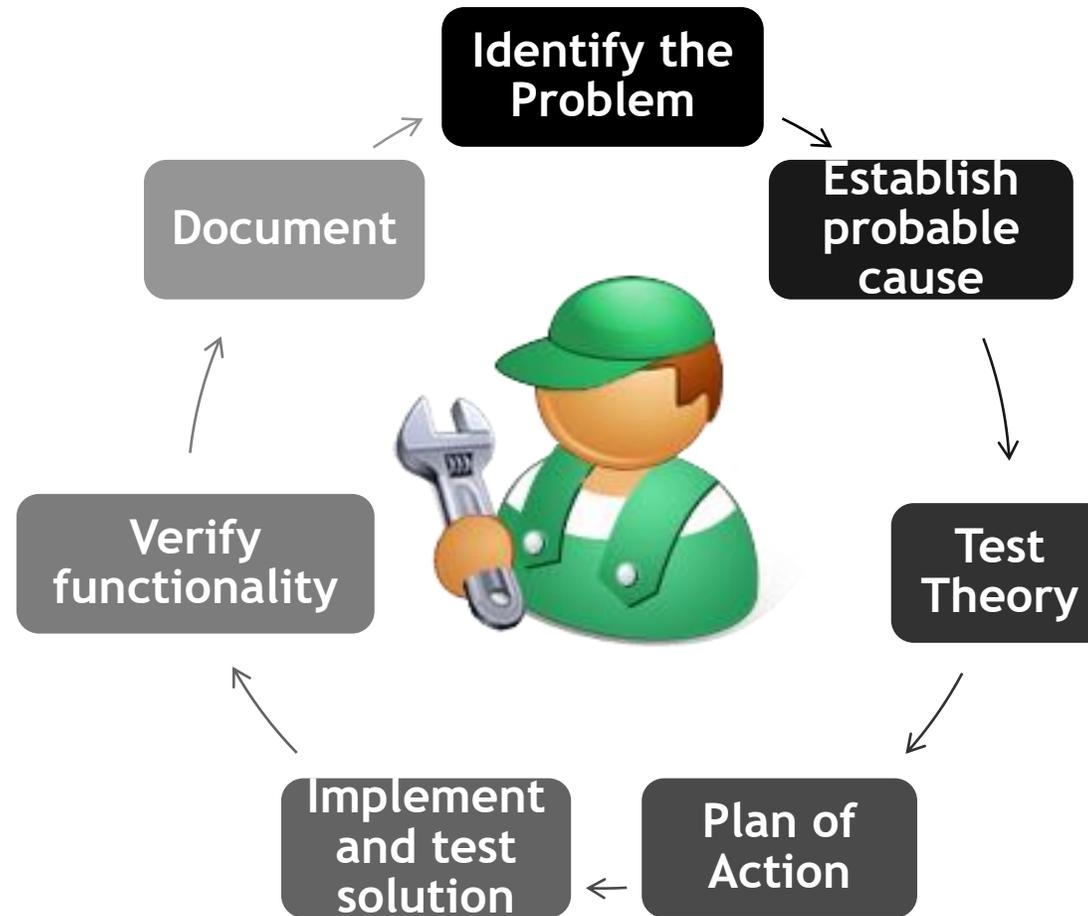
A+ CORE 1 1001

13/03/2019

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BASICS OF TROUBLESHOOTING



COMPTIA TROUBLESHOOTING

- Identify the problem (Questions)
- Establish a Theory of Probably Cause (Question the obvious)
- Test the Theory to Determine Cause
- Establish a Plan of Action to Resolve the Problem and Implement the Solution
- Verify Full System Functionality (and implement preventative measures if needed)
- Document Finds, Actions and Outcomes

SHUTDOWNS

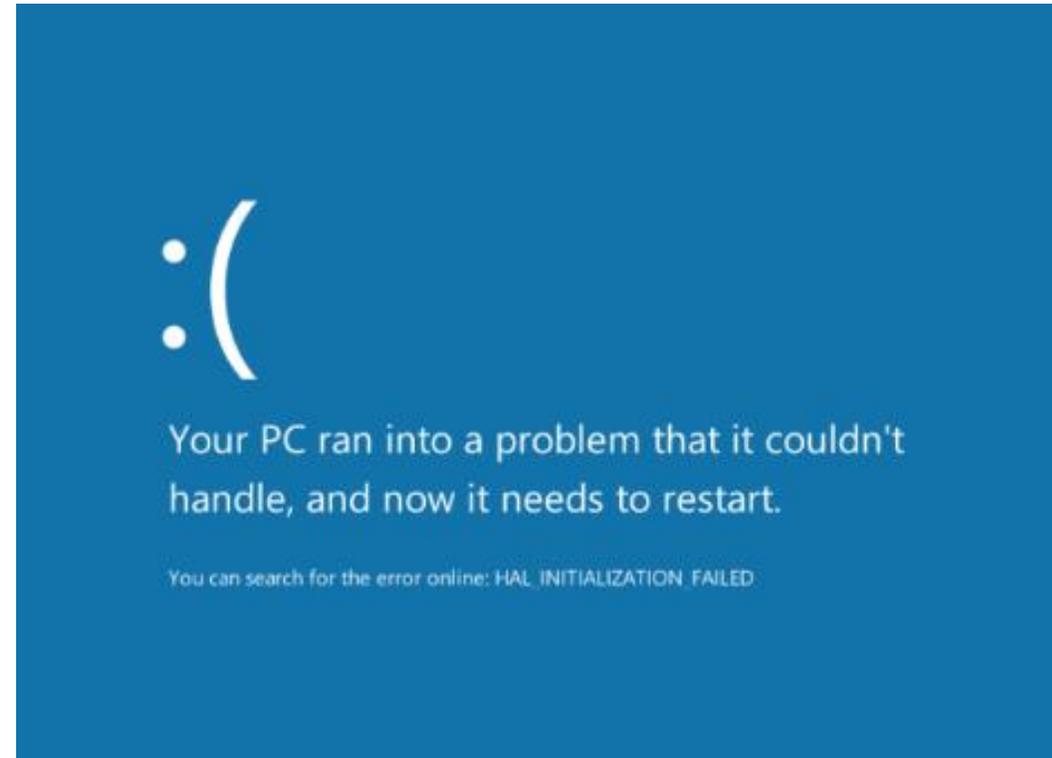
- System shuts down without warning and may even restart
- Heat or power related issue is the most common
- High CPU usage - more heat generated
- Check all fans and heat sinks - clean, thermal paste, contact
- BIOS may show fan status and temperatures
- Failing hardware
- Check Device Manager, run diagnostics
- Eliminate what's working - roll back any changes made prior to fault occurring
- Power issues - faulty power supply or cable.
- Check BIOS settings - factory reset
- Any POST beeps when the system boots?

LOCKUPS

- System completely stops/freezes.
- Ask the user what they were doing when it occurred?
- Check for any activity - any system response?
- Hard drive, status lights, power lights try using Ctrl-Alt-Del to get into Task Manager
- Shut down and restart system - does fault disappear after restarting the system?
- Update drivers and software patches to latest versions
- Low system resources - CPU, RAM, storage
- Burning smell or smoke from the system - turn off immediately, electrical issue or short circuit.

WINDOWS

- Blues Screen of Death (BSOD)
- Unexpected Shutdowns
- System Lockups
- POST code Beeps - refer to vendor
- BIOS Time/Settings Resets
- No Power
- Event Viewer
- Boot logs
- System Configuration
- Windows bootlog



APPLE MAC

Pinwheel of Death (PWOD)

- Application crash or misconfiguration
- Faulty hardware
- Disk access slow
- Application issue
- First try restarting the computer



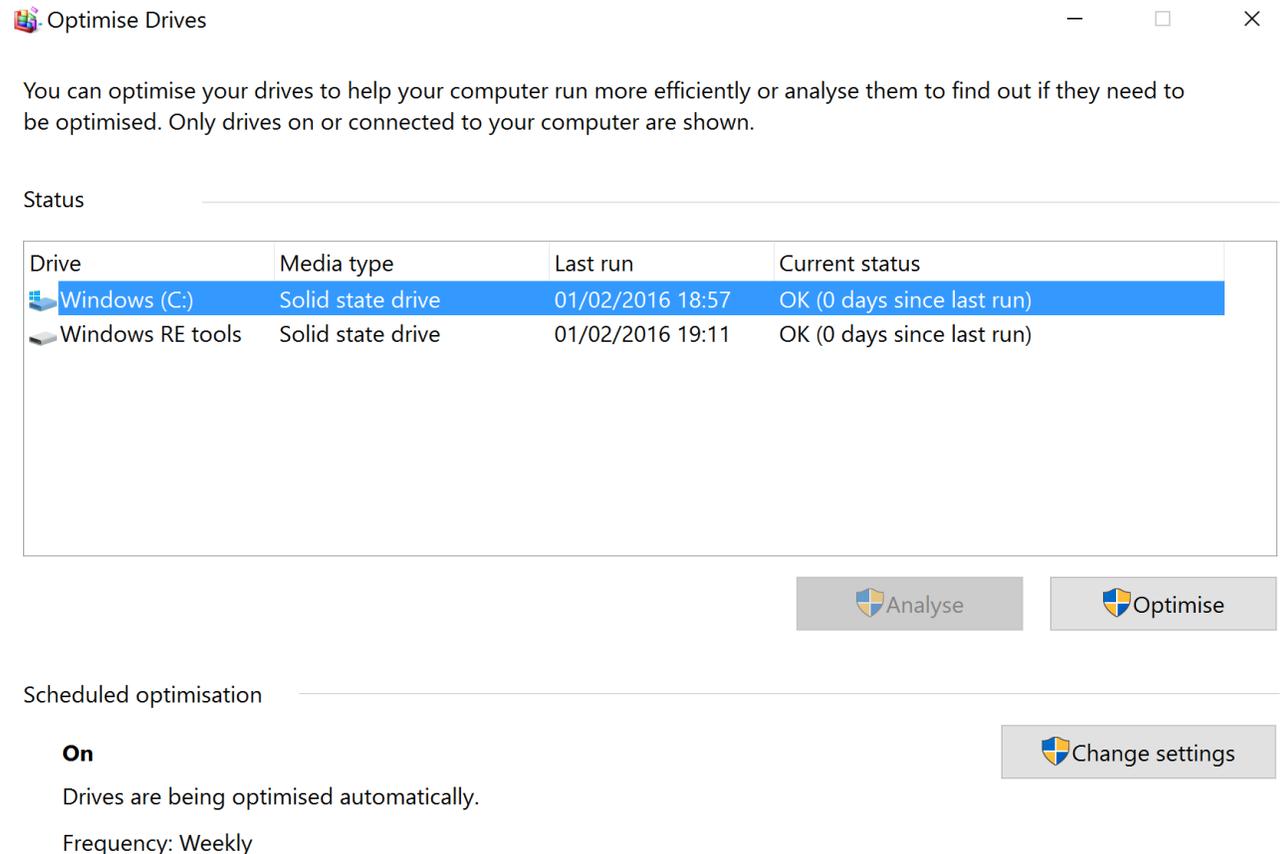
TROUBLESHOOT - HDD/SSD/RAID

- Read/Write Failures
- Slow Performance
- Clicking Noise/strange noise
- Computer fails to load/boot
- Drive not recognised in BIOS or OS
- RAID not found - backplane, RAID battery



TROUBLESHOOTING TOOLS

- Screwdriver
- CHKDSK
- Format
- BOOTREC
- DISKPART
- DEFRAG



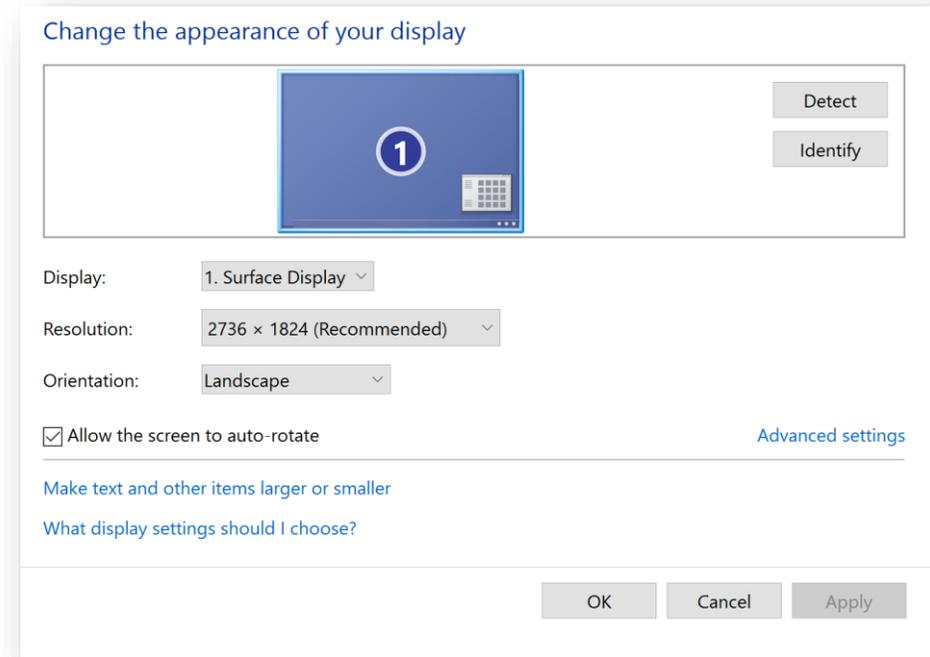
The screenshot shows the 'Optimise Drives' window in Windows. It contains a table with the following data:

Drive	Media type	Last run	Current status
Windows (C:)	Solid state drive	01/02/2016 18:57	OK (0 days since last run)
Windows RE tools	Solid state drive	01/02/2016 19:11	OK (0 days since last run)

Below the table are two buttons: 'Analyse' and 'Optimise'. At the bottom, there is a 'Scheduled optimisation' section with a toggle set to 'On' and a 'Change settings' button. The text below the toggle reads: 'Drives are being optimised automatically. Frequency: Weekly'.

TROUBLESHOOT - VIDEO, PROJECT & DISPLAY

- Video Card issues - no image
- Resolution
- No Image
- Dead Pixels/Artifacts
- Dim Image/Flickering Image
- Distortion
- Burn in



MOBILE DEVICES

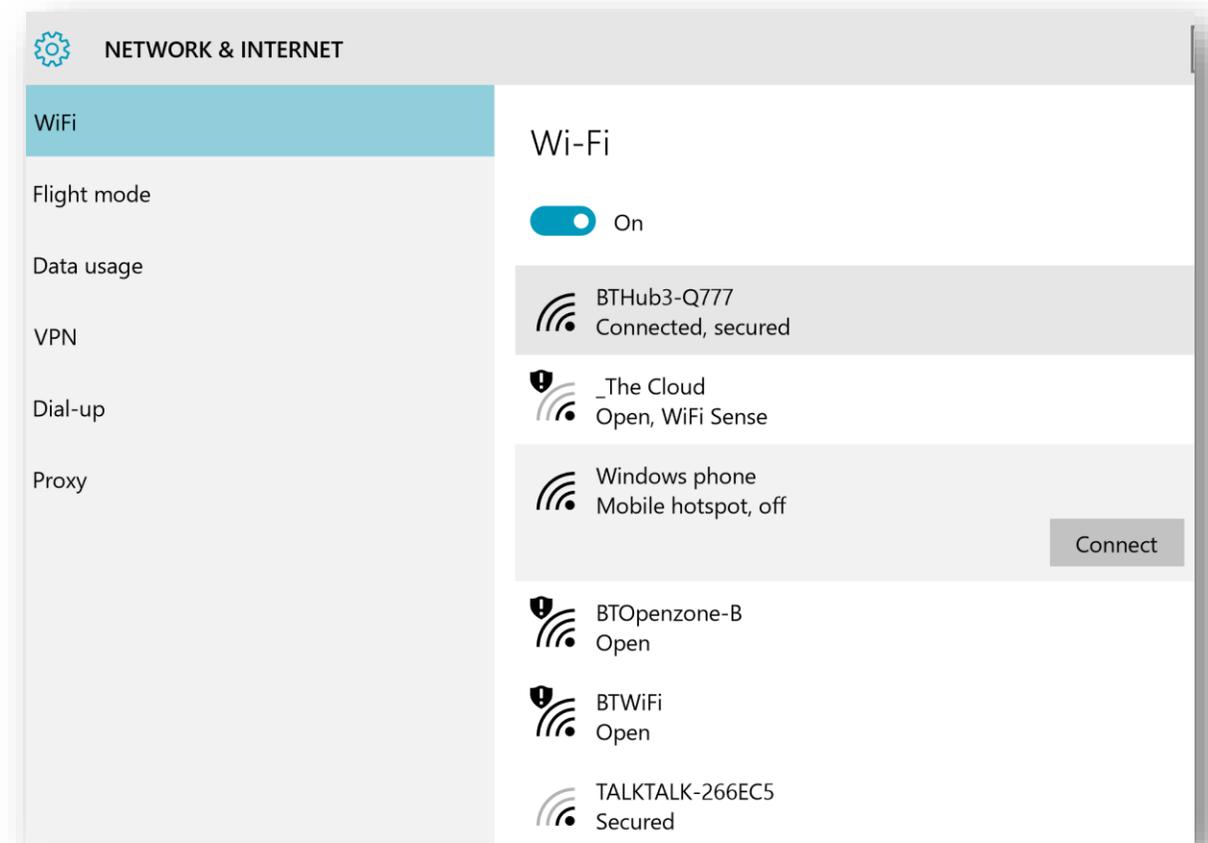
- Mobile runs slowly or crashes/unresponsive
- Non-responsive touchscreen
- Screen is black, oddly coloured lines or graphics
- Android especially can have different ‘flavours’ which means different key combinations
- Me phones cannot be reset using key combination - refer to mobile phone manufacturer FAQ
- Try resetting the phone using the recommended process
- Check apps are updated and latest OS is installed and up to date

