CA106 Web Design

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History of the Internet

- Terminals attached to mainframe computer
- From mid 1960's packet-switching network
  - US Government agency + few universities
- 1970's US Advanced Research Projects Agency (ARPA) furthers packet-switching development and develops ARPANET. X25 and other network types being developed

- 1973: First intercontinental connection (University College London)
- *[Bill Gates creates Microsoft]*
- 1978: First international packet-switching network (IPSS)
- Hosts became responsible for reliability of network
- USENET develops email, chat, discussion etc.
- Commercialisation of network
- 1981 Standards published. TCP/IP developed
- 1989 Europe integrated with US internet

Developments

- 1985: Forerunner of America Online (AOL) launched by Steve Case
- 1990: Tim Berners-Lee develops Internet computer language and address system
- 1991: First browser (text)
- 1993: Mosaic launched
- [1994: First World Wide Web Consortium Conference]
- 1995 Amazon launched by Jeff Bezoz

- 1995: eBay basis set up
- 1995: Yahoo launched
- 1998: Google set up
- 1998: ICANN, the Internet Corporation for Assigned Names and Numbers established

- 2000:…….the dot com bubble

- 2004: Google stock market launch

This Course

- How the internet works
  - Architecture
  - Browsers, servers etc
- Web authoring
  - Creating web sites using HTML
  - Advanced technologies - XHTML/CSS JavaScript etc.
  - Design tools

Organisation of Course

- Two lectures per week – Monday at 11 and 12.
- Lab sessions – only if required
- End of semester exam – worth 50% of module marks
- Continuous assessment (projects) – worth 50% of module marks
- Course materials available on Moodle:
  - Log on to http://moodle.dcu.ie and choose CA106

What is the Internet?

- Network of networks
- Computers communicate over the Internet using TCP/IP (Transmission Control Protocol/Internet Protocol)
- Client/server architecture

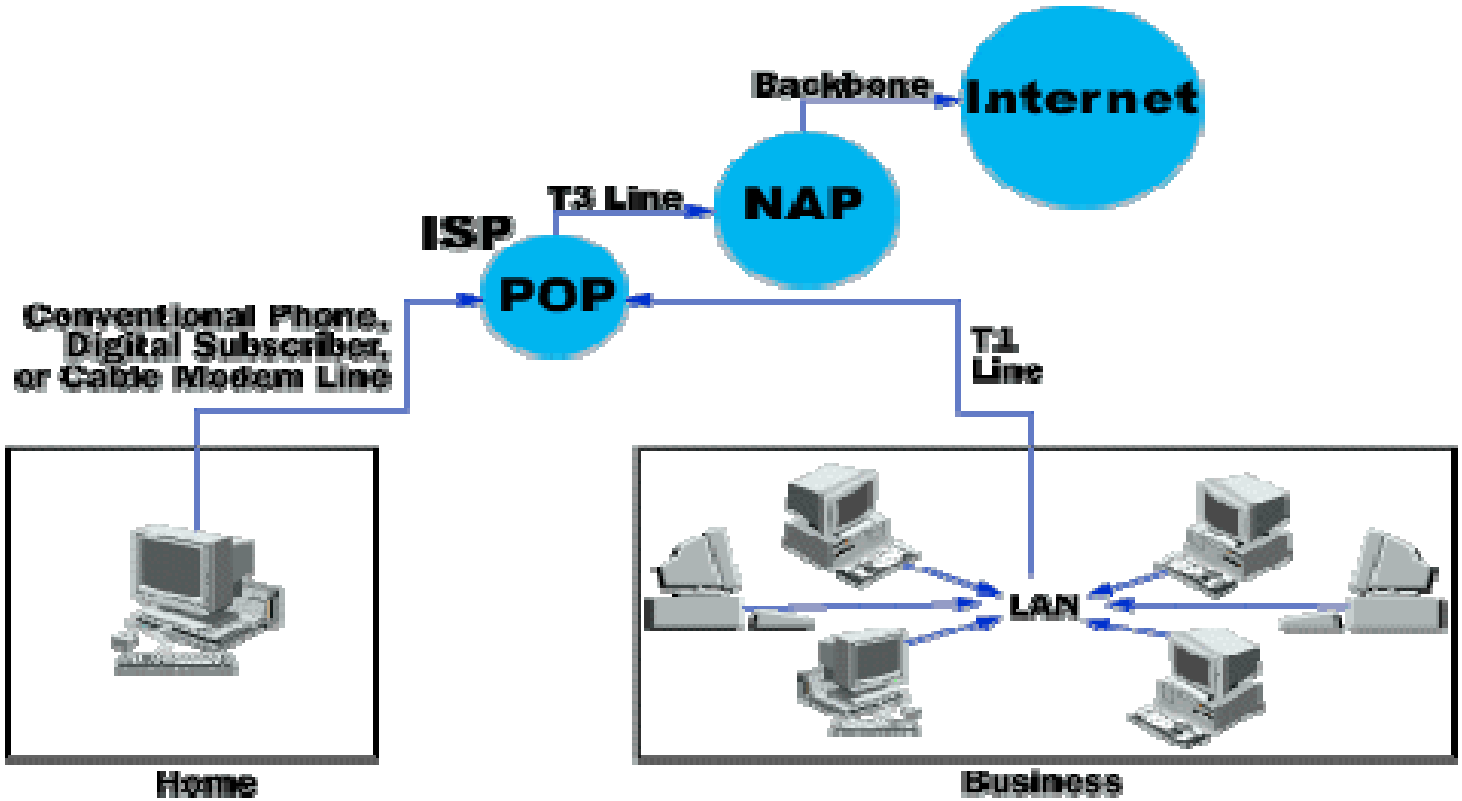
Who runs the Internet?

