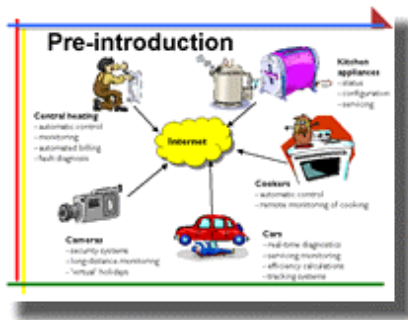


Slide 1

Greetings



Good afternoon everyone. This is the Computer Networks and Distributed Systems class (CO32006). We hope that everyone finds the module stimulating, and fulfilling.

The main source of information for the module is the WWW site at:

<http://www.soc.napier.ac.uk/~bill/cnds.html>

Here you will find all of the most up-to-date material on the module. The main elements are:

🔗 Module notes

[\[http://www.soc.napier.ac.uk/~bill/cds_notes.htm\]](http://www.soc.napier.ac.uk/~bill/cds_notes.htm)

🔗 Registration page

[\[http://www.soc.napier.ac.uk/~bill/form_cnds.html\]](http://www.soc.napier.ac.uk/~bill/form_cnds.html)

🔗 Presentations

[\[http://www.soc.napier.ac.uk/~bill/cds_presentation.htm\]](http://www.soc.napier.ac.uk/~bill/cds_presentation.htm)

🔗 Project

[\[http://www.soc.napier.ac.uk/~bill/cds_project.htm\]](http://www.soc.napier.ac.uk/~bill/cds_project.htm)

🔗 On-line test

[\[http://www.soc.napier.ac.uk/~bill/cds_tests.html\]](http://www.soc.napier.ac.uk/~bill/cds_tests.html)

🔗 Module organiser

[\[http://www.soc.napier.ac.uk/~bill/cdsMOa.htm\]](http://www.soc.napier.ac.uk/~bill/cdsMOa.htm)

You should receive a teaching pack in the next week or so, which contains all of the notes, presentations, module details, tutorials, and so on. If you did not receive one today, you should receive it in the practical session (although we may have to print a few more copies, as we currently do not actually know the total number of students enrolled on this module). All the notes, though, are available on the WWW site. The only part of it that is protected by a password is the notes session, for which the password is #~=%%-9*. If you have any questions about the module please refer to the WWW site, or send an email to the Teaching Team.

Last year the Teaching Team implemented an email support system, where students enrol onto the module from a registration page, using their email address that they use most often. This is then added to a database, and updates on the module can be sent on a regular basis. This worked extremely well, and will be extended in the current session. Thus, please register as soon as possible at:

[\[http://www.soc.napier.ac.uk/~bill/form_cnds.html\]](http://www.soc.napier.ac.uk/~bill/form_cnds.html)

and will receive confirmation of your registration within a day or so. After which you should check to see if your details are correct on the following page:

[\[http://www.soc.napier.ac.uk/~bill/cnds_reg_students.html\]](http://www.soc.napier.ac.uk/~bill/cnds_reg_students.html)

Practical sessions take place once a week for one hour, at which an academic, and demonstrator will be present. Please ask questions at this session on the practical elements of the module. If you need help at any other time, you can contact me either by email or by using MSN Messenger, and I'll try and help you. As much as possible I will post any questions relating to the module on the WWW page, so that everyone can share in the information provided. This worked extremely well with the CNDS FAQs page, last year. Also if you'd like anything added (or deleted!) from the WWW page, just ask, and I'll try and help.

A major new addition is on-line tests. These should be taken at the end of each unit. We would like to move towards a totally on-line assessment of this module, thus we will be experimenting with the use of on-line testing throughout the module, so we hope that you will participate in this. The final

examination is likely to involve multiple-choice questions, so this experience should be useful.

... lots more about the operation of the module.

---- end of the boring bit. The material covered in the next bit just provides a little taster of the background to the subject, and will not be examined.

Networks and the Internet are key technologies for the future, and are areas that have an impact on virtually every person, both a work and at home. They are now becoming part of the fabric of our lives, in the same way that electricity, gas and water are. Soon a connection to the Internet will be just a standard as having a TV aerial, or an electricity supply.

Never before in the history of mankind have we come across a technology that has grown so fast, and has had such an impact on your daily lives. The telephone, the motor car, the airplane, radio, TV, and so on, have all had a massive effects on society, but the Internet, and the networking of electronic devices, will have an even greater impact on the way that we work, and live. Without the WWW, email, remote file transfer, on-line database, and so on, we could not function efficiently. It is reckoned that in many companies the IT

infrastructure is now the most important element of their business, and a loss of any part of it, even for a short time, can cause dramatic effects. At work, many people will even leave their office if they have no network connect.

