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| **Minor Award Name** | Networking Essentials |
| **Minor Award Code** | 5N2929 |
| **Level** | 5 |

**Suggested resources to support delivery:**

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| --- | --- | --- | --- | --- |
| **Theme/Topic** | **Type** | **Relevance** | **Author/Source** | **Web Link** |
| Reference | Website | **FOLDOC**  The Free Online Dictionary of Computing: online since 1985, but lately no longer supported by Imperial College London. | Denis Howe | <http://foldoc.org/> |
|  | Wikipedia† | **OSI Model** | Commons | <https://en.wikipedia.org/wiki/OSI_model> |
|  | Wikipedia† | **Ethernet Frame** | Commons | <https://en.wikipedia.org/wiki/Ethernet_frame> |
|  | Website | **Internetworking Technology Handbook** | Cisco | <http://docwiki.cisco.com/wiki/Internetworking_Technology_Handbook> |
|  | Website | **Ethernet Technologies** | Cisco | <http://docwiki.cisco.com/wiki/Ethernet_Technologies> |
|  | Website | **IANA IPv4 Address Space Registry** | IANA | <http://www.iana.org/assignments/ipv4-address-space/ipv4-address-space.xhtml> |
|  | Website | **IANA IPv4 Special-Purpose Address Registry** | IANA | <http://www.iana.org/assignments/iana-ipv4-special-registry/iana-ipv4-special-registry.xhtml> |
|  | Website | **ICANN Registry Information** | ICANN | <https://www.icann.org/resources/pages/registries/registries-en> |
|  | PDF | **Open Systems Interconnection: Basic Reference Model**  ISO/IEC standard 7498-1:1994 | ISO | <http://standards.iso.org/ittf/PubliclyAvailableStandards/s020269_ISO_IEC_7498-1_1994(E).zip> |
|  | PDFs | **IEEE 802.3™: Ethernet** | IEEE | <http://standards.ieee.org/about/get/802/802.3.html> |
|  | Posters | **Cheat Sheets**  Collection of free to download networking posters/cheat sheets. | PacketLife.net | <http://packetlife.net/library/cheat-sheets/> |
|  | Poster | **Networking Essentials Poster** | CCNA-Security.net | <http://www.ccna-security.net/wp-content/uploads/2008/12/networkingessentials.jpg> |
|  | Website | **HEAnet Schools**  Map and information on the HEAnet School Broadband Network. | HEAnet | <http://www.heanet.ie/schools> |
|  | Website | **Switcher.ie**  Sample broadband comparison website. | Forward Internet Ireland Limited | <https://switcher.ie/broadband/> |
| Internet Maps | Website | **Ireland Offline Map**  Map of broadband availability in Ireland. | IrelandOffline | <http://irelandoffline.org/map/> |
|  |  | **Global Internet Map 2012** | TeleGeography | <http://global-internet-map-2012.telegeography.com/> |
|  | Website | **Internet Traffic Report**  “The Internet Traffic Report monitors the flow of data around the world. It then displays a value between zero and 100. Higher values indicate faster and more reliable connections. “ | Internet Traffic Report | <http://www.internettrafficreport.com/> |
|  |  | **Real-Time Web Monitor**  “Akamai monitors global Internet conditions around the clock. With this real-time data we identify the global regions target of the greatest web attack traffic, cities with the slowest web connections (latency) and geographic areas with the most web traffic (traffic density). “ | Akamai | <https://www.akamai.com/us/en/solutions/intelligent-platform/visualizing-akamai/real-time-web-monitor.jsp> |
|  | Website | **Submarine Cable Map**  Mapping the world's undersea cables. “Data contained in this map is drawn from the Global Bandwidth Research Service and is updated on a regular basis.” | TeleGeography | <http://www.submarinecablemap.com/> |
|  | Website | **Submarine Cable Map 2015** | TeleGeography | <http://submarine-cable-map-2015.telegeography.com/> |
|  | Website | **Greg's Cable Map**  “an attempt to consolidate all the available information about the undersea communications infrastructure“ | Greg Mahlknecht | <http://www.cablemap.info/> |
|  | Website | **Nasa Interactive Satellite Tracker**  Live satellite map and data. WebGL and non-WebGL versions. | Nasa | <http://science.nasa.gov/iSat/> |
|  | Website | **SatBeams.com**  Satellite maps and footprints. | Satbeams SPRL | <http://www.satbeams.com/> |
|  | Website | **WiGLE**  Collaborative WiFi map of the world. | bobzilla & arkasha & uhtu | <https://wigle.net/> |