MOBILE DEVICES

- Unable to decrypt email - encrypted email PGP/SMIME - mainly corporate systems
- Use a Mobile Device Manager (MDM) if a corporate devices to aid in 'push' updates
- Bad reception always searching for signal - is the signal strong or weak
- Battery life short - how old is the battery? What apps are running? Is device hot?
- Disable unnecessary features - wireless, Bluetooth, data
- Check application battery use by looking in phone settings
- If a device gets too hot it can cause unreparable damage.
- Keep device cool and out of direct sunlight or other heat sources

TROUBLESHOOT - NETWORKS

- No Connectivity
- APIPA
- Limited Connectivity
- IP Issues
- Speed
- Wi-fi issues



TROUBLESHOOTING TOOLS

- Cable Tester
- Loopback Plug
- Punch-Down Tool
- Tone Generator & Probe
- Wire Strippers / Crimper
- Wireless Locator



COMMAND LINE TOOLS

PING

IPCONFIG / IFCONFIG

TRACERT

NETSTAT

NBTSTAT

NET

NSLOOKUP

```
Command Prompt
C:\Users\phil>TRACERT WWW.GOOGLE.COM

Tracing route to WWW.GOOGLE.COM [173.194.40.148]
over a maximum of 30 hops:

  0  0 ms  0 ms  0 ms  192.168.1.1
  1  8 ms  2 ms  2 ms  BTBusinessHub.home [192.168.1.254]
  2  21 ms 18 ms 17 ms  217.32.143.225
  3  22 ms 15 ms 19 ms  217.32.143.254
  4  24 ms 19 ms 19 ms  213.120.181.214
  5  24 ms 22 ms 19 ms  217.41.169.69
  6  24 ms 17 ms 18 ms  213.120.179.81
  7  47 ms 30 ms 18 ms  acc1-10GigE-9-2-0.sf.21cn-ipp.bt.net [109.159.251.93]
  8  40 ms 23 ms 25 ms  core1-te0-0-0-6.ealing.ukcore.bt.net [109.159.251.29]
  9  30 ms 25 ms 25 ms  peer5-te0-9-0-10.telehouse.ukcore.bt.net [109.159.252.33]
 10 30 ms 26 ms 25 ms  109.159.253.67
 11 125 ms 304 ms 610 ms  209.85.244.182
 12 29 ms 25 ms 24 ms  209.85.143.67
 13 40 ms 39 ms 35 ms  216.239.43.65
 14 36 ms 42 ms 30 ms  209.85.248.30
 15 36 ms 33 ms 32 ms  209.85.243.47
 16 37 ms 32 ms 32 ms  par10s10-in-f20.1e100.net [173.194.40.148]

Trace complete.

C:\Users\phil>
```

DISASSEMBLING/REASSEMBLING

- Use the correct tools
- Take photos - before and during
- YouTube video?
- Organize parts in labelled bags or pots
- Refer to manufacturer resources



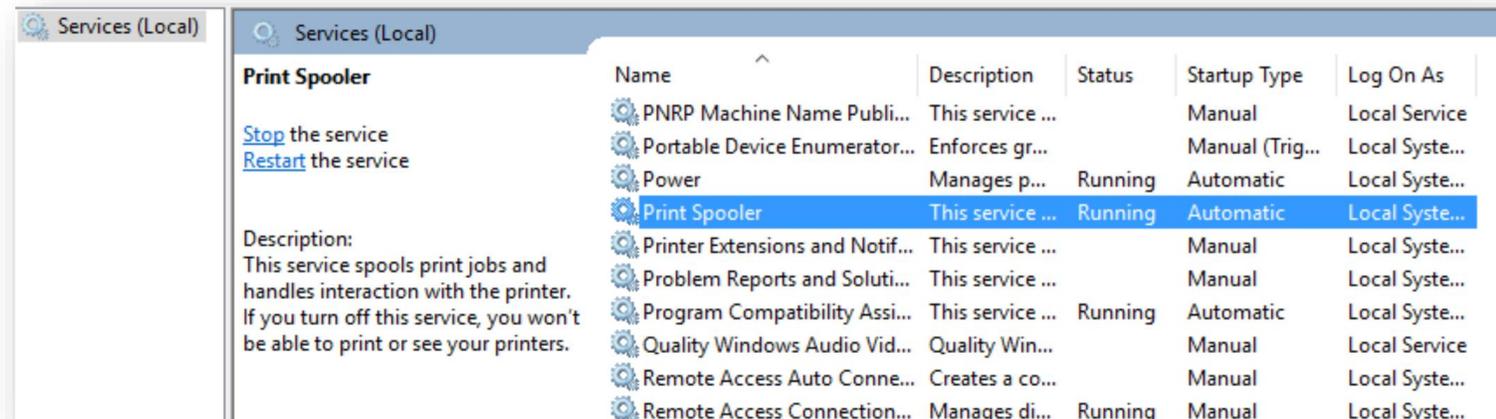
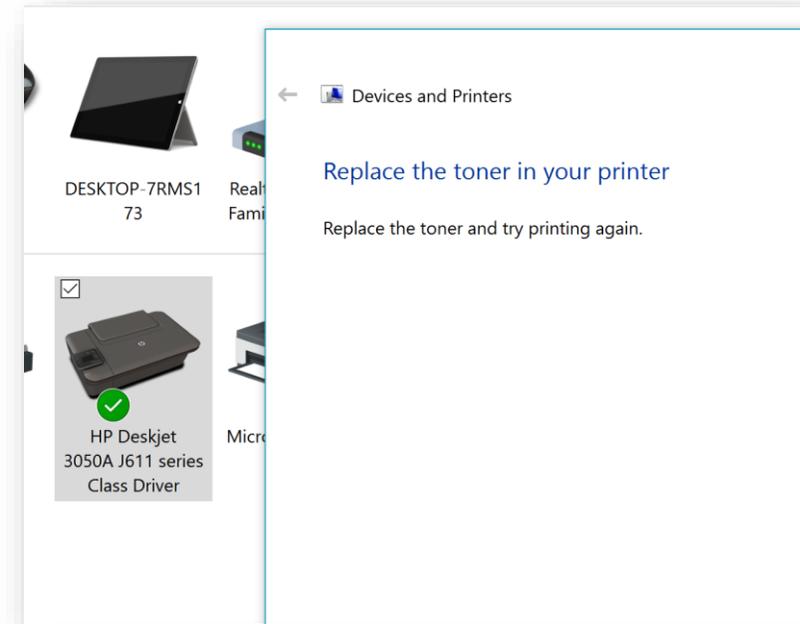
TROUBLESHOOT - PRINTERS

- Streaks
- Fading
- Ghost Images
- Paper Jam
- Connectivity issues
- Access issues
- Printer Driver issues



TROUBLESHOOTING PRINTERS

- Maintenance Kits
- Toner Vacuum
- Compressed Air
- Spooler Service



MODULE 5: OPERATING SYSTEMS

A+ CORE 2

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Exam 220-1002
Max 90 questions
(Multiple choice & performance based)
90 minutes duration
Pass mark 700/900

1002 CORE 2

CompTIA A+ 220-1002 covers installing and configuring operating systems including Windows, iOS, Android, Apple OS X and Linux. It also addresses security, the fundamentals of cloud computing, operational procedures and basic scripting.

EXAM BREAKDOWN

Domain	Percentage of Exam
1.0 Operating Systems	27%
2.0 Security	24%
3.0 Software troubleshooting	26%
4.0 Operational Procedures	23%

OPERATING SYSTEMS

Standard OS features

- File management - folders files - add, delete, rename, move
- Software support
- Memory and disk management
- Input and Output support - Printers, keyboards, hard drives, display, sound
- USB, Firewire, Lighting, Thunderbolt
- Operating system configuration and management tools.
- 32 and 64 bit versions
- Hardware driver specific to the OS and device
- Touchscreen support
- Keyboards/mouse/pen/stylus
- Security?

32 BIT V 64 BIT

The terms 32-bit and 64-bit refer to the way a computer's processor (also called a CPU), handles information. The 64-bit version of Windows handles large amounts of random access memory (RAM) more effectively than a 32-bit system. 32 bit system can only handle a maximum of 4gb of RAM.

Memory Type	Limit on x86	Limit on x64
Physical Memory	4GB 64 GB with PAE	1 TB
Kernel Virtual Address	2 GB 1 GB with 4GT (/3GB)	8 TB
User Mode Process	2 GB 3 GB with 4GT (/3GB)	2 GB for 32-bit processes 4 GB for 32-bit processes with LARGE_ADDRESS_AWARE 8 TB for 64-bit processes
Paged Pool	550 MB	128 GB
Non-paged Pool	256 MB 128 MB with 4GT (/3GB)	75% of RAM up to 128 GB
System Cache	860 MB	1 TB
Page Table Entries	~250,000 ~40,000 with 4GT (/3GB)	>33,000,000

WINDOWS 7

Windows 7 was released October 22, 2009 and was built on the look and feel of Vista. It was able to run on the same hardware as Vista. It had many updated user areas such as the task bar and came in Starter, Home Premium, Ultimate, Professional and Enterprise

Minimum Spec:

- 1 gigahertz (GHz) or faster
- 1 gigabyte (GB) RAM (32-bit) or 2 GB RAM (64-bit)
- 16 GB available hard disk space (32-bit) or 20 GB (64-bit)
- DirectX 9 graphics device with WDDM 1.0 or higher driver

WINDOWS 8 & 8.1/8.2

Windows 8 was released on 26 October, 2012 but Did not have the ‘Windows’ Button which caused user issues and frustration.

Windows 8.1/8.2 saw further updates and was released 17 October, 2013.

Windows 8.2 added ‘Windows’ button. Windows 8 came in Core, Pro and Enterprise versions.

Minimum Spec:

PAE (Physical Address Extension)

32-bit processors can use more than 4 GB of physical memory

NX (NX Processor Bit) to protect against malicious software

A standard processor instruction set used by third-party applications and drivers

WINDOWS 10

Windows 10 is the current version of Windows and was released on 29 July, 2015. It was designed as a single OS to support - Desktops, laptops, tablets, phones, all-in-one devices. Offered initially as a free upgrade some systems and some systems can still upgrade for free. Windows 10 is stated to be the last 'version' with large and small updates during each year. Comes as Windows 10 Home, Pro Education, Enterprise and S for Secure.

Minimum Spec:

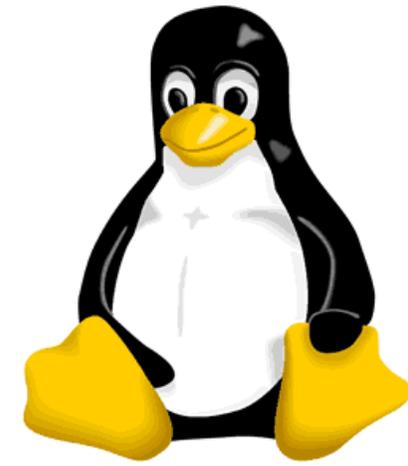
- Same requirements as Windows 8/8.1/8.2
- PAE (Physical Address Extension) - 32-bit processors can use more than 4 GB of physical memory
- NX (NX Processor Bit) to protect against malicious software

LINUX

Linux is a free Unix-compatible software system in many flavours or distributions like Ubuntu, Debian, Red Hat/Fedora. It is Unix-like, but not Unix.

Works on a wide variety of hardware and has a large and active community supporting it.

However, has limited driver support and limited support



Linux



MAC OS

Desktop/Laptop OS running on Apple hardware

Is an easy to use and secure OS with 100% comparability with Apple hardware and software.

Apple tends to be more expensive and has a smaller audience and less industry support compared to Windows.



MacTM OS

ANDROID

Google Android an open handset alliance Open-source OS, based on Linux. Supported on many different manufacturer's devices and third party creators of Android Apps. The Apps are actually developed on Windows, Mac OS X, and Linux with the Android SDK. Apps available from Google Play



ANDROID

CHROME OS

- Google's operating system
- Based on the Linux kernel like Android
- Chrome web browser
- Applications are web-based
- Many different manufacturers - relatively less expensive
Relies on the cloud so an internet connection is necessary.

WINDOWS OPERATING SYSTEMS

- Windows 7
- Windows 8, 8.1 & 8.2
- Windows 10



KEY FEATURES

- System Restore
- Event Viewer
- Control Panel
- Windows Explorer
- Edge
- Metro UI
- OneDrive
- Windows Store
- Charms
- Start Screen



UPGRADES

Ensure that minimum hardware specs are met.

Ensure OS is the correct architecture for the system (32/64bit).

Compatibility with existing software including drivers and applications. Use upgrade advisor to check. You can use the built in Windows compatibility mode to run older software.



INSTALLATION METHODS

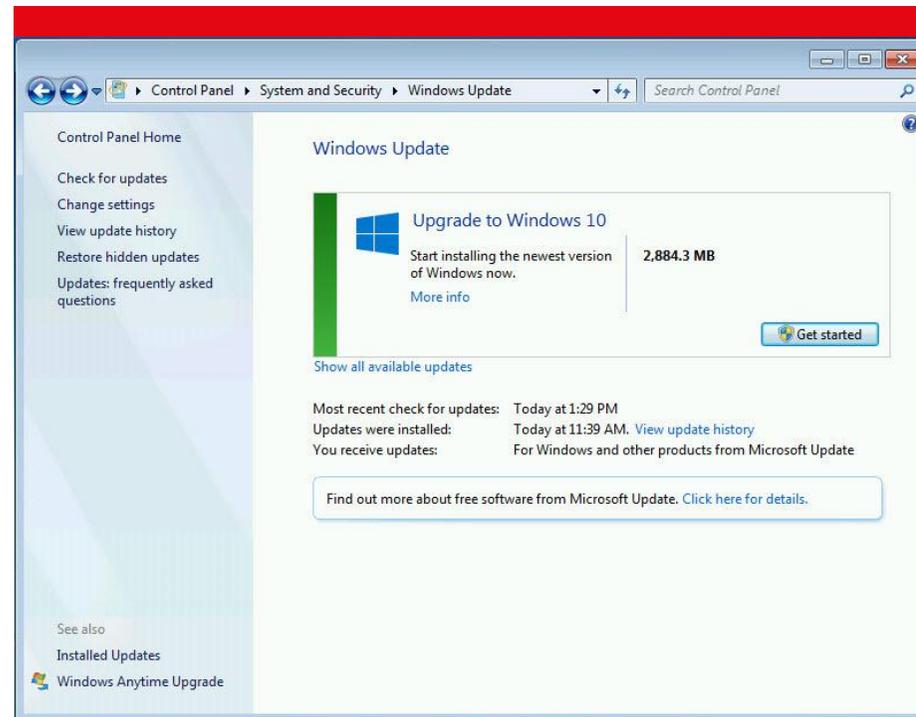
- Optical Drive (DVD)
- USB
- PXE (Preboot Execution Environment)
- Windows Deployment Services (WDS)

TYPES OF INSTALLATION

- Bootable Media
- Unattended Installation
- Sysprep/Imaging
- Remote Install

TYPES OF INSTALLATION

- Upgrade
- Clean Install
- Repair Installation
- Multiboot or Dualboot
- Remote Network Installation
- Refresh/Restore/Reset (Windows 8/8.1/10)



OTHER INSTALLATION CONSIDERATIONS

- Formatting - file formats NTFS, FAT32, ExFAT, CDFS, NFS
- Third Party Drivers
- Time/Date/Regional Settings
- Quick Format - deletes FAT
- Full format - formats entire drive so takes much longer

DRIVE PARTITIONING

Dynamic - It is a separate form of volume management that allows one volume to have non-contiguous extents on one or more physical disks.