It is an area that students in any area relating to technology and computing require to study, as an understanding of how devices network together, and how the Internet operates, is key in many industries. For example for media developers it is about the successful delivery of media content over networks or the Internet, or the integration of content on WWW pages, or receiving live-data over the Internet, and so on. For WWW developers it is the understanding or the set-up of interactive WWW servers, how to receive media content over the Internet, how to interact with remote systems, how to make the content secure, and so on. For software developers it could be the understanding of the differing elements of programming over a network, or the implementation of the protocols involved, or the distribution of processes over a network, and so on. For technologists and IT managers, it is the ability to plan technological developments to achieve business objectives, and to manage technicians and engineers in an efficient way.

For IT specialists it could be the ability to plan and install networks on a small-scale (within buildings) or large-scale (over cities, countries, over even, over the world), to be able to fault-find over networks, to provide security, and so on. For networking specialists it could be the design of complex networks, with the interaction of all the different elements with them, the distribution of processes, file systems, and so on. Of special important to everyone is the users must have an understanding of how to keep their own data secure against others. Thus an important element of this module will be the investigation of network security systems.

For all it may be the first time that you will be presented with a model of a complete computing system, which will show how systems can be abstracted in different ways. If we had special glasses, we could switch them between all the different layers that we could view the Internet, and how application programs communicate over a network. At the lowest levels we would see the electrical or light pulses on cables, at another level we would see the 1's and the 0's, and the next level we would see data frames, which looked like trains passing stations. At the level above, we would see data packets making their way over the Internet, and so on. It will also show how the complex architecture of the Internet is put together, and how IT

Whiteboard, where ideas can be sketched.

An increasing usage of the Internet is to provide access to database systems. These could range from providing access to bank details to interrogating sports results. Databases are now becoming so important that they are often mirrored in many places, where an updated to one database, will be mirrored to other ones. This is important in disaster recovery systems, where the database is mirrored on different systems, in different geographical areas. A fault in one of the system does not cause any loss of data. The importance of this was seen in the terrorist bombing in the New York, where the New York stock exchange was able to be recovered within days of a large part its database being damaged.

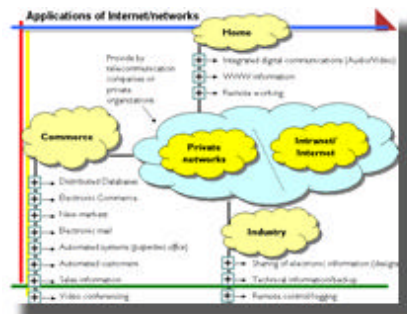
An increase amount of information is also being gained from data mining which involves systems search through databases to determine information about users. This has become so refined that WWW pages can be generated based on the person's interests.

Slide 4

Advantages of Networks

Networking and the Internet have an impact on virtually every areas of work and home life. In the home there is now an increase in the number of

workers would work from home, as many people only need a computer and a network connection to work these days. In fact with the increase in mobile computing, it is possible to work with a mobile device, such as a mobile phone, or PDA, and, of course, a network connection. With the increase in the usage of mobile communications, especially with new WAP technologies, such as 2.5G and 3G, there will be an increasing amount of content delivered to mobile devices. Within a few years we could see full video and audio delivered to mobile devices. At home, technologies such as ADSL will provide connections which are as good, if not better, than connections with companies.



In industry the Internet and networks have allowed designers to share their designs with others. Along with this it is also easier for them now to provide technical information over networks, such as providing on-line help, downloadable driver updates, and so on.

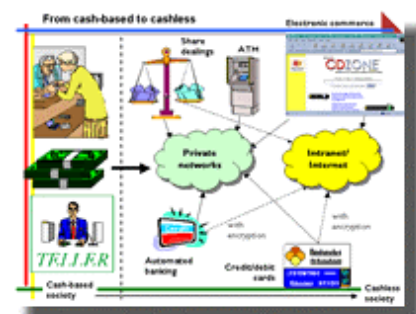
With the robustness, and cheapness, of the Internet, it

is also now possible to control and monitor equipment remotely. This has a great advantage in unmanned situations, such as on unmanned oil platforms, pumping stations, and so on. In fact soon many buses and trains will have transmitters on them, which send signals, over the Internet, to remote databases, which are then used to send information to passengers who are waiting for them, either on their computer screen, or more typically, on their mobile device.

In business the Internet has many advantages as it can be used to automated many transactions which required low-level skills. Thus many organisation are moving towards automating much of the 'back-end' business, which involves the infrastructure for the buying and selling of their products. Electronic mail is an integral part of this, and is now the foundation elements of most organisations, without it few large companies could now operate effectively.