| Video | Video | **Professor Messer's Networks+ Tutorials**  Excellent video tutorials in a wide range of networking topics. | Messer Studios | <http://www.professormesser.com/network-plus/n10-006/n10-006-course-index/>  <https://www.youtube.com/user/professormesser/> |
|  | Video | **The New Boston**  Networking tutorials. | Bucky Roberts | <https://www.thenewboston.com/videos.php?cat=44> |
|  | Video | **Fiber optic cables: How they work** | Engineer Guy | <https://www.youtube.com/watch?v=0MwMkBET_5I> |
|  | Video | **How It's Made: Fiber Optics** | Discovery / Science Channel | <https://www.youtube.com/watch?v=u1DRrAhQJtM> |
|  | Video | **EXFO Tube**  EXFO's Animated Glossary of Fiber Optics | EXFO | <https://www.youtube.com/user/EXFOTube> |
|  | Video | **Emerald Bridge Fibres Network**  **A view of cable laying across the Irish Sea.** | ESB Telecoms | <http://www.esbtelecoms.ie/emerald_bridge/overview.htm> |
|  | Video | **The Telegraph Field - Valentia Island** | Telegraph Field Valentia | <https://www.youtube.com/watch?v=ywSJ7-Qri9w> |
|  | Video | **American Experience: The Great Transatlantic Cable** | PBS | <http://www.pbs.org/wgbh/amex/cable/>  <https://www.youtube.com/watch?v=cFKONUBBHQw> |
|  | TV‡ | **Modern Marvels: Transatlantic Cable** | History Channel |  |
|  | Video | **How it's Made: Copper Communications Cables** | Superior Essex | <https://www.youtube.com/watch?v=G1XKqYlDVfA> |
|  | Video | **Explore a Google data center with Street View** | Google | <https://www.youtube.com/watch?v=avP5d16wEp0> |
|  | Video | **Networking 101** | Cisco | <https://www.youtube.com/playlist?list=PL2D6D953CAEEA70A6> |
|  | Video | **AT&T Tech Channel**  “The AT&T Tech Channel is your source for originally-produced videos about the past, present and future of the world of technology. From the depths of tech history to the latest in Cyber Security, you'll find something to feed your inner geek at the AT&T Tech Channel. “ | AT&T | <http://techchannel.att.com/>  <https://www.youtube.com/user/ATTTechChannel> |
|  | Video | **TED Talks**  “TED is a nonprofit devoted to spreading ideas, usually in the form of short, powerful talks (18 minutes or less).” | TED Talks | <http://www.ted.com/topics/technology>  <http://www.ted.com/topics/internet> |
|  | TV | **NerdTV**  Free online interviews with technology pioneers (2005-2006). | PBS | <http://www.pbs.org/cringely/nerdtv/shows/> |
|  | TV‡ | **BBC Horizon: Shock and Awe: The Story of Electricity** | BBC | <http://www.bbc.co.uk/programmes/p00kjq6d>  <https://www.youtube.com/watch?v=Gtp51eZkwoI> |
|  | TV‡ | **The Genius of Invention: Communication** | BBC | <http://www.bbc.co.uk/programmes/b01qb0p5>  <https://www.youtube.com/watch?v=PIf0FmLr_Ww> |
|  | TV‡ | **In Orbit: How Satellites Rule Our World** | BBC | <http://www.bbc.co.uk/programmes/b01f6qpq>  <https://www.youtube.com/watch?v=u2gXKJKtl3U> |
| Podcasts | Podcast | **Computing Britain**  “Hannah Fry looks back at 75 years of computing history to reveal the UK's lead role in developing the technologies we rely on today.” | BBC | <http://www.bbc.co.uk/programmes/b06bq6j1/episodes/downloads> |
|  | Podcast | **Digital Human**  “Aleks Krotoski explores the digital world.” | BBC | <http://www.bbc.co.uk/programmes/b01n7094/episodes/downloads> |
|  | Podcast | **Click**  “Technological and digital news from around the world.” | BBC | <http://www.bbc.co.uk/programmes/p002w6r2/episodes/downloads> |
| Maths | Website | **The Binary Game**  Excellent fun tool for developing binary literacy. | Cisco | <http://forums.cisco.com/CertCom/game/binary_game_page.htm> |
|  | Website | **Maths is Fun**  Good source for simple supplementary maths instruction for binary and hexadecimal required in networking. | MathsIsFun.com | <http://www.mathsisfun.com/binary-number-system.html> |
|  | Website | **Binary to Decimal to Hexadecimal Converter** | MathsIsFun.com | <https://www.mathsisfun.com/binary-decimal-hexadecimal-converter.html> |
|  | Website | **Hexadecimal Decimal Binary and Octal Converter** | Vimtech Ltd | <http://calc.50x.eu/> |
| Devices & Cabling | Websites | Perhaps one of the best ways to explore the real world for devices and cabling is to explore options and prices in the stores. Amazon, eBay, and Maplin, etc., are probably familiar to everyone. CableMonkey.ie may not be so familiar but has proved a good source for cable specifications and pricing.  Samples of cabling and connectors are of course useful for the classroom. |  | [http://amazon.co.uk](http://amazon.co.uk/)  [http://ebay.ie](http://ebay.ie/)  [http://maplin.ie](http://maplin.ie/)  [http://cablemonkey.ie](http://cablemonkey.ie/) |