Basic - Basic disk uses partitions to manage data, and one partition cannot share and split data with other partitions

Primary - Contains one file system

Extended - Only one extended but can be divided multiple logical

Logical - Virtualized - each partition can have a separate operating system on it

GPT - GUID Partition Table newer system

WINDOWS COMMAND LINE UTILITIES

TASKKILL

BOOTREC

SHUTDOWN

MD/RD/CD

FORMAT

COPY/XCOPY/ROBOCOPY

DISKPART

GPUPDATE

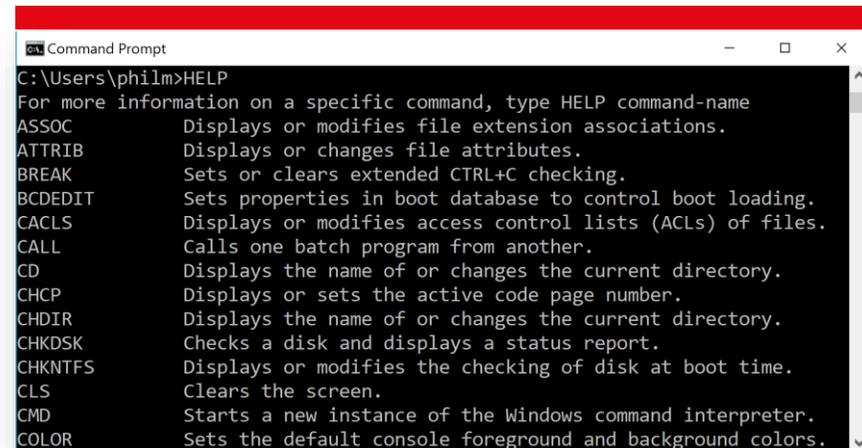
DIR

EXIT

HELP

SFC

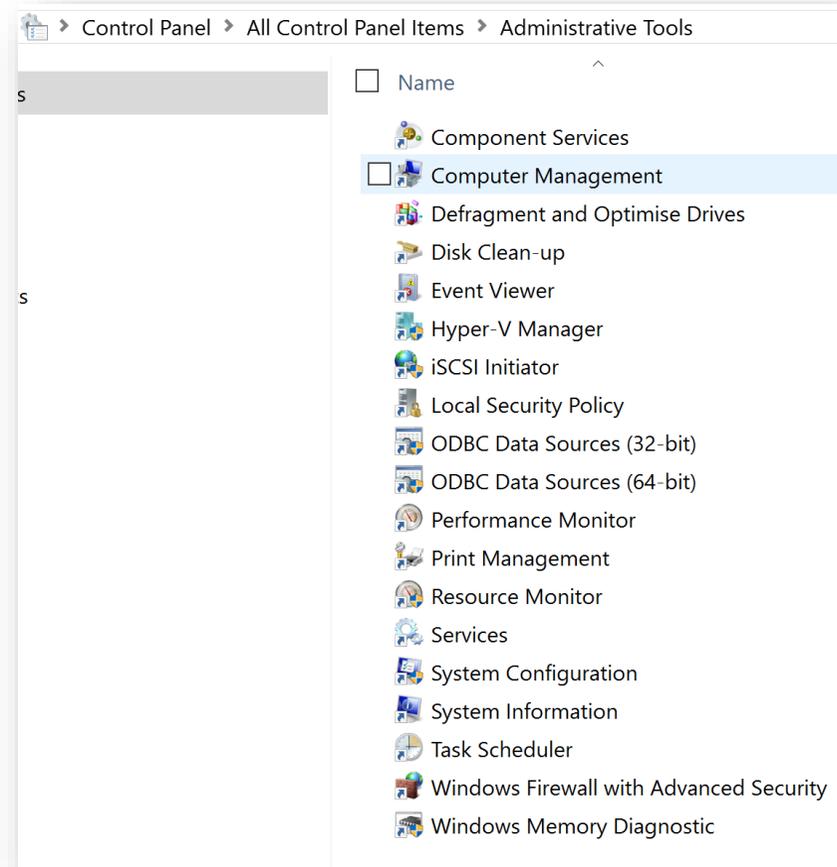
CHKDSK



```
Command Prompt
C:\Users\phil>HELP
For more information on a specific command, type HELP command-name
ASSOC      Displays or modifies file extension associations.
ATTRIB     Displays or changes file attributes.
BREAK      Sets or clears extended CTRL+C checking.
BCDEDIT    Sets properties in boot database to control boot loading.
CACLS      Displays or modifies access control lists (ACLs) of files.
CALL       Calls one batch program from another.
CD         Displays the name of or changes the current directory.
CHCP       Displays or sets the active code page number.
CHDIR      Displays the name of or changes the current directory.
CHKDSK     Checks a disk and displays a status report.
CHKNTFS    Displays or modifies the checking of disk at boot time.
CLS        Clears the screen.
CMD        Starts a new instance of the Windows command interpreter.
COLOR      Sets the default console foreground and background colors.
```

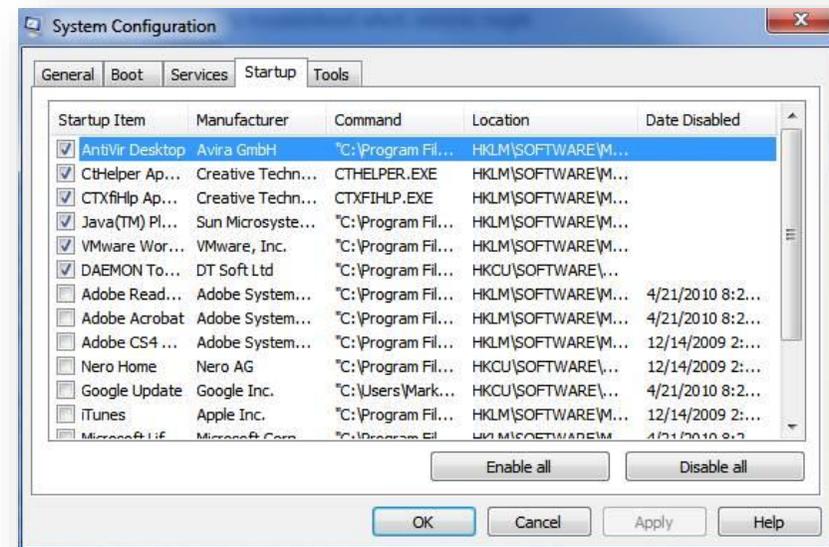
ADMINISTRATIVE TOOLS

- Computer Management
- Device Manager
- Users and Groups
- Local Security Policy
- Performance Monitor
- Services
- System Configuration
- Task Scheduler



MSCONFIG

MSconfig is a Windows start-up utility used to disable or re-enable software, device drivers and Windows services that run at start-up, or change boot parameters



TASK MANAGER

Task Manager

File Options View

Processes Performance App history Start-up Users Details Services

6% CPU 89% Memory 3% Disk 0% Network

Name

Apps (6)

- Adobe Digital Editions 4.5 (32 bit) 0.1% CPU, 24.4 MB Memory, 0 MB/s Disk, 0 Mbps Network
- Internet Explorer (2) 0% CPU, 13.2 MB Memory, 0 MB/s Disk, 0 Mbps Network
- Microsoft PowerPoint (32 bit) 0% CPU, 28.9 MB Memory, 0 MB/s Disk, 0 Mbps Network
- Settings 0% CPU, 0.1 MB Memory, 0 MB/s Disk, 0 Mbps Network
- Task Manager 0.7% CPU, 10.7 MB Memory, 0 MB/s Disk, 0 Mbps Network
- Windows Explorer (3) 1.7% CPU, 40.7 MB Memory, 0.1 MB/s Disk, 0 Mbps Network

Background processes (34)

- Adobe Acrobat Update Service ... 0% CPU, 0.1 MB Memory, 0 MB/s Disk, 0 Mbps Network
- Adobe® Flash® Player Utility 0% CPU, 0.5 MB Memory, 0 MB/s Disk, 0 Mbps Network
- Application Frame Host 0% CPU, 0.7 MB Memory, 0 MB/s Disk, 0 Mbps Network
- Bonjour Service 0% CPU, 0.7 MB Memory, 0 MB/s Disk, 0 Mbps Network
- Cortana 0% CPU, 0.1 MB Memory, 0 MB/s Disk, 0 Mbps Network
- Dropbox (32 bit) 0% CPU, 2.3 MB Memory, 0 MB/s Disk, 0 Mbps Network

Windows Task Manager

File Options View Help

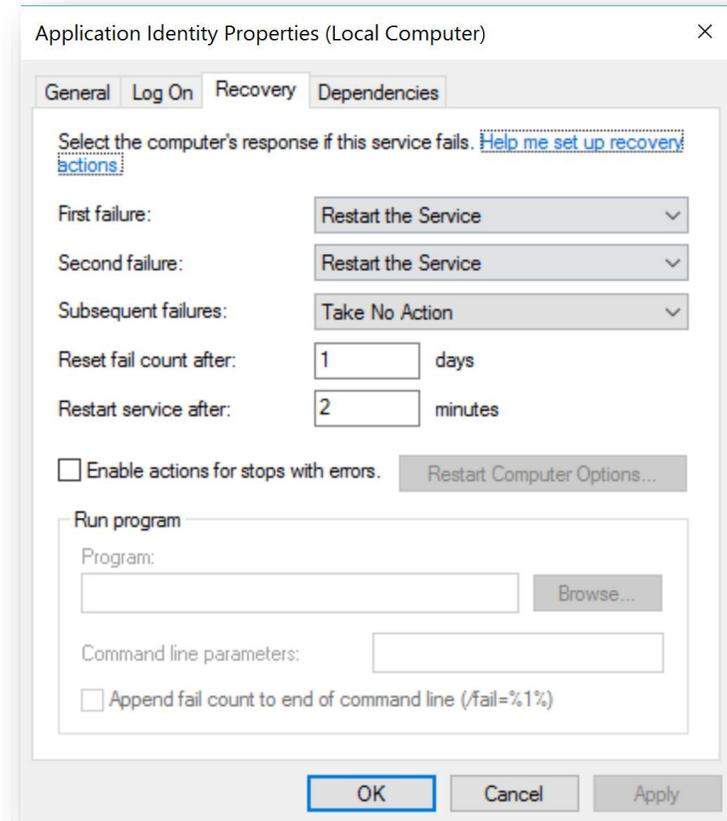
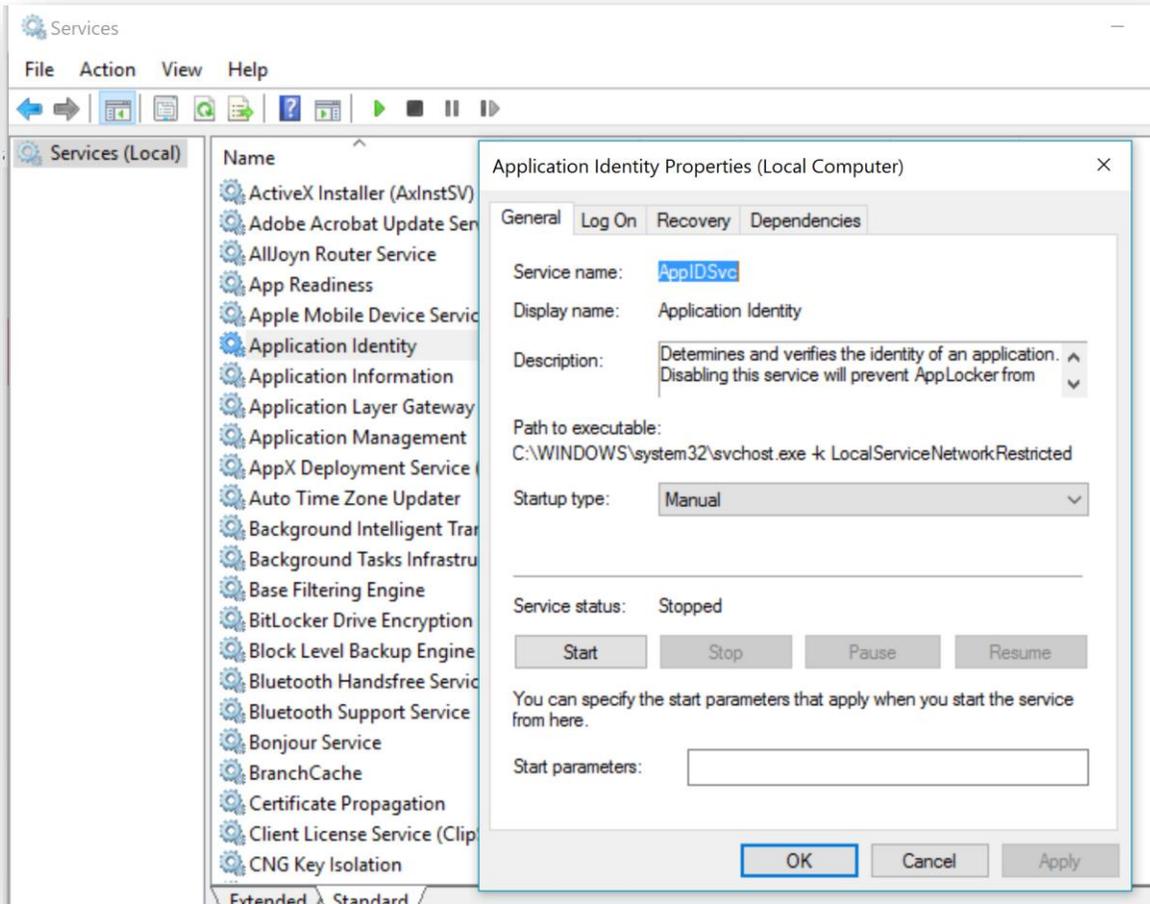
Applications Processes Services Performance Networking Users

Image Name	PID	User Name	CPU	Memory
Action.exe *32	1660	geek	00	6,09
Adobelm_Cleanup.0001 *32	5756	geek	00	1,86
Adobelm_Cleanup.0001 *32	6672	geek	00	1,87
AutoHotkey.exe *32	4120	geek	00	2,66
cmd.exe	5964	geek	00	96
Converter.exe *32	5996	geek	00	12,20
Core Temp.exe *32	2724	geek	00	1,38
csrss.exe	4604		00	3,77
dllhost.exe *32	5576	geek	00	9,24
dpupdchk.exe	4612	geek	00	1,84
dwm.exe	4284	geek	00	106,77
explorer.exe	2780	geek	00	98,92
firefox.exe *32	2420	geek	00	196,57
FolderShare.exe *32	800	geek	00	3,74

Show processes from all users End Process

Processes: 100 CPU Usage: 2% Physical Memory: 56%

SERVICES



DISK MANAGER

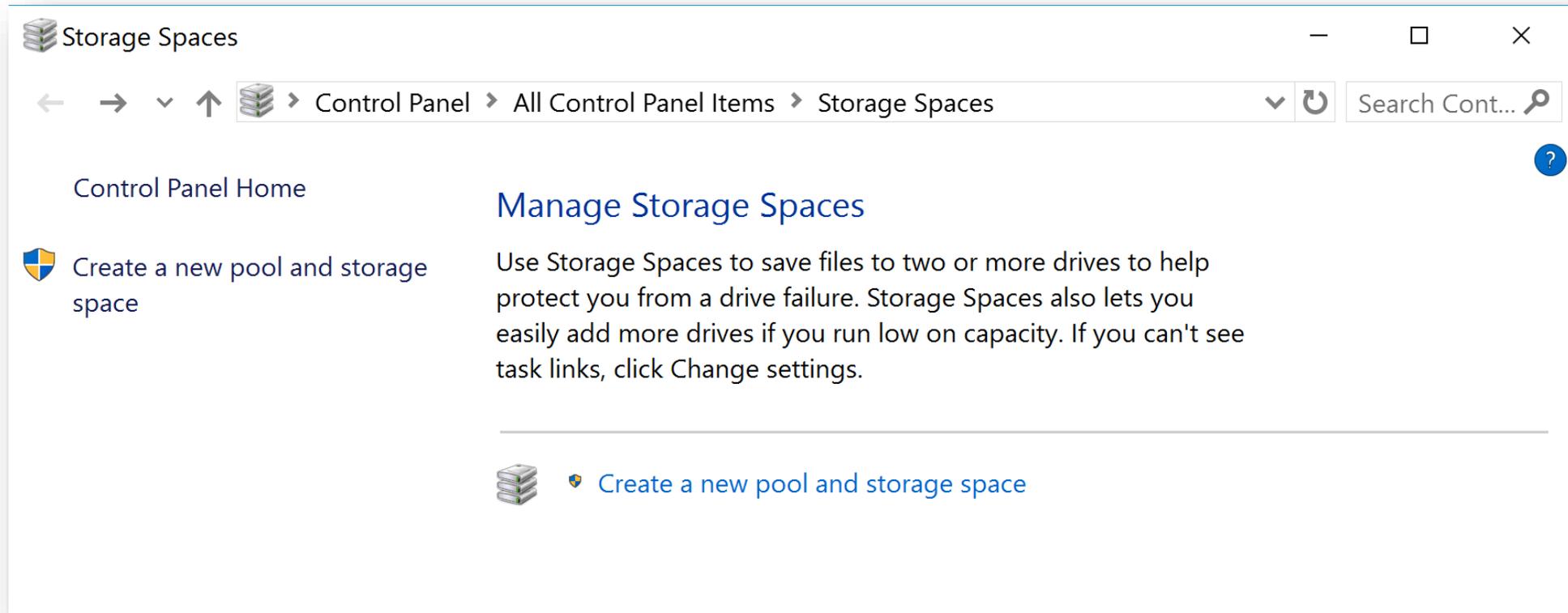
The screenshot shows the Windows Disk Management console. At the top, there is a menu bar with 'File', 'Action', 'View', and 'Help'. Below the menu is a toolbar with navigation and help icons. The main area contains a table of disk volumes.

