Week 25 Lab Worksheet

This worksheet contains no assessed questions, but the exercises will illustrate points from lectures and improve your understanding. The last exercise will be useful preparation for the exam.

Investigating Processes

Press "Ctrl-Alt-Del" and select "Task Manager". This will start the Task Manager, an application which displays information about the tasks or processes which are being executed, and the resources they are using.

Click on the "Applications" tab to see a list of the applications which are running. See how this changes when you start a new application, or close a running application.

Click on the "Processes" tab to see a list of all the processes which are running. These are the "tasks" which are taking it in turns to be executed by the CPU: this is where multi-tasking is working. Notice that there are far more processes than the number of running applications: the operating system uses several processes for its own purposes. For example, the process called "EXPLORER.EXE" is the user interface of the operating system itself: it controls the desktop.

Click on the "Performance" tab to see a graph of CPU usage. This shows the proportion of time the CPU is spending on executing applications, rather than managing multi-tasking. Start a new application (for example, Microsoft Word) and observe the corresponding peak in CPU activity.

Within the "Applications" view, it is possible to terminate any of the currently running applications by clicking on "End Task". Try this out, but beware that terminating an application may result in loss of data because it may not be given a chance to tidy itself up. Sometimes it is necessary to terminate applications in this way, if they get themselves into error states from which they are unable to recover.

It is also possible to terminate internal operating system processes in the same way, within the "Processes" view, but this is not a good idea because they are necessary for the normal operation of the OS. For example, by terminating the "EXPLORER.EXE" process you can remove the user interface of the operating system; the system will continue to run without the "Start" menu, the task bar or the normal desktop view. It would then be necessary to log out, and log in again to restore normal service.

Investigating the Internet: DNS Lookup

Start Internet Explorer and go to the site `www.infobear.com/cgi-bin/nslookup.cgi` which provides an interface to the Domain Name Service. You can enter any domain name and find out the corresponding IP address. You also have a (limited) choice of which DNS server to use.

If this site is not accessible, try `www.enc.com.au/itools/nslookup.php` which provides a similar service. (You might want to try this one as well in any case, as it returns a more detailed answer).

Enter a domain name (for example `news.bbc.co.uk`) and click on the button "Run nslookup". (What is happening is that a program called `nslookup` is executed on the machine which is running the web server for `www.infobear.com`). You will see an IP address: four decimal numbers separated by dots. Type this IP number into the address field of Internet Explorer and see what happens.

It is possible for a domain name to resolve to several IP addresses. Typically this means that an organisation is using several servers to provide the same service, probably because a high volume of requests is expected. Try looking up `www.nascar.com` to see an example of this.

Investigating the Internet: Route Tracing

In Internet Explorer, go to the site `www.traceroute.org` which is a catalogue of sites providing route tracing services. A good one to try is University of California, Berkeley (scroll down or follow the link to USA, then click on the Berkeley link). Type a domain name (or IP address, if you like) into the box and press Enter. For example, try `www.dcs.gla.ac.uk` which is the department web server. What happens is that a program called `tracert` is executed on the machine running the route tracing service — this machine is presumably located in California. This program sends a series of packets to the chosen address (and measures how long they take to arrive), producing a list of intermediate points which the packets pass through. How many network hops does it take for packets to reach Glasgow from California? You will see all sorts of domain names and IP addresses in the listing. IP addresses beginning with 130.209 are in the University of Glasgow. Domain names ending with `.ja.net` are part of JANET, the network used by UK universities to access the internet.

Try some of the other route tracing servers on the original list at `www.traceroute.org`. Each one will trace routes starting from itself, so you can see routes to Glasgow from various parts of the world. Can you see any differences in route lengths from different countries or different continents?

Investigating the Internet: HTTP Requests and Responses

In Internet Explorer, go to the site `www.rexswain.com/httpview.html` which allows you to see the exact content of the HTTP request and response when the browser accesses a website. Enter the name of a website into the URL field, for example `www.dcs.gla.ac.uk`, click SUBMIT and see what comes back. The header contains some information about the server, and specifies what kind of information follows (in this case, HTML code). The content is the HTML code that the browser has to convert into the visual representation of a web page.

Creating an HTML Document

In AMS, set up the exercise Week25. Go into the Week25 folder in your CS1Q workspace and double-click on the file "lab5". Because it is an HTML document (as you can see by selecting "Details" from the "View" menu), Internet Explorer will start, and you will see a very simple page with some text and a link. Select "Source" from the "View" menu to see the HTML code which produces this page.

In your Week25 folder, double-click on the file "lab5word". This is also an HTML document, which was produced by "Save as web page" from Microsoft Word. View the source and compare it with the previous one; you will see that Word inserts a large amount of formatting information into the HTML file.

The file "lab5" can be edited with Programmer's File Editor or Notepad. The web page produced by "lab5word" can be edited directly with Word. Using Word is an easy way to produce web pages, although more specialised HTML editors give much more control over the structure of the page.

The department does not allow first year students to publish web pages, so these HTML files can only be viewed locally; you can't make them visible from the department's web site. However, if you have internet access at home, or if you sign up with a commercial provider of web space, you could create and publish your own web site.

Useful Preparation for the Exam

Once we have a network (for example, the internet), various distributed applications are possible. One example of a distributed application is airline booking: customers anywhere in the world can find out about flight times, prices, and ticket availability.

Earlier in the year you evaluated airline web sites. These web sites take a particular approach to implementing the distributed application of airline booking: they take advantage of the fact that everyone has a web browser, and design a web site which provides the functionality of flight queries and booking.

The airline booking application is a client-server system: the client is a web browser and the server is a web server connected to databases which store detailes of flights and bookings.

If we think about airline booking as a client-server system rather than a web application, then we can see that there are other ways to implement it. As long as the network exists, a client-server system can be implemented independently of the web. The server and clients are just application programs which communicate with each other by sending messages over the network. Of course, every user who wanted to book flights would have to install the client application on his or her computer.

Think back to your evaluation of the airline booking web sites. You might want to refresh your memory by visiting some of them again. If you found any problems with them (for example, poor usability or poor response time), to what extent do you think these problems are caused by the network and to what extent do you think they are caused by the web browser interface?

If you were setting out to design and implement a flight booking system using specialised

client and server applications, instead of the web, what would you do differently? Could you improve usability? Could you improve performance by reducing the use of the network (you are free to design any protocol you like for communication between client and server — the network allows a client to send a message and the server to respond)? Would there be any effect on security? What would you have to do to make sure that the information available to the user is up to date?

Think about these questions, and discuss them with your friends, but you do not have to write anything down or hand anything in. You will find that thinking about the issues raised will be useful preparation for the exam.

Supplementary

Read Chapter 17 of *Computer Science Illuminated*.