|  | Hardware | Not a downloadable resource, but worth listing anyway.  The networks teacher will benefit from a number of basic devices (hubs, switches, and routers) and tools (multimeter, crimping tool, wire-stripper) and well as supplies of sample cable.  A range of devices can be useful alongside use of virtual machines and labs whenever available: Android and iOS phones, tablets and TV dongles, games machines, Apple, Linux and Windows PCs.  The Raspberry PI in particular is ideally suited to a multitude of networking and IT projects.  A compass or a mobile phone compass/metal detector app can be a useful illustration of EMI. |  | [http://amazon.co.uk](http://amazon.co.uk/)  [http://ebay.ie](http://ebay.ie/)  [http://maplin.ie](http://maplin.ie/)  [http://cablemonkey.ie](http://cablemonkey.ie/)  <https://www.raspberrypi.org/> |
| Modelling Tools | Software | **Pencil**  Cross-platform, free and open-source drawing tool. | Evolus | <http://pencil.evolus.vn/> |
|  | Software | **Dia**  Cross-platform, free and open-source drawing tool. | The Dia Developers | <http://dia-installer.de/> |
| Network Tools | Website | **Hea.net**  Access to statistics and information on the Heanet external connections, backbone and networks – including schools broadband – and “Looking Glass” online testing tools. | HEAnet | <http://www.hea.net/> |
|  | Website | **SpeedTest.net**  Visual speedtest and comparison tool. | Ookla | <http://www.speedtest.net/> |
|  | Website | **SpeedOf.me**  HTML 5 alternative to SpeedTest.net | SPEED OF ME | <http://speedof.me/> |
|  | Website | **IP Chicken**  Get your router's external IP address. | IPChicken | <http://www.ipchicken.com/> |
|  | Website | **Info Sniper**  Attempt to geolocate an IP address. | infoSNIPER.net | <http://www.infosniper.net/> |
|  | Website | **Visual Traceroute**  Illustrate Internet routing from a set of testing servers. | VisualRoute | <http://visualroute.visualware.com/> |
|  | Website | **HWAddress**  Lookup MAC addresses and companies. |  | <http://hwaddress.com/> |
|  | Software | **Bping**  Audible ping alternative for Windows. Useful and fun for the classroom when testing connections – especially between rooms. | [wrybread@gmail.com](mailto:wrybread@gmail.com) | <http://gizmoware.net/bping/> |
|  | Software | **WireShark**  Cross-platform free open-source network (wired and WiFi) passive wire sniffing tool. Perfect educational tool for parsing the Ethernet frame. | Wireshark Foundation | <https://www.wireshark.org/> |
|  | Software | **TCPDump**  Free open-source cross-platform command-line alternative to WireShark. | Tcpdump/Libpcap | <http://www.tcpdump.org/> |
|  | Software | **Fing**  Free Android app. Scans network and machine services. | Overlook | <https://play.google.com/store/apps/details?id=com.overlook.android.fing> |
|  | Software | **Wifi Analyzer**  Free Android app. Monitors wifi signals/channels. | farproc | <https://play.google.com/store/apps/details?id=com.farproc.wifi.analyzer> |
|  | Software | **LinSSID**  LinSSID is “graphically and functionally similar to *Inssider*” (commercial Windows software from MetaGeek.com). | wseverin | <http://sourceforge.net/projects/linssid/> |
|  | Software | **VNC Viewer for Chrome** | RealVNC Limited | [http://chrome.google.com/webstore/detail/vnc%C2%AE-viewer-for-google-ch/iabmpiboiopbgfabjmgeedhcmjenhbla?hl=en](http://chrome.google.com/webstore/detail/vnc®-viewer-for-google-ch/iabmpiboiopbgfabjmgeedhcmjenhbla?hl=en) |
|  | Software | **PuTTY**  Free portable Windows SSH/Telnet client. | Simon Tatham | <http://www.chiark.greenend.org.uk/~sgtatham/putty> |
| Security Software | Software | **AVG Free** | AVG Technologies | [http://free.avg.com](http://free.avg.com/) |
|  | Software | **AVAST** | AVAST | [http://www.avast.com](http://www.avast.com/) |
| Lab Tools | Software | **VirtualBox**  Free and open-source virtualisation software. Create and test virtual network and client-server relationships. Store and run from a library of multiple operating systems and pre-installed appliances easily in the lab. Integrates with GNS3. | Oracle | <https://www.virtualbox.org/> |