Volume	Layout	Type	File System	Status	Capacity	Free Spa...	% Free
	Simple	Basic		Healthy (E...)	260 MB	260 MB	100 %
	Simple	Basic		Healthy (R...)	1.88 GB	1.88 GB	100 %
Windows (C:)	Simple	Basic	NTFS	Healthy (B...)	116.98 GB	18.24 GB	16 %

Below the table, the 'Disk 0' section is expanded, showing a graphical layout of the disk. The disk is 119.12 GB and is online. The layout shows three partitions:

- A 260 MB partition, labeled 'Healthy (EFI System Part)', shown with diagonal hatching.
- A 116.98 GB NTFS partition, labeled 'Windows (C:)', which is 'Healthy (Boot, Page File, Crash Dump, Primary Partio'.
- A 1.88 GB partition, labeled 'Healthy (Recovery Partition)'.

STORAGE SPACES (WIN 8/8.1/8.2/10)



The screenshot shows the Windows Storage Spaces Control Panel window. The title bar reads "Storage Spaces" with standard window controls. The breadcrumb navigation path is "Control Panel > All Control Panel Items > Storage Spaces". Below the navigation, there is a "Control Panel Home" link and a "Create a new pool and storage space" link with a shield icon. The main content area is titled "Manage Storage Spaces" and contains the following text: "Use Storage Spaces to save files to two or more drives to help protect you from a drive failure. Storage Spaces also lets you easily add more drives if you run low on capacity. If you can't see task links, click Change settings." Below this text is a horizontal line and a link "Create a new pool and storage space" with a storage icon.

Storage Spaces

Control Panel > All Control Panel Items > Storage Spaces

Control Panel Home

Create a new pool and storage space

Manage Storage Spaces

Use Storage Spaces to save files to two or more drives to help protect you from a drive failure. Storage Spaces also lets you easily add more drives if you run low on capacity. If you can't see task links, click Change settings.

Create a new pool and storage space

STORAGE SPACES

- Create a Storage Pool from a collection of physical disks
- Create a Storage Space- Virtual Disk
- Partition and Format
- Create RAID

SYSTEM UTILITIES

MSCONFIG

REGEDIT

COMMAND

SERVICES.msc

MMC

MSTSC

NOTEPAD

EXPLORER

MSINFO32

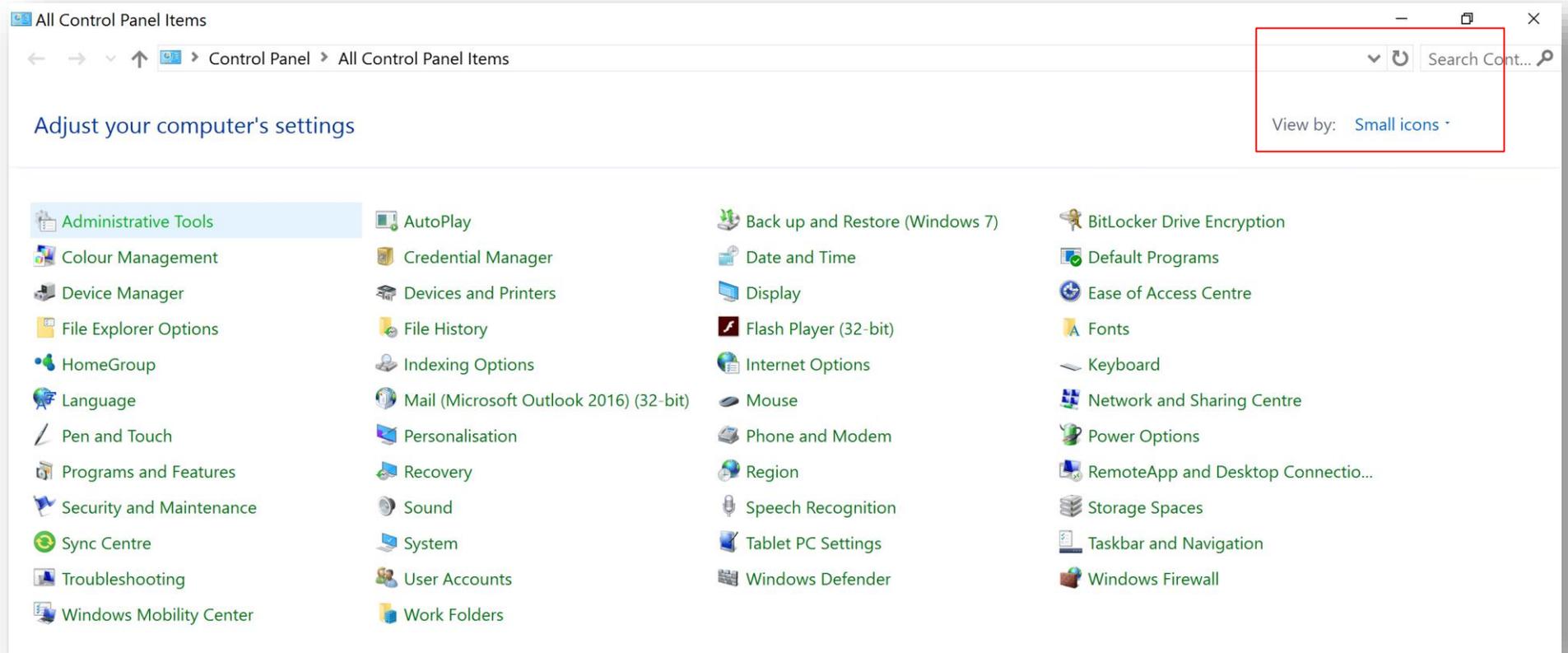
DXDIAG

DEFRAG

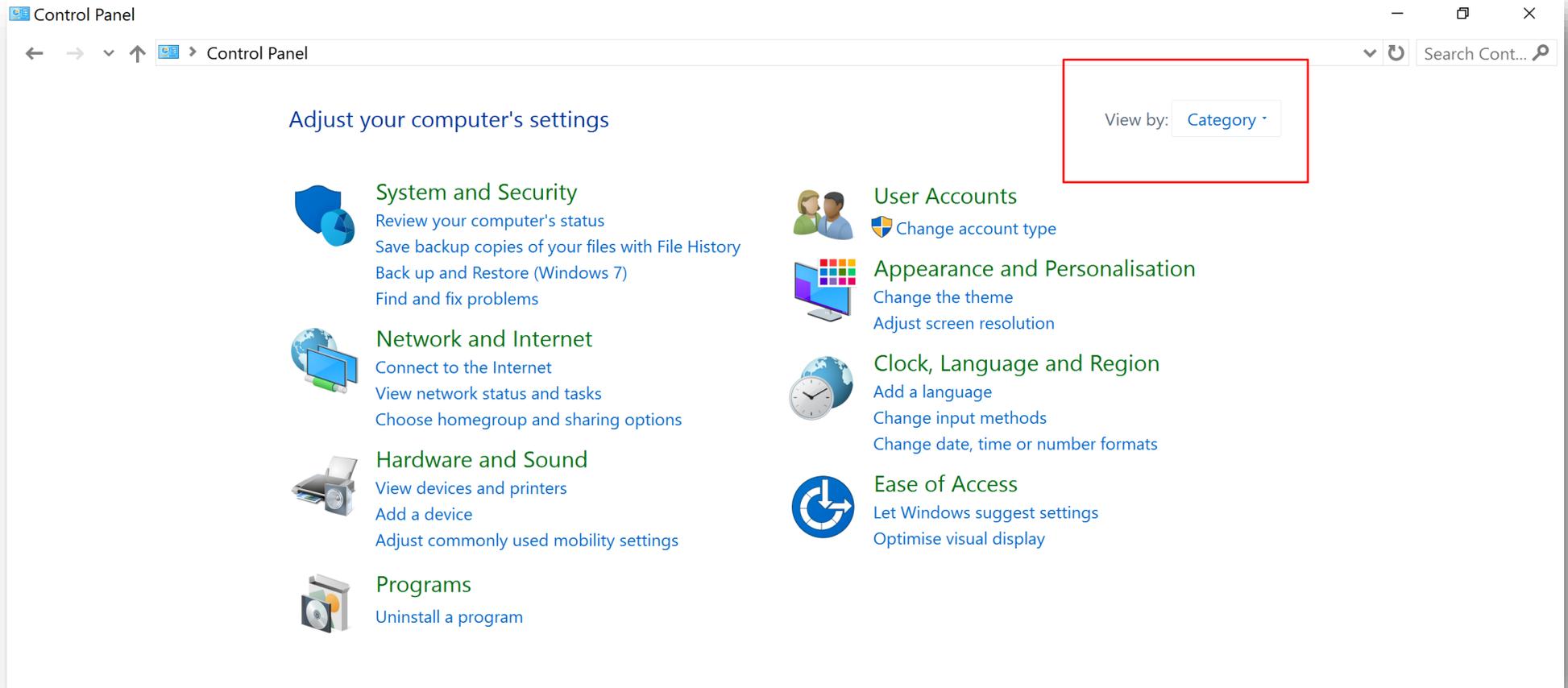
System Restore

Windows Update

WINDOWS CONTROL PANEL UTILITIES

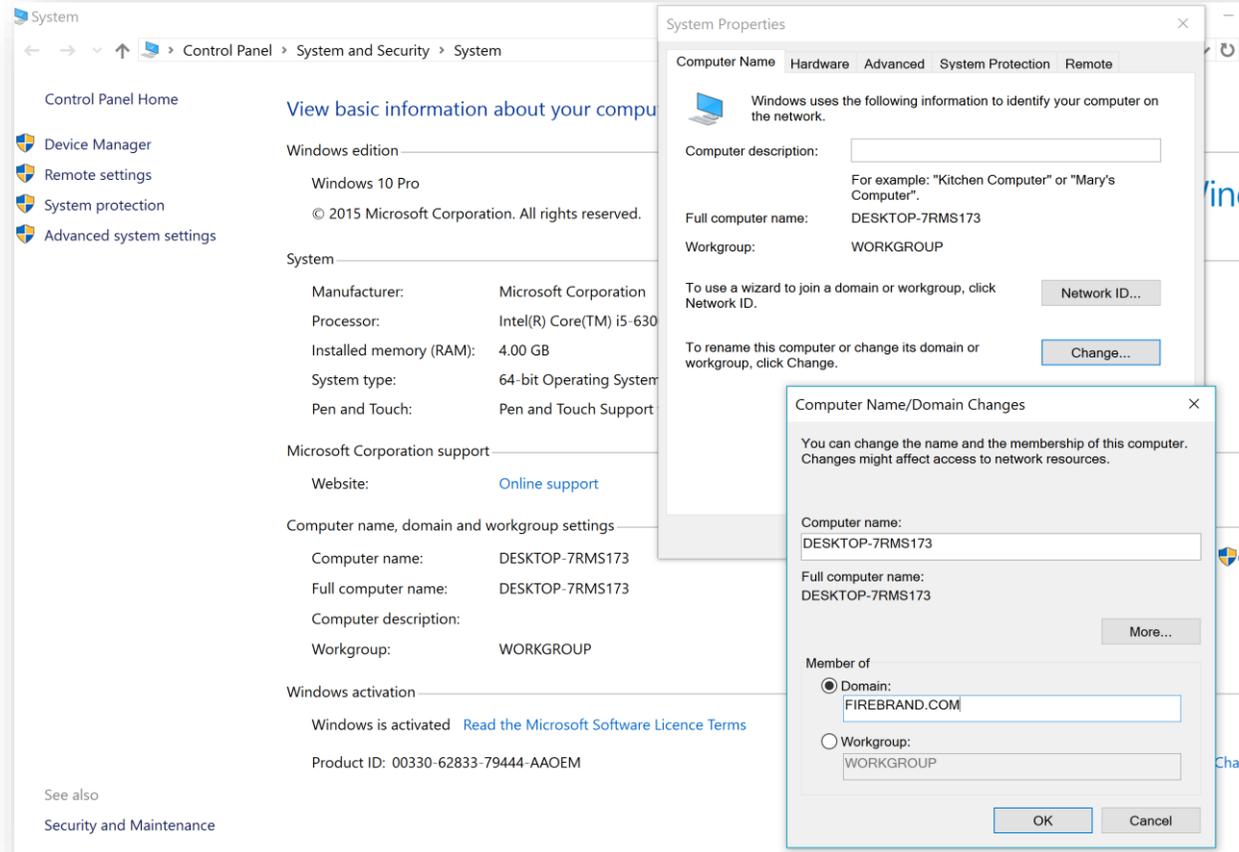


WINDOWS CONTROL PANEL



WINDOWS NETWORKING

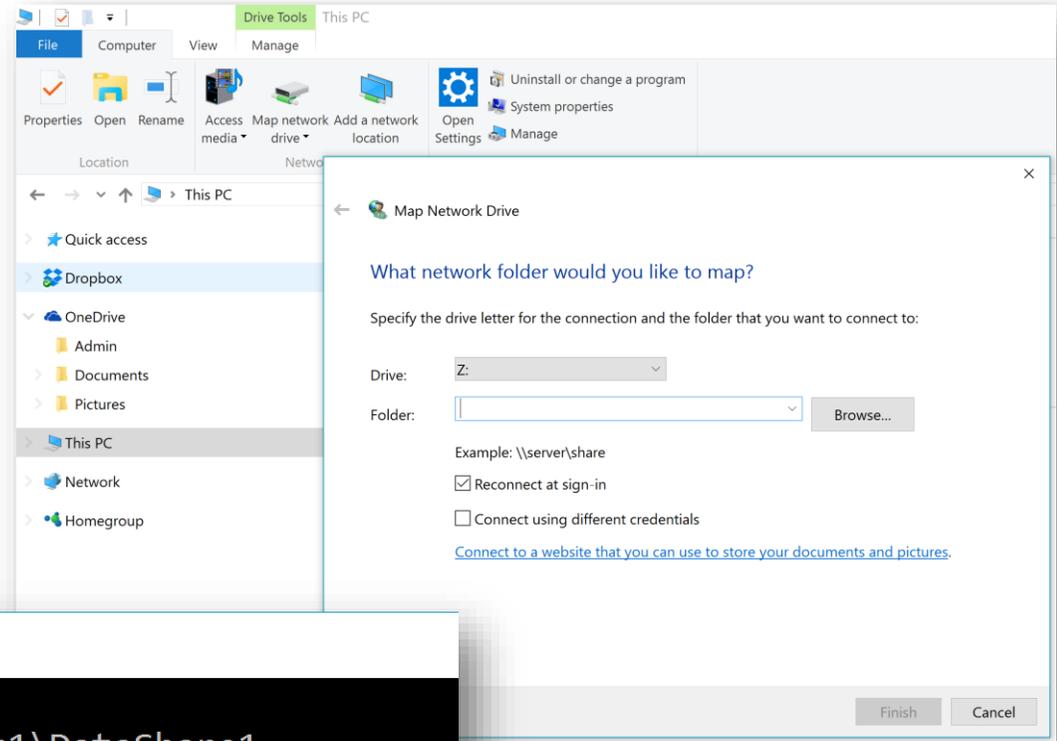
- Workgroup
- Domain
- Homegroup



NETWORK SHARES

Mapping Drives

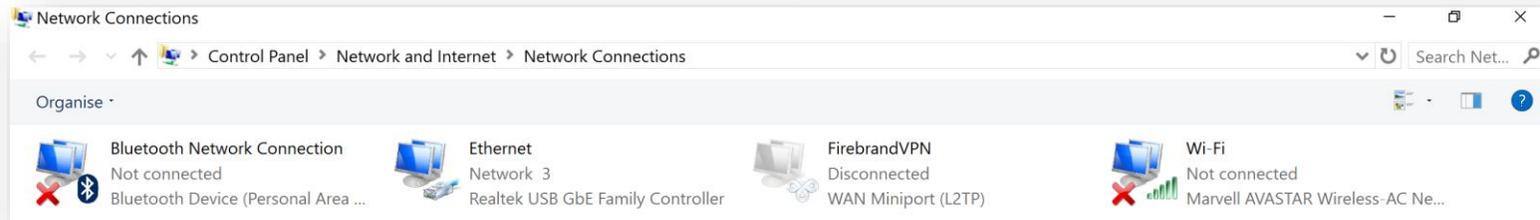
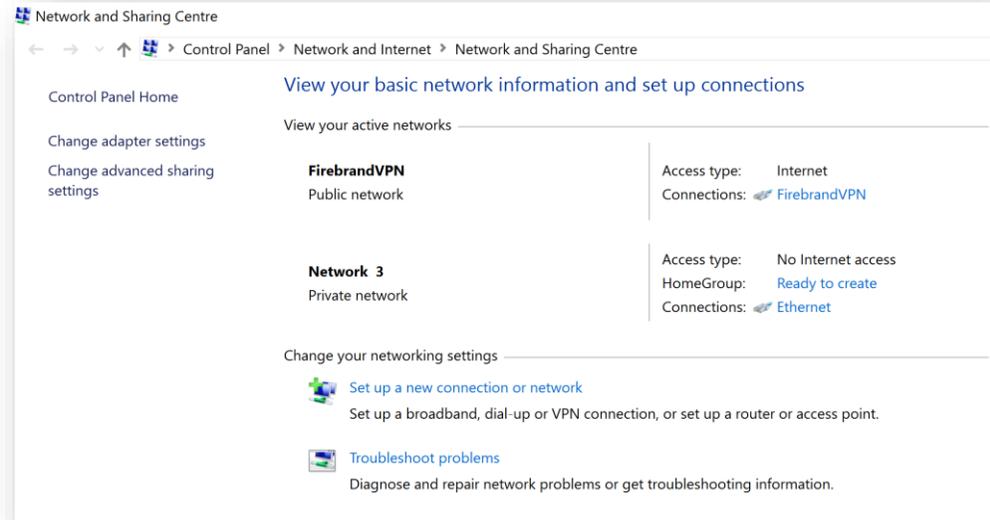
- Explorer
- NET USE Command



```
Command Prompt
C:\Users\philm>net use s: \\FileServer1\DataShare1
```

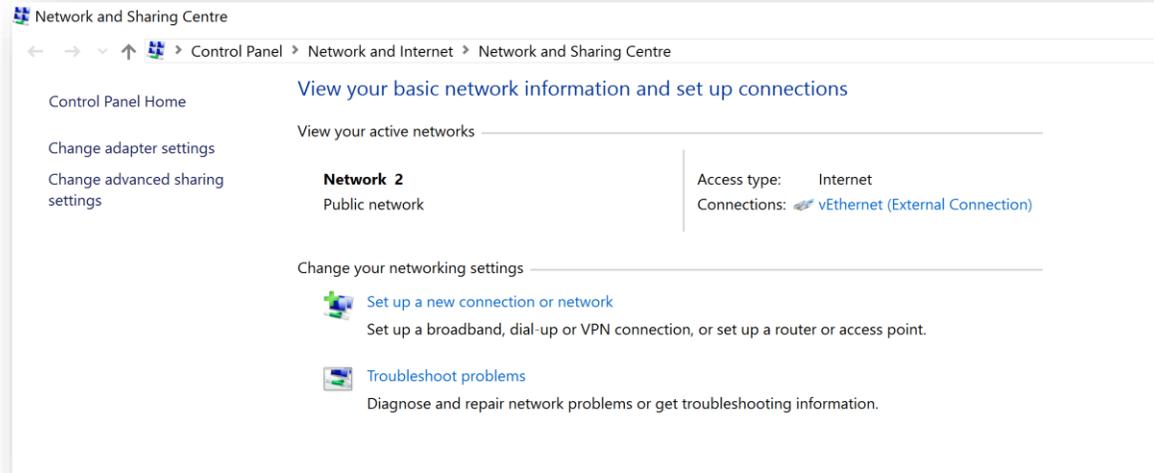
NETWORK CONNECTIONS

- VPN
- WIRELESS
- WIRED
- WWAN
- PROXY
- REMOTE DESKTOP CONNECTION

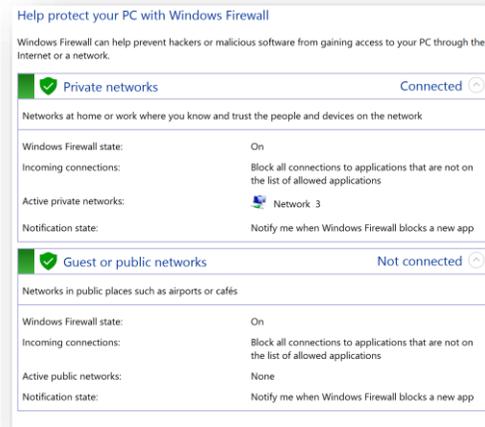


NETWORK LOCATION

Domain
Home/Private
Work/Private
Guest/Public



Firewall Settings



NETWORK ADAPTER CONFIGURATION

Internet Protocol Version 4 (TCP/IPv4) Properties

General Alternative Configuration

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

Obtain an IP address automatically

Use the following IP address:

IP address: [. . .]

Subnet mask: [. . .]

Default gateway: [. . .]

Obtain DNS server address automatically

Use the following DNS server addresses:

Preferred DNS server: [. . .]

Alternative DNS server: [. . .]

Validate settings upon exit

Advanced...

OK Cancel

Internet Protocol Version 4 (TCP/IPv4) Properties

General Alternative Configuration

If this computer is used on more than one network, enter the alternative IP settings below.

Automatic private IP address

User configured

IP address: [. . .]

Subnet mask: [. . .]

Default gateway: [. . .]

Preferred DNS server: [. . .]

Alternative DNS server: [. . .]

Preferred WINS server: [. . .]

Alternative WINS server: [. . .]

Validate settings, if changed, upon exit

OK Cancel

Advanced TCP/IP Settings

IP Settings DNS WINS

IP addresses

IP address	Subnet mask
DHCP Enabled	

Add... Edit... Remove

Default gateways:

Gateway	Metric
---------	--------

Add... Edit... Remove

Automatic metric

Interface metric: []

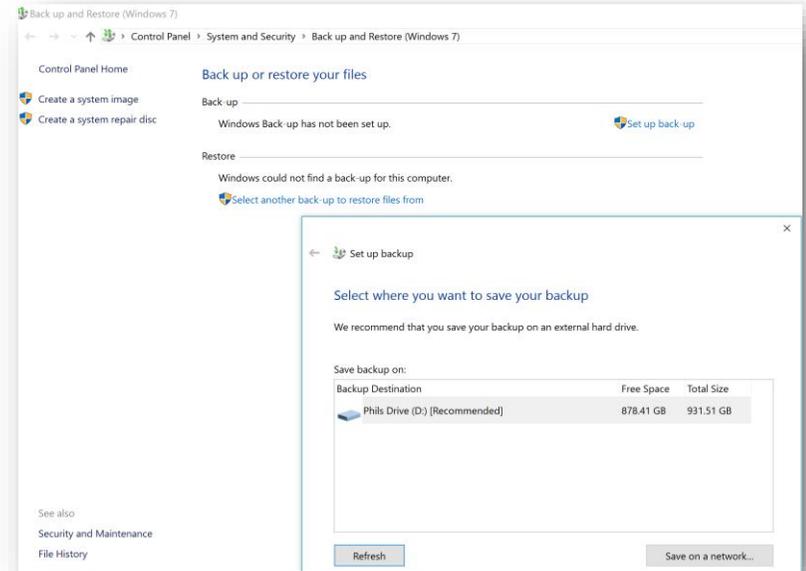
OK Cancel

BACKUPS

Scheduled Backup

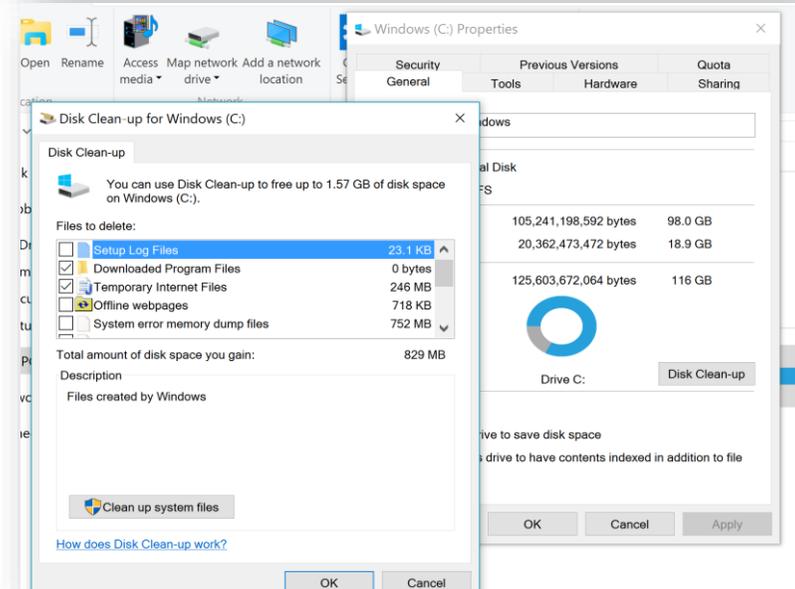
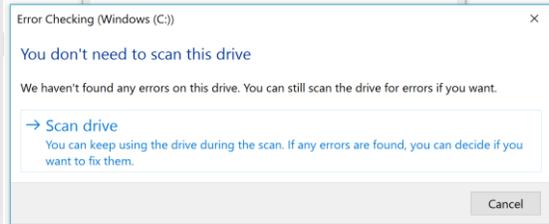
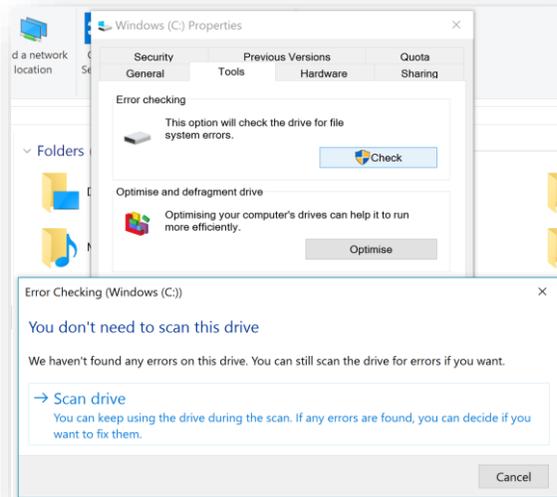
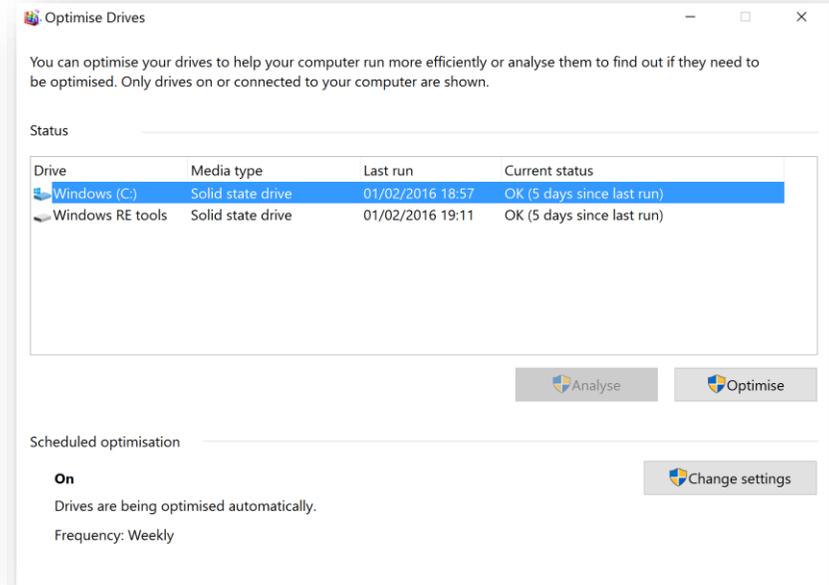
Working Copies

- Full
- Incremental
- Differential
- File History (Library Folders 8/8.1/10)



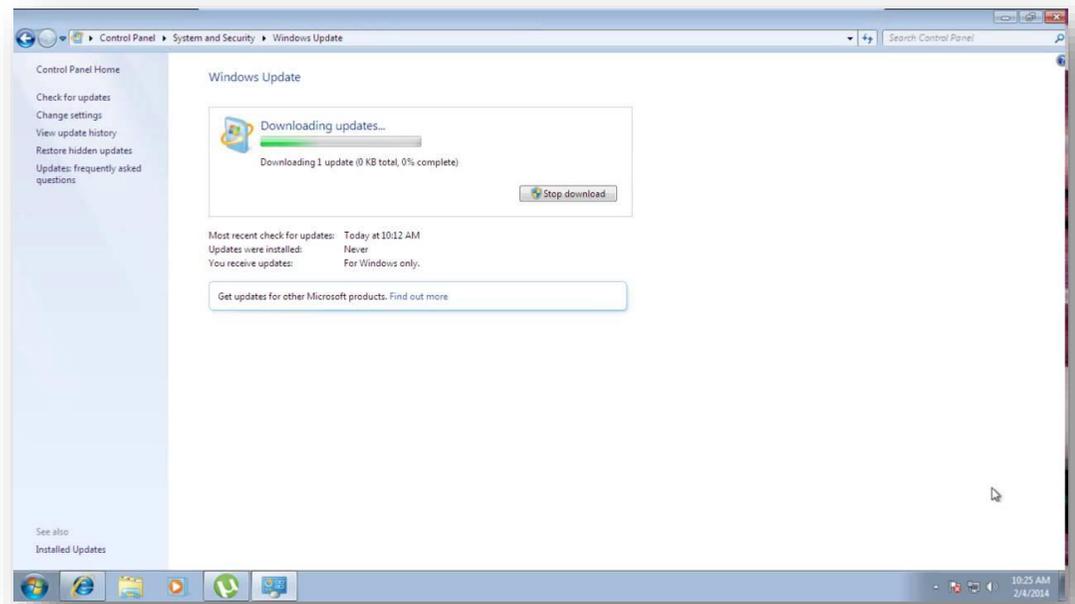
DISK MAINTENANCE

- Scheduled Defrag
- CHKDSK
- Disk Cleanup



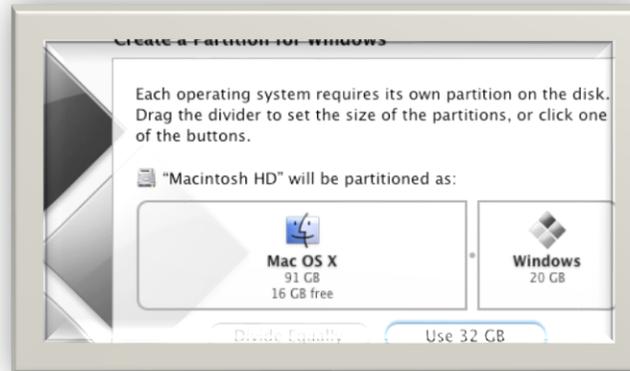
PATCH MANAGEMENT

- Windows Updates
- Driver/Firmware Updates
- Application Updates
- Antivirus/Antimalware Updates
- WSUS



MAC OS AND LINUX - COMMON FEATURES

- Backups - rsync utility/Time Machine
- System updates - Apple Store & App store
- Antivirus updates
- Shell /Terminal
- Multiple Desktops
- Keychain
- Spot Light
- Boot Camp

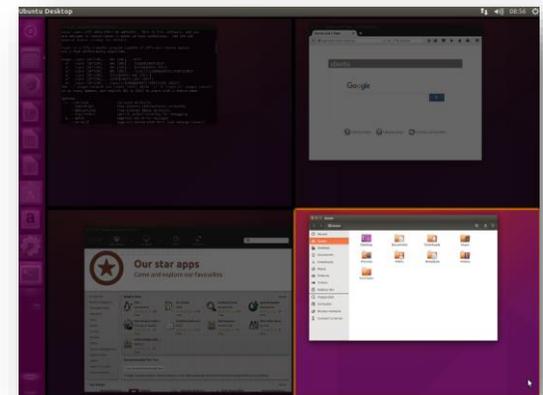


```
phil@phil-Virtual-Machine:~$
rsync comes with ABSOLUTELY NO WARRANTY. This is free software, and you
are welcome to redistribute it under certain conditions. See the GNU
General Public Licence for details.

rsync is a file transfer program capable of efficient remote update
via a fast differencing algorithm.

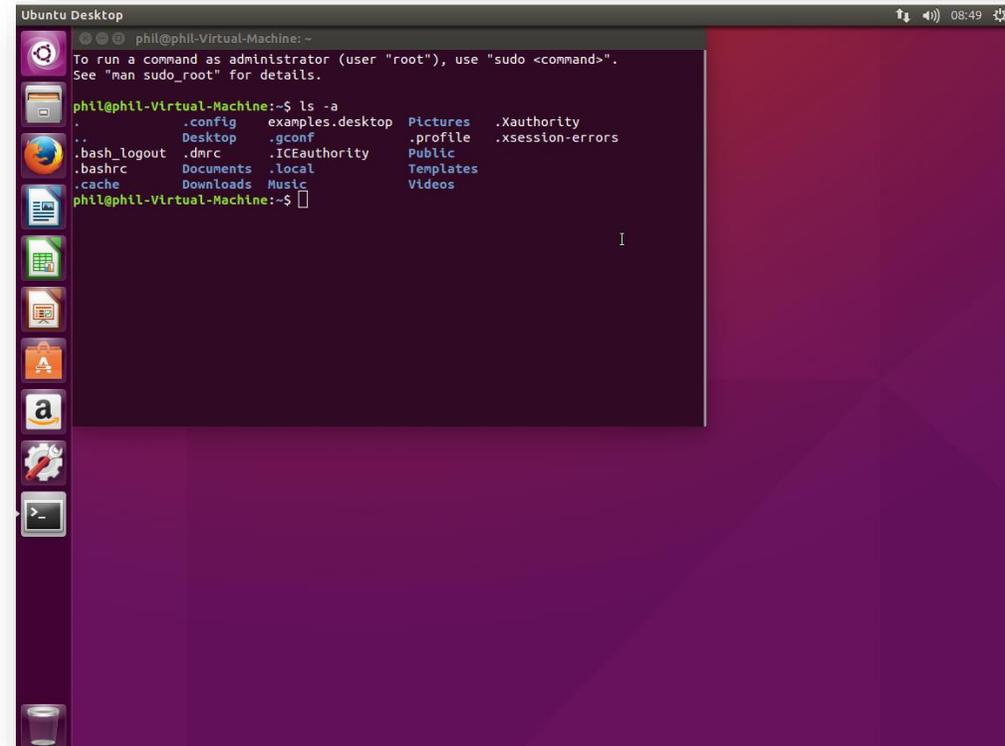
Usage: rsync [OPTION]... SRC [SRC]... DEST
or rsync [OPTION]... SRC [SRC]... [USER@]HOST:DEST
or rsync [OPTION]... SRC [SRC]... [USER@]HOST:DEST
or rsync [OPTION]... SRC [SRC]... rsync://[USER@]HOST[:PORT]/DEST
or rsync [OPTION]... [USER@]HOST:SRC [DEST]
or rsync [OPTION]... [USER@]HOST:SRC [DEST]
or rsync [OPTION]... rsync://[USER@]HOST[:PORT]/SRC [DEST]
The ':' usages connect via remote shell, while '::' & 'rsync::/' usages connect
to an rsync daemon, and require SRC or DEST to start with a module name.

Options
-v, --verbose          increase verbosity
--info=FLAGS          fine-grained informational verbosity
--debug=FLAGS        fine-grained debug verbosity
--msgs2stderr         special output handling for debugging
--quiet              suppress non-error messages
-Q, --no-notd         suppress daemon-mode MOTD (see manpage caveat)
```



BASIC LINUX COMMANDS

- Ls/ps
- grep
- cd
- shutdown
- mv
- rm
- Chmod
- Chown
- apt-get
- Sudo
- ifconfig
- Dig
- Passwd
- pwd



The screenshot shows a terminal window titled 'Ubuntu Desktop' with the prompt 'phil@phil-Virtual-Machine: ~'. A message at the top states: 'To run a command as administrator (user "root"), use "sudo <command>". See "man sudo_root" for details.' The terminal shows the command 'ls -la' being executed, resulting in the following output:

```
phil@phil-Virtual-Machine:~$ ls -la
.                  .config           examples.desktop  Pictures          .Xauthority
..                 Desktop           .gconf            .profile         .xsession-errors
.bash_logout      .dmirc            .ICEauthority     Public
.bashrc            Documents         .local            Templates
.cache             Downloads         Music              Videos
```

The terminal prompt returns to 'phil@phil-Virtual-Machine:~\$'.

LINUX

- System updates - apt-get
- Driver/firmware updates
- Anti-virus - ClamAV
- Backups - rsync
- Image recovery - dd
- Disk maintenance - var/log clear logs
- Terminal - command line
- Screen sharing - UltraNVC, Remmania

MODULE 6:SECURITY

A+ CORE 2 1002

13/03/2019

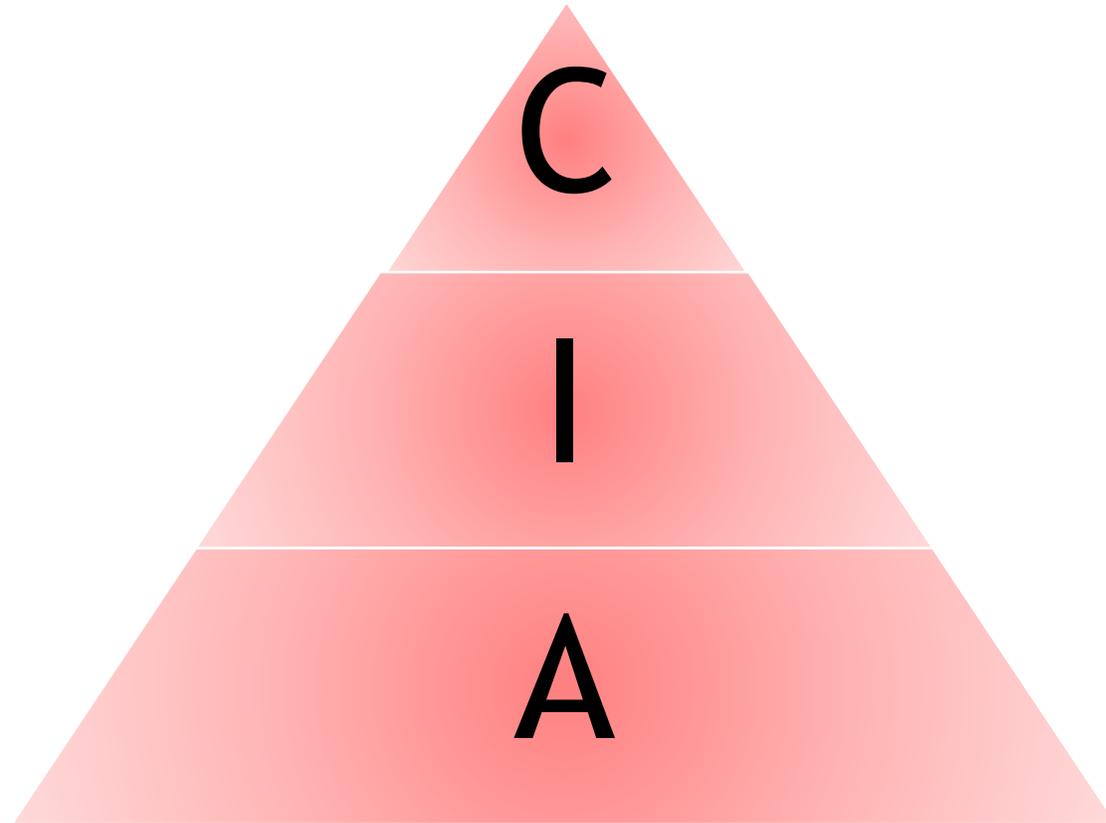
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BASIC CONCEPTS

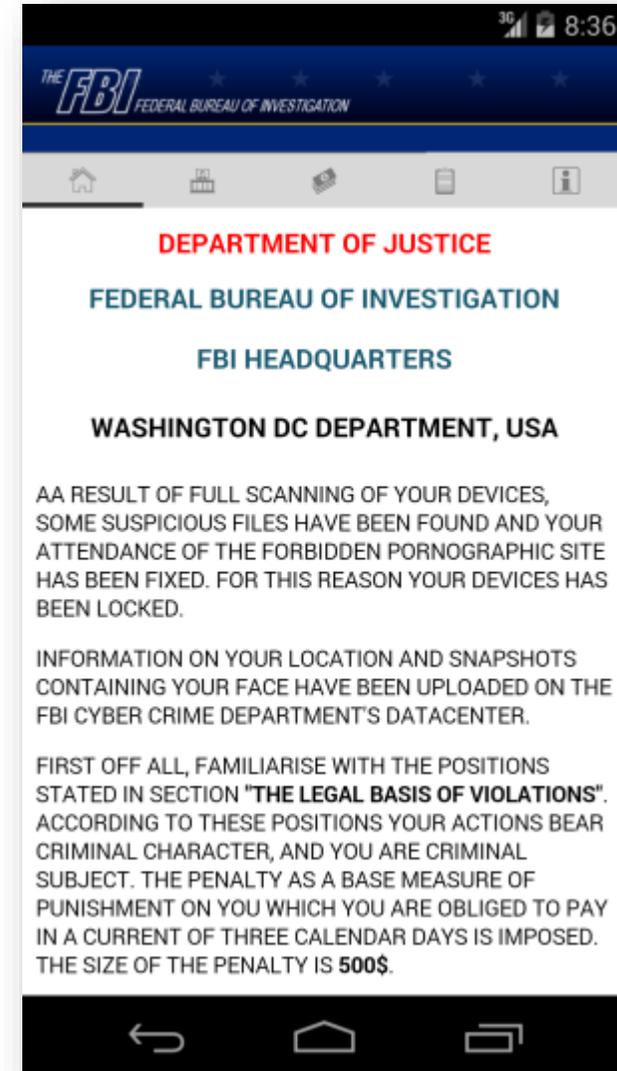
Confidentiality
Integrity
Availability

Authentication
Authorization
Accounting



COMMON SECURITY THREATS & VULNERABILITIES

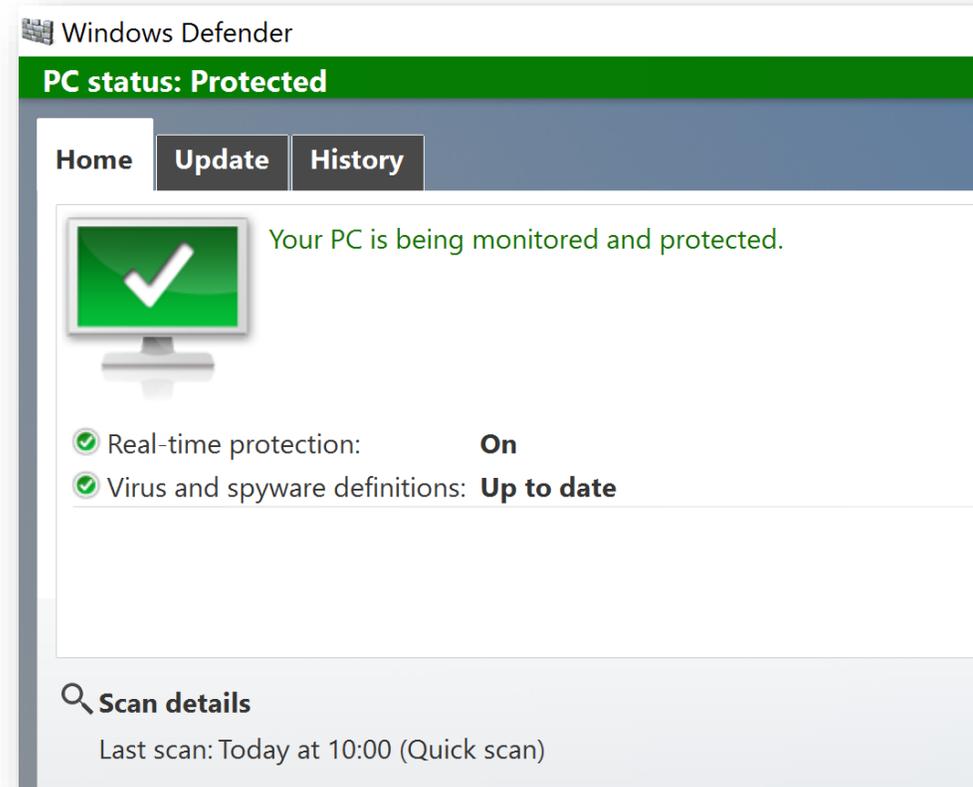
- Malware
- Spyware
- Virus
- Worm
- Trojan
- Rootkit
- Ransomware



COMMON SECURITY THREATS & VULNERABILITIES

Types of Virus

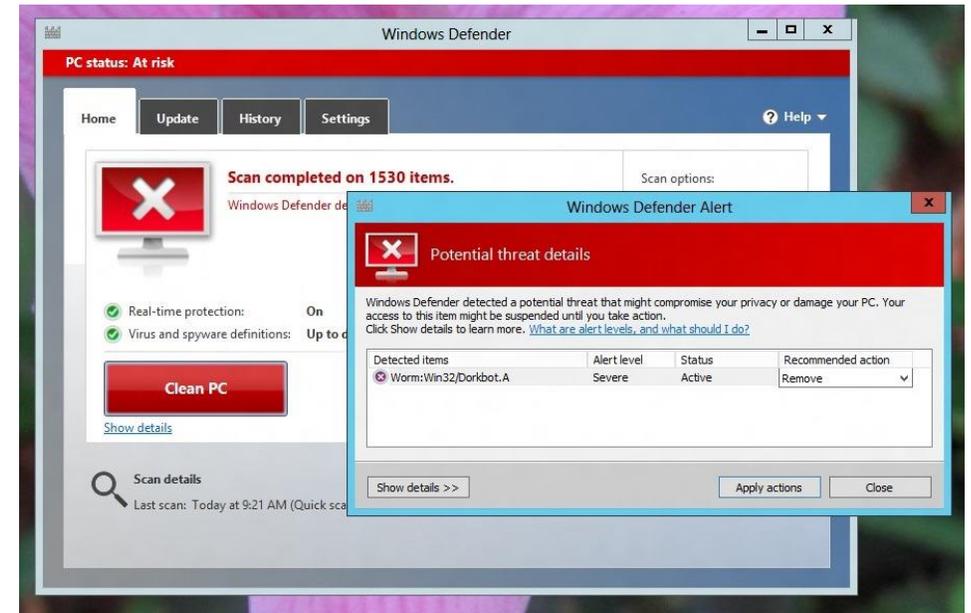
- Armoured
- Companion
- Macro
- Multipartite
- Phage
- Polymorphic
- Retrovirus
- Stealth



COMMON SECURITY THREATS & VULNERABILITIES

Remember!

- A Virus requires a host to propagate
- A Worm propagates itself
- A Trojan masquerades as something useful



COMMON SECURITY THREATS & VULNERABILITIES

Social Engineering

- Phishing (Vishing)
- Spear Phishing
- Whaling
- Spoofing
- Shoulder Surfing
- Tailgating
- Dumpster Diving

From: eBay-Optima <checkout@ebay.com>
Subject: **eBay Member: teccalep**Read Now****
Date: November 30, 2005 5:31:00 PM PST
To: Vaughn Aubuchon
Reply-To: checkout@ebay.com

Update Your Information

Dear eBay user ,
During our regular update and verification of the accounts, we couldn't verify your current information.

Either your information has changed or it is incomplete.
Please [click here](#) update and verify your information by signing in your account below.
If the account information is not updated to current information within 5 days then, your access to bid or buy on eBay will be restricted.

This eBay notice was sent to brian_s_clifton at yahoo.com based on your eBay account preferences. If you would like to review your notification preferences for other types of communications, [click here](#). If you would like to receive this email in text only, [click here](#).

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COMMON SECURITY THREATS & VULNERABILITIES

Other Threats

- Zero Day Attack
- Bot/Botnet/Zombie
- Man in the Middle
- Password Attacks
- Dictionary
- Brute Force



SECURITY - PREVENT

Physical Security

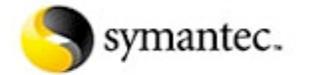
- Door Locks
- Mantrap
- Cable Locks
- Shredder
- Biometrics
- ID Badges
- Smart Card / Token



SECURITY - PREVENT

Digital Security

- Antivirus/AntiMalware
- Firewalls
- Updates/Patches



AUTHENTICATION / AUTHORIZATION

Authentication : Proving to the system who you say you are.

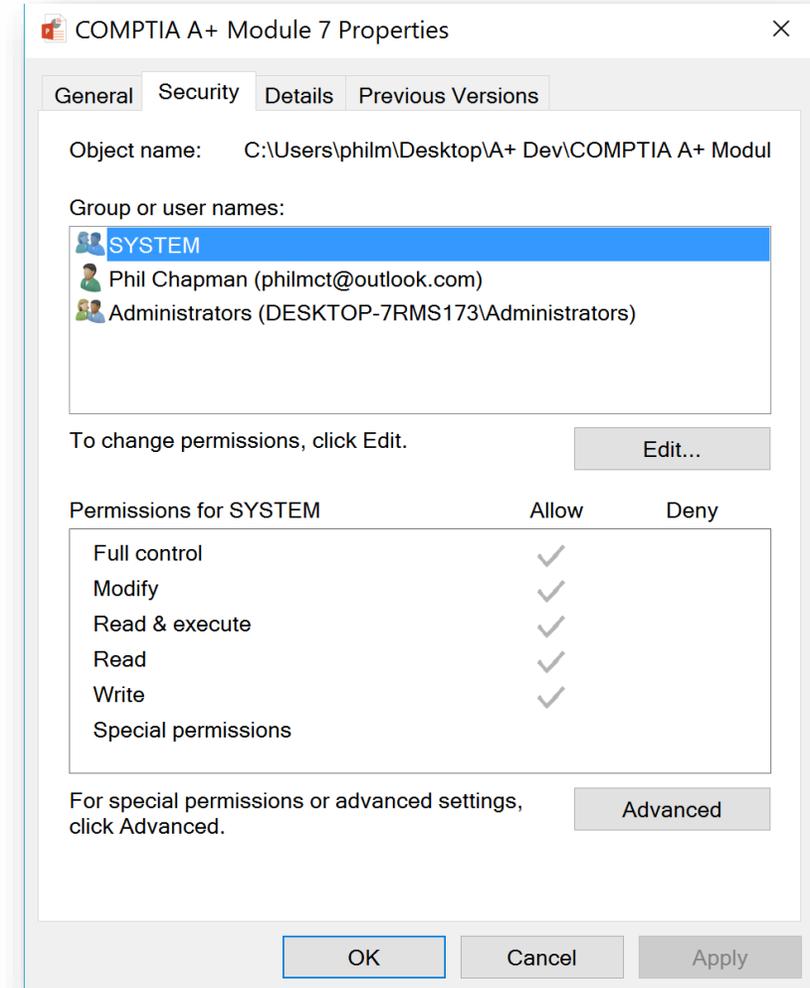
- Something that you know (Password/Pin/Username)
- Something that you have (Smartcard/Token)
- Something that you are (Biometric)

Authorization : Access rights and privileges

- Permissions
- Membership

SECURITY - PREVENT

- Virtual Private Networks (VPN)
- Data Loss Prevention (DLP)
- Access Control Lists (ACL)
- Acceptable Use Policy (AUP)
- Principle of Least Privilege
- User Education



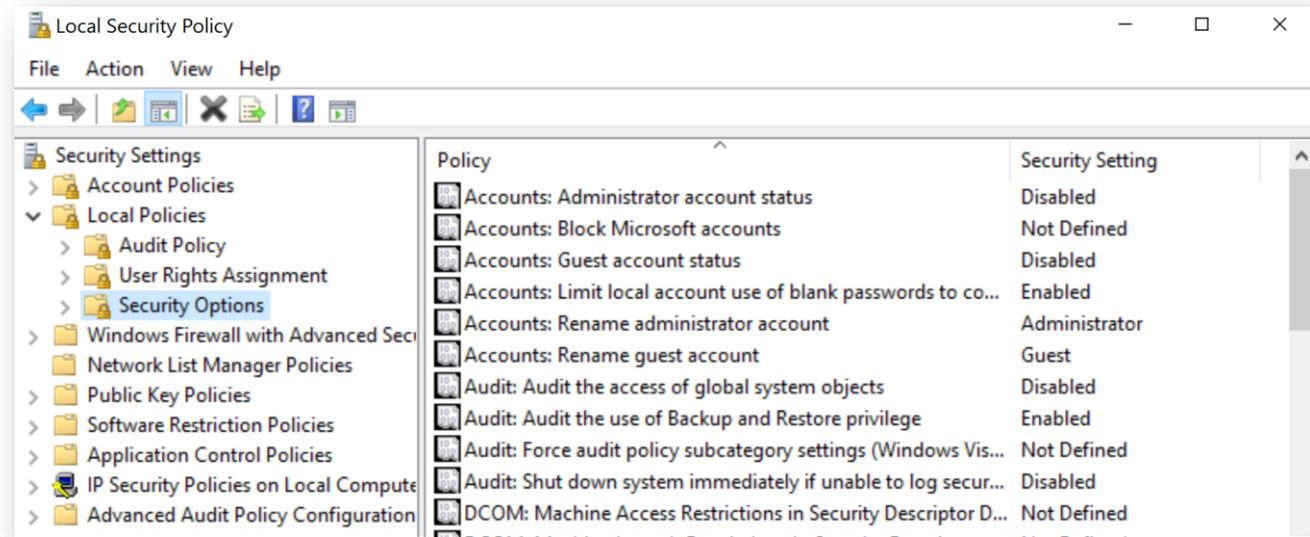
BASIC WINDOWS OS SECURITY SETTINGS

- Users and Groups (Permissions/Privileges)
- NTFS/Share Permissions
- User Authentication
- BitLocker / BitLocker to Go
- Encrypting File System (EFS)



SECURITY - BEST PRACTICES TO SECURE A WORKSTATION

- Password Policy
- Screensaver Required Password
- BIOS/UEFI Security
- Account Management
- Disable AutoRun
- Data Encryption
- Patch/Update Management



SECURITY - SECURING MOBILE DEVICES

- Screen Locks
- Remote Wipe / Sanitize
- Remote Backup
- Antivirus / Antimalware
- Patches/OS Updates
- Authentication
- Encryption
- BYOD / Corporate Policies

Sign in to your Microsoft account to find your phone, get support and get warranty info. Some services vary by region.

[Sign in](#)
[Create an account](#)



Find your lost phone
Lost your phone or think someone stole it? Locate, ring, lock or erase it here.



Scheduling repairs
Once you've registered a device, fix it and check on its repair status.



Keep track of your devices
See and manage your Windows Phone, Surface and Xbox in one place.



Check Reset Protection status
Getting a phone from someone else? [Check its Reset Protection status](#)

When you sign in, you can:

Manage your devices	Ring your phone	Get recovery key	View device warranty status
Add a device	Erase your phone	Schedule a repair	
Remove a device	Lock your phone	View device repair status	
View detailed info about your device (OS version, serial number, etc.)	Check Reset Protection status	Register a device warranty	
Find your phone	Turn off Reset Protection	Buy an extended device warranty	

SECURITY - DATA DESTRUCTION AND DISPOSAL

Physical Destruction

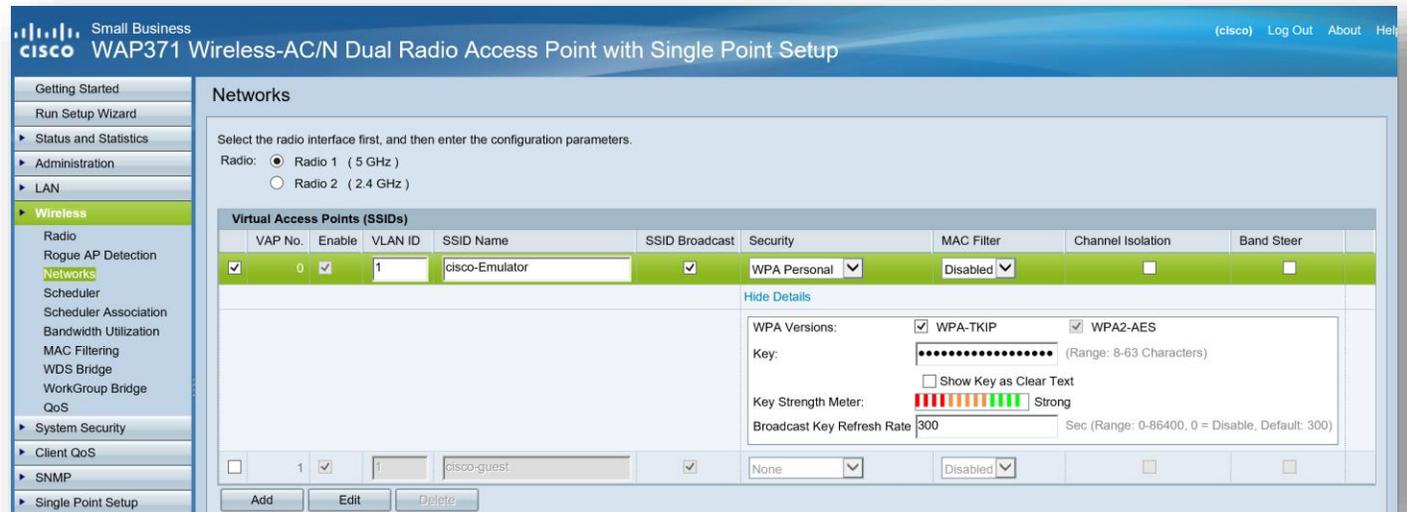
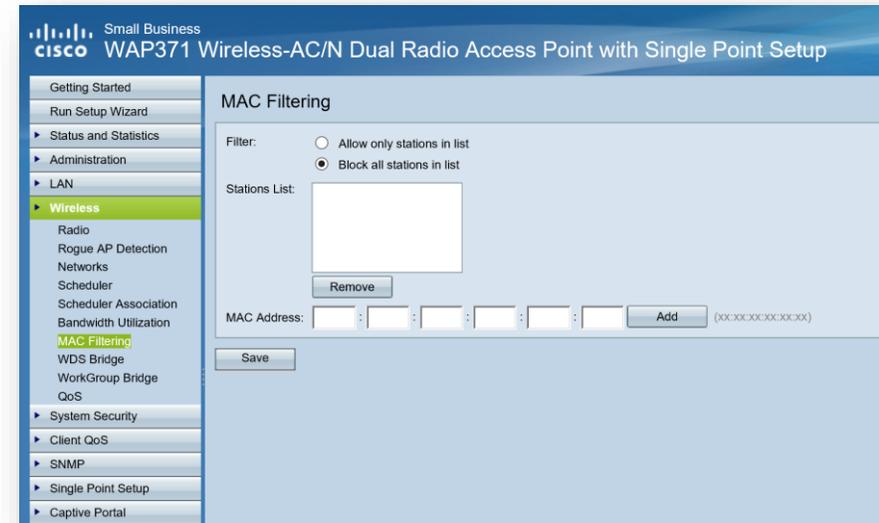
- Shredder
- Drill/Hammer
- Electromagnetic/Degaussing
- Incinerator
- Certificate of Destruction
- Recycling/Repurposing



SECURITY - WIRELESS / WIRED NETWORKS

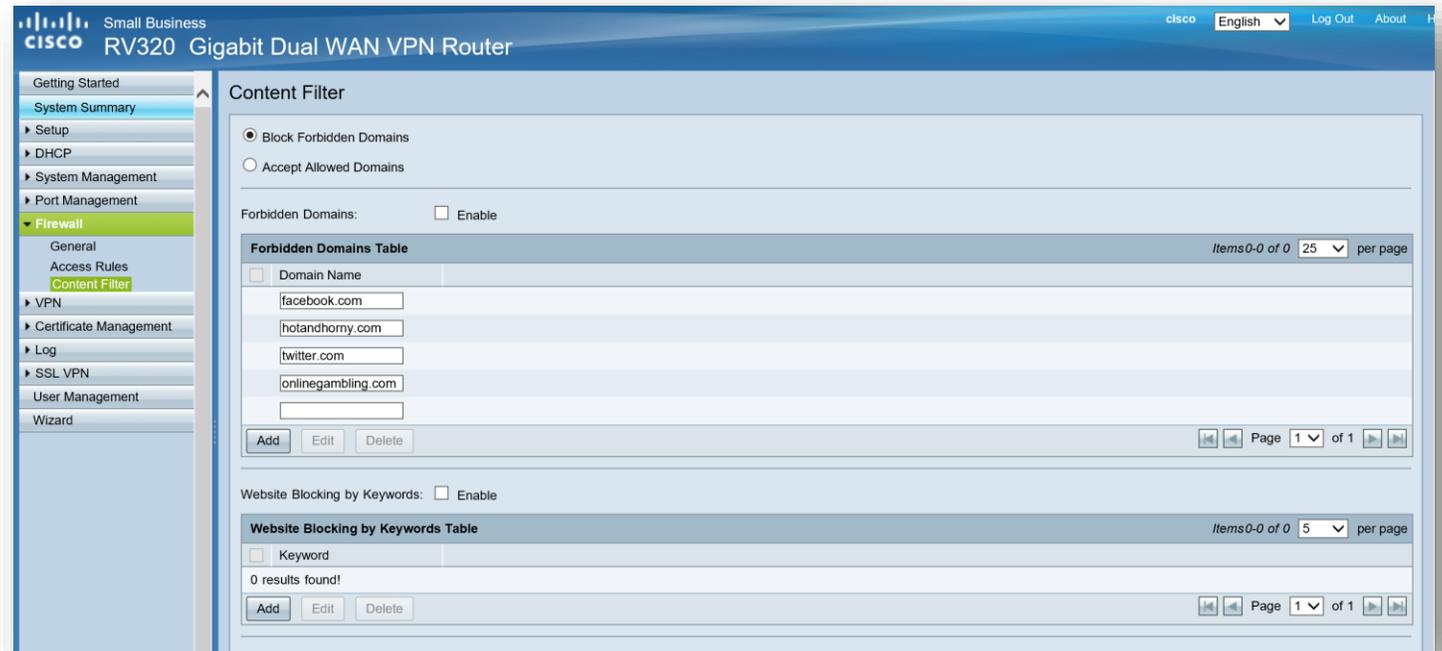
Wireless

- Default SSID
- Disable SSID
- Placement/Siting
- Encryption
- Power
- Passwords
- MAC Filters



ADDITIONAL SOHO NETWORK SECURITY CONFIGURATIONS

- Static IP Addresses
- Firewall Settings
- Port Forwarding (NAT)
- Content Filtering
- Physical Security



MODULE 7: TROUBLESHOOTING

A+ CORE 2 1002

13/03/2019

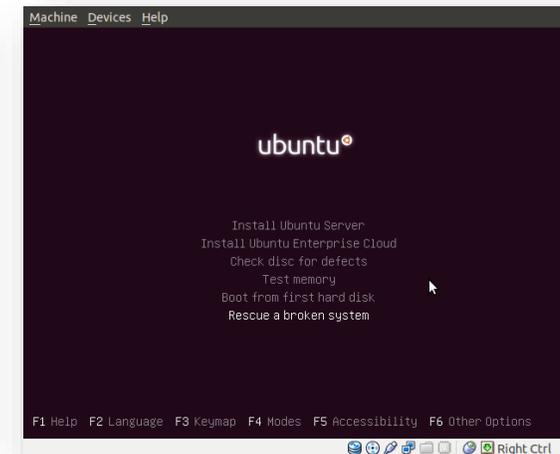
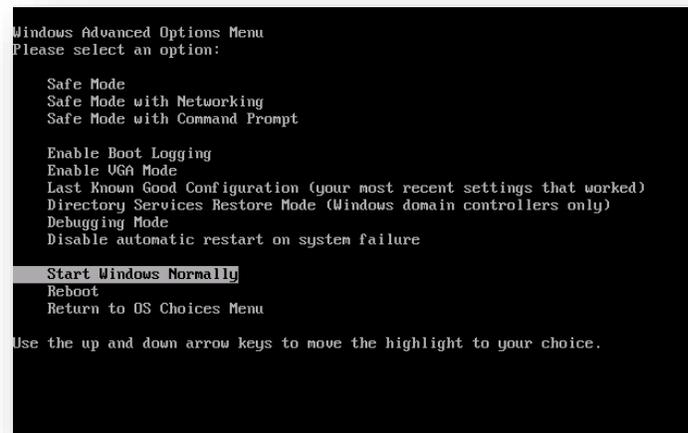
Your fastest way to learn. Guaranteed.



TROUBLESHOOT PC OS PROBLEMS

Common Symptoms

- BSOD
 - Boot Failure
 - Spontaneous Shutdown/Restart
 - Device failure
 - Missing DLL
 - Services failure
 - Compatibility Error
 - Safe Mode Boot
- Missing OS
 - Missing GUI
 - Missing GRUB (Unix)
 - Multiple Monitor problems



TROUBLESHOOTING TOOLS

- BIOS/UEFI
- SFC (System File Checker)
- Logs
- Recovery Console
- Repair Discs
- MSCONFIG
- DEFRAG
- REGEDIT
- SAFE MODE
- ERD/ASR

```
Administrator: Command Prompt
Microsoft Windows [Version 10.0.10586]
(c) 2015 Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>SFC /?

Microsoft (R) Windows (R) Resource Checker Version 6.0
Copyright (C) Microsoft Corporation. All rights reserved.

Scans the integrity of all protected system files and replaces incorrect versions with
correct Microsoft versions.

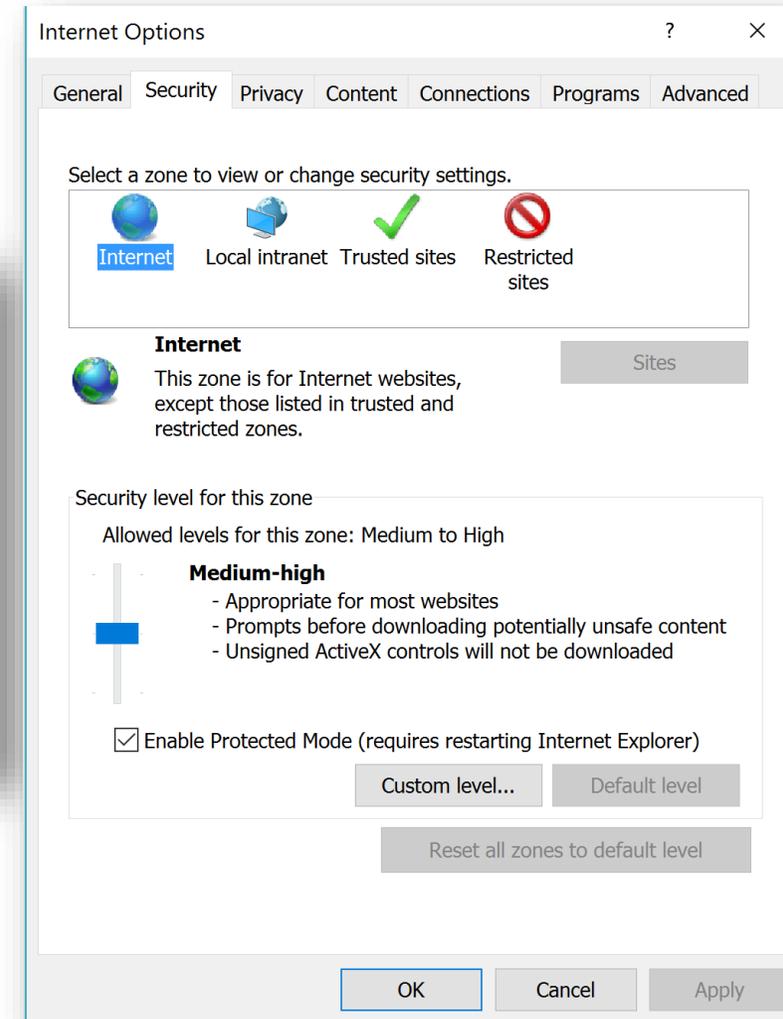
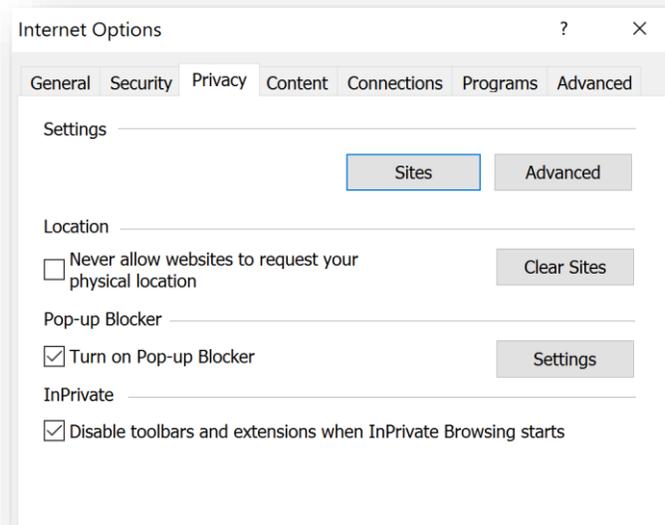
SFC [/SCANNOW] [/VERIFYONLY] [/SCANFILE=<file>] [/VERIFYFILE=<file>]
[/OFFWINDIR=<offline windows directory> /OFFBOOTDIR=<offline boot directory>]
```

Level	Date and Time	Source	Event ID	Task Category
Information	08/02/2016 18:15:41	Outlook	26	None
Error	08/02/2016 18:15:34	Apps	5973 (5973)	
Information	08/02/2016 18:15:32	Outlook	26	None
Warning	08/02/2016 17:49:47	Search	10023	Gatherer
Error	08/02/2016 17:44:05	Apps	5973 (5973)	
Error	08/02/2016 17:24:05	Apps	5973 (5973)	

TROUBLESHOOTING SECURITY ISSUES

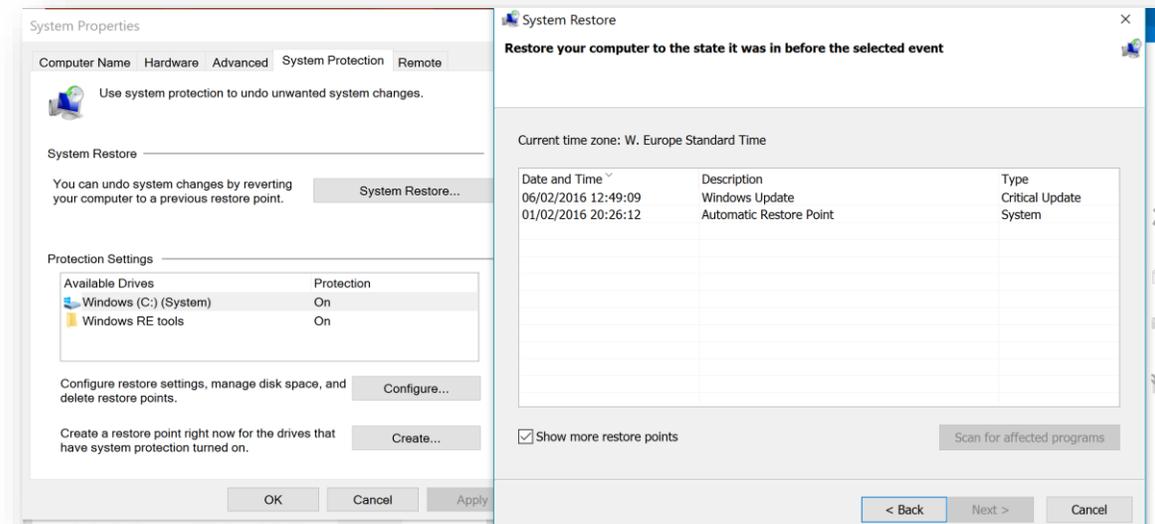
Common Symptoms

- Browser Pop Ups
- Browser Redirection
- Security Alerts
- SPAM
- Malware



TROUBLESHOOTING TOOLS

- Antivirus Software
- Command Line (Windows) / Terminal (Linux)
- Recovery Console
- Safe Mode
- System Restore / Snapshot
- MSCONFIG
- Refresh/Restore (Windows 8/8.1/10)



BEST PRACTICE FOR MALWARE REMOVAL

- Identify Malware Symptoms
- Quarantine
- Disable System Restore
- Remediation
- Schedule Scan / Run Updates
- Re-Enable System Restore
- End User Education



TROUBLESHOOTING MOBILE OS AND APPLICATIONS

Common Symptoms

- Display problems
- Wireless connectivity issues
- Bluetooth connectivity issues
- External monitor issues
- Touchscreen issues
- Application issues



TROUBLESHOOTING TOOLS/TECHNIQUES

- Hard Reset (Factory Reset)
- Soft Reset
- Uninstall/Reinstall Applications
- Force Stop



DOCUMENTATION

Internal Operating Procedures - how the business runs, where you find out how things are done - procedure, policy

Knowledge Base - Such as Microsoft Knowledge base to find out fixes for issues

Network Topology - Physical and Logical diagrams showing network map and settings

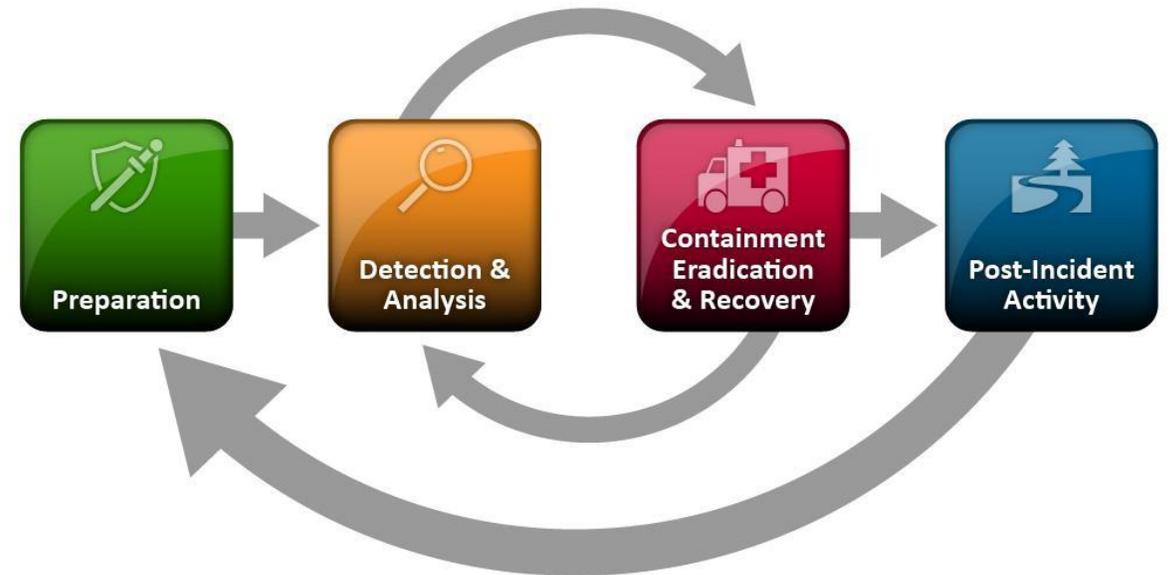
Change management - how is change managed - system, software, hardware?

Disaster Recovery - Hurricane, flooding, fire, war, lightning...

INCIDENT RESPONSE POLICY (IRP)

IR (Incident Response)

- Identify (the problem)
- Report
- Preserve Data/Device
- Document
- Chain of Custody (Evidence Tracking)



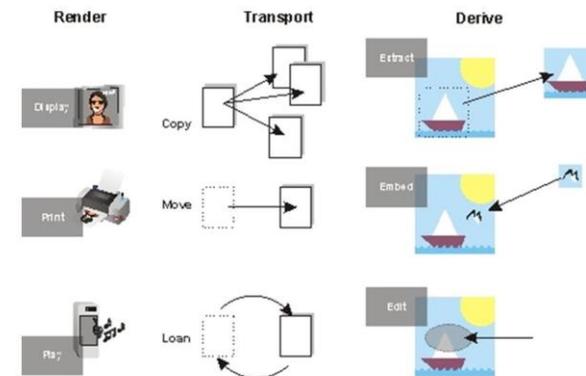
LEGAL REQUIREMENT

- Licensing - End User License Agreement (EULA)
- Commercial or Open License
- Personal or Enterprise License
- DRM (Digital Rights Management)
- GDPR
- PII (Personally Identifiable Information)
- PCI-DSS



Digital Rights Management (DRM)

- Intellectual Property Rights
- Render - Use
- Transport - Broadcast
- Derive - Edit
- DRM System
 - Identify
 - Rights Assign
 - Manage
 - Track
 - Enforce



SECURITY POLICIES - EXAMPLES

- Password Policy
- Acceptable Use Policy (AUP)
- Access Control Policy
- Remote Access Policy (RAP)



COMPTIA A+ Course

Acceptable Use Policy

This Acceptable Usage Policy covers the security and use of all CompTIA A+ Course information and IT equipment. It also includes the use of email, internet, voice and mobile IT equipment. This policy applies to all CompTIA A+ Course employees, contractors and agents (hereafter referred to as 'individuals').

Computer Access Control – Individual's Responsibility

Access to the CompTIA Course IT systems is controlled by the use of User IDs, passwords and/or tokens. All User IDs and passwords are to be uniquely assigned to named individuals and consequently, individuals are accountable for all actions on the IT systems.

Individuals must not:

- Allow anyone else to use their user ID/token and password on any CompTIA Course IT system.
- Leave their user accounts logged in at an unattended and unlocked computer.
- Use someone else's user ID and password to access IT systems.
- Leave their password unprotected (for example writing it down).
- Perform any unauthorised changes to IT systems or information.
- Attempt to access data that they are not authorised to use or access.
- Exceed the limits of their authorisation or specific business need to interrogate the system or data.
- Connect any non-CompTIA Course authorised device to the CompTIA Course network or IT systems.
- Store CompTIA Course data on any non-authorised CompTIA Course equipment.
- Give or transfer CompTIA Course data or software to any person or organisation.

outside CompTIA Course without the authority of CompTIA Course. Line managers must ensure that individuals are given clear direction on the extent and limits of their authority with regard to IT systems and data.

Internet and email Conditions of Use

Use of CompTIA Course internet and email is intended for business use. Personal use is permitted where such use does not affect the individual's business performance, is not detrimental to CompTIA Course in any way, not in breach of any term and condition of employment and does not place the individual or CompTIA Course in breach of statutory or other legal obligations.

All individuals are accountable for their actions on the internet and email systems.

MODULE 7: OPERATIONAL PROCEDURES

A+ CORE 2 1002

13/03/2019

Your fastest way to learn. Guaranteed.



SAFETY PROCEDURES

- Electrostatic Discharge (ESD)
- Grounding
- Antistatic Bag
- ESD Strap/Bracelet
- ESD Mat
- Self Grounding



SAFETY PROCEDURES

Toxic Waste Handling

- Batteries
- Toner
- CRT
- Compliance with local regulations
- MSDS - Material Safety Data Sheet
- Local government policies



SAFETY PROCEDURES

Personal Safety

- Disconnect Power
- Remove Jewellery
- Lifting techniques
- Electrical Fire Safety (Class C Extinguisher)
- Cable Management



Health



Safety

ENVIRONMENTAL IMPACT

Temperature, Humidity and Ventilation Control, HVAC

Power

- Surge
- Blackout
- Brownout
- Sag
- Spike

UPS

Surge Suppressor

Airborne Particles

Dust/Debris

- Compressed Air
- Vacuums

COMMUNICATION TECHNIQUES & PROFESSIONALISM

- User proper language (avoid Jargon, Acronyms and Slang)
- Stay positive and confident
- Use active listening skills
- Do not interrupt
- Be culturally sensitive
- Be punctual
- Avoid distractions



Try inputting another URL in IE and see if DNS Query Traffic is responding. If not I may have to check your NICs and flush your cache

PROFESSIONALISM - DEALING WITH DIFFICULT CUSTOMERS

- Do not be drawn into an argument
- Do not dismiss problems
- Do not be judgemental
- Seek clarification
- Maintain customer confidentiality
- Set realistic expectations and communicate
- Offer different options (if applicable)
- Provide documentation
- Follow up with the customer



SCRIPTING

Scripting is a way of using a programming language to create a program. PowerShell helps users rapidly automate tasks that manage operating systems (Linux, macOS, and Windows) and processes. It can be just a few words to multiple lines of instructions.

Scripting languages are designed to be easy to learn and code with as short source code files.

What steps would you do to make a cup of tea?

Can this be done in any order or is one order better than the other?

It is a process just like scripting with a start and an end.

SCRIPTING

Shell script

- Scripting within the Unix or Linux shell
- Used to automate
- .sh file extension

Python

- .py file extension
- Has become widely adopted and popular
- Widely taught in UK schools

JavaScript

- .js file extension
- Used with HTML and CSS
- Used on almost every web site
- Java (compiled) and JavaScript (interpreted) are very different.



SCRIPTING BASICS

- Variables - holds information which changes e.g string, text, integer, float, Boolean
- Constant- information stays the same and can be easily be reused
- Loops to automate part of the process - For While
- Branch is where a subroutine is started - If Then
- Code can be used to interface with computer hardware
- Syntax error is usually a code spelling or grammar error - check your code

PYTHON EXAMPLE - LAB

```
print("Let's see how long you have lived in days, minutes and seconds.")
print("Enter your age")
age = int(input("age: "))
days = age * 365
minutes = age * 525948
seconds = age * 31556926
print("You have been alive for", days, "days", minutes, "minutes and", seconds, "seconds! Wow!")
```

Use an online compiler to write and execute your code:

<https://repl.it/repls/ScholarlyMuddyTitles>

REMOTE ACCESS

RDP - port 3389

TELNET - port 23

SSH (Secure Shell) - port 22

REMOTE ACCESS SECURITY

- Microsoft Remote Desktop is an open port tcp/3389 you can undertake a brute force attack, which is common
- Third-party remote desktops often secured with just a username and password
- Too much username/password re-use meaning easy to get in and stay in. Then easy to jump to other systems to obtain information such as bank details, PII