- Internet Society
- IETF (Internet Engineering Task Force) TCP/IP
- W3C (World Wide Web Consortium) MIT
- Private Companies – domain registration

Domain Registration

- IANA (Internet Assigned Numbers Authority) allocates blocks of numbers to five regional IP address registries
- Regional authorities allocate smaller blocks to large Internet Service Providers (ISP's)
- …which allocate blocks to smaller ISP's
- …..which allocate smaller blocks to network customers
- ……which allocate addresses to individual machines

Infastructure of Internet



Infrastructure of the Internet

- How computers send data across the Internet
- How TCP/IP works
- How addresses and domain names work
- How routers work

How computers send data across the Internet

- TCP/IP protocol
- Hardware:
  - Hubs
  - Bridges
  - Gateways
  - Repeaters
  - Routers

How computers send data

- TCP breaks data into packets
- Computer sends these packets – on local network, through ISP etc.
- Packets travel through many levels of networks, computers etc to reach destination

Hardware which transmits data

- Hub – links groups of computers
- Bridge – links one Local Area Network (LAN) with another LAN
- Gateway – allows communication between different types of networks
- Repeater – amplifies data (needed for long distance transmission)
- Router – used when transmitting between networks; selects quickest route

TCP/IP

- Messages broken into packets + data to help the packet find its way through Internet (TCP)
- Series of switches or routers (IP) ensures packets arrive at correct place

Packets

- Hardware restriction – packets of 1500 bytes each
- Packet given header with order of packet & checksum (based on amount of data)
- Each packet put into separate IP envelope, containing addressing information
- IP envelope header contains:
  - Sender's address
  - Destination address
  - Length of time packet should be kept

  - As packets sent across Internet, routers examine IP envelope to find best route
  - Packets arrive out of order. TCP calculates the checksum for each packet (error checking) and assembles packets into original form at destination
- Winsock software is intermediary between Internet and PC

To use TCP/IP

To connect to the Internet and use TCP/IP

- Direct connection (LAN, cable modem, DSL – needs network card and hardware driver)
- Dial up connection (Modem)
  - Serial Line Internet Protocol (SLIP)
  - Point-to-Point Protocol (PPP)

Internet Addresses and Domain Names

- Domain Name System (DNS) – way computers contact each other
  - E.g. to visit web site, type in address (URL):

    www.computing.dcu.ie
- Numbers convenient for computers
  - TCP/IP uses its DNS application to provide name-to-address translation
  - DNS translates 'English' address into IP address like

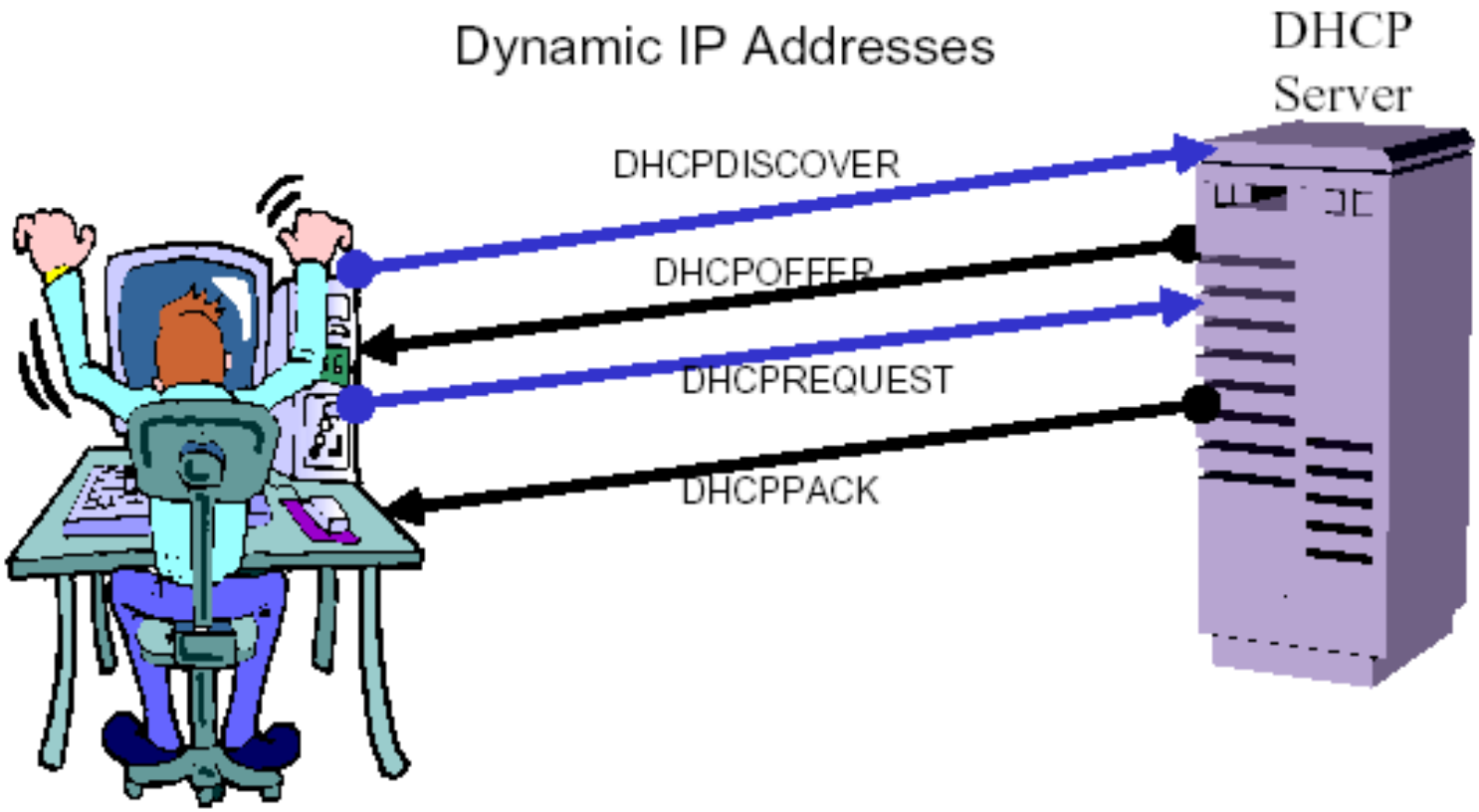
    136.2.6.111

  All computers connected to the Internet have an IP address – defines location

IP Addresses

- Static IP Address – manually assigned to a computer, never changes
- Dynamic IP Address – automatically assigned by the server when you connect, usually using Dynamic Host Configuration Protocol (DHCP)

How Dynamic Address Obtained



Domains

- Major domains and minor domains:

  www.computing.dcu.ie

  .ie is the major domain

  .dcu is Dublin City University domain

  .computing is School of Computing server

Domain names

- Some U.S. domain names:
  - **.edu** educational establishment
  - **.com** commercial business
  - **.gov** government ……etc. etc.
- Country domain names:
  - **.ie** Ireland
  - **.uk** United Kingdom
  - **.de** Germany
  - **.za** South Africa ……etc. etc.

Network Size

- Class A – addresses for large networks with many devices
- Class B – addresses for medium-sized networks
- Class C – addresses for small networks (fewer than 256 devices)

IP address and Network size

- IP address in two parts
  - Part 1 identifies network
  - Part 2 identifies node (host or actual computer)
- IP address expressed as four eight-bit numbers, separated by periods.
- Example: 136.5.6.25

  Class A address range: 1-126

  Class B address range: 128 – 191

  Class C address range: 192 - 223

URL (Uniform Resource Locator)

- URL's identify each file on the web:

http://www.computing.dcu.ie/~lkillen/teaching.htm

- **http://** tells the browser the protocol is "hypertext transfer protocol" – rules by which the document is transferred.
- **www.computing.dcu.ie** is host name
- Follow host name with path to directory
- **teaching.html** is the file holding the document

Routers

- ‘Traffic cops’ of the Internet. Get data to destination via most efficient route
- Check IP envelopes for destination address
- Calculate best route and sends package
  - Router sends packet to another router (closer to destination), which sends to another…..
  - Router considers
    - Traffic congestion
    - Number of hops

Routers

- Routers have two or more physical ports
  - Input port (routing process run, routing table)
  - Output port (results from routing, defines route packets should follow)
  - Input queue (holding area for input)
- Routing table
  - Static – specifies specific routes
  - Dynamic – can have multiple routes
- Routing protocols
  - Interior – Interior Gateway Routing Protocol(IGRP))
  - Exterior (Exterior Gateway Protocol (EGP), now replaced by Border Gateway Protocol (BGP))