|  | Software | **VMware Player**  Free proprietory virtualisation software. No longer advertised on the company site but still available in the downloads at this time. | VMware | <https://my.vmware.com/web/vmware/free#desktop_end_user_computing/vmware_player/6_0|PLAYER-607> |
|  | Software | **Packet Tracer**  A tool for describing, modelling and testing, network scenarios. Invaluable for demonstrating the movement of packets through the network. Proprietory software but still worth a mention as it may be available to you as part of a centre's involvement with Cisco Academy. | Cisco | <http://www.cisco.com/web/learning/netacad/course_catalog/PacketTracer.html> |
|  |  | **iTALC**  Free open-source PC lab management software for classroom monitoring and support using VNC (currently requires a VNC server running without password protection in Windows 7) – as well as a useful client-server example. | iTALC | <http://italc.sourceforge.net/> |
| Application Software | Software | **Browsers**  It can be useful to have a selection of browsers: IE, Chrome, Firefox. | Microsoft  Google  Mozilla Foundation | <http://windows.microsoft.com/en-IE/internet-explorer/download-ie>  <https://www.google.com/chrome/>  <https://www.mozilla.org/en-GB/firefox/> |
|  |  | **ThunderBird**  Free open-source cross-platform email client. | Mozilla Foundation | <https://www.mozilla.org/en-US/thunderbird/> |
|  |  | **FileZilla**  Free open-source cross-platform graphical FTP client. | Mozilla Foundation | [http://filezilla-project.org](http://filezilla-project.org/) |
|  |  | **Skype**  Popular VoIP client. | Microsoft | <http://www.skype.com/en/> |
|  | Software | **LAN Games**  Useful as examples of client-server relationships on a network which will resonate with younger learners, for LAN testing, and a classroom reward for constructing a working network, there are a number of free or open-source multi player LAN games available. | | |
|  |  | **Team Fortress 2**  Free to play. | Valve | <http://store.steampowered.com/app/440/> |
|  |  | **Wolfenstein: Enemy Territory.**  Free, cross-platform. | Splash Damage | <http://www.splashdamage.com/content/wolfenstein-enemy-territory-barracks> |
|  |  | **World of Padman**  Free, open-source, cross-platform. | Padworld Entertainment | <http://www.indiedb.com/games/world-of-padman/> |
|  |  | **Teamviewer**  Free for private use; remote access to a GUI server/OS. | TeamViewer | [http://www.teamviewer.com](http://www.teamviewer.com/) |
|  |  | **VNC**  Virtual Network Computing | RealVNC Limited | [http://www.realvnc.com](http://www.realvnc.com/) |
| News & Media | Website | **Slashdot**  "News for Nerds. Stuff that Matters" | DHI Group, Inc. | <http://slashdot.org/> |
|  | Website | **BBC Technology News** | BBC | <http://www.bbc.com/news/technology> |
|  | Website | **The Guardian Technology News** | The Guardian | <http://www.theguardian.com/uk/technology> |
| Further Resources |  | See also the Physical and Logical Networking 6N2093 resource list. Many of the topics broadly overlap or may otherwise provide useful tools for teacher preparation and course delivery. In particular, server software and GNS3 modelling may prove useful at Level 5 for teacher development of classroom labs and scenarios. |  |  |

†While *Wikipedia* is crowd-sourced and thus not an intrinsically reliable academic reference, it has proved to be a very useful starting point for exploring technical information and context in networking and IT generally.

‡ May not be currently available on TV, online, or as DVD; but might be worth keeping an eye out for or searching for online.

**Useful Organisations:**

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| **Name** | **Contact Information** |
| ICANN | <https://www.icann.org/> |
| IANA | <http://www.iana.org/> |
| HEAnet | <http://www.heanet.ie/> |
| Internet Service Providers' Association of Ireland | <http://www.ispai.ie/> |
| Commission for Communications Regulation | <http://www.comreg.ie/> |
| Irish Internet Association | <http://www.iia.ie/> |
| National IT Teachers Association (NITTA) | <https://sites.google.com/a/cfedundrum.com/nitta-brown-bag-sessions-beta/> |

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| **MOOCs (Massive Online Open Courses)** | |
| Free access to online courses  Search regularly for new courses and new start dates | https://www.mooc-list.com/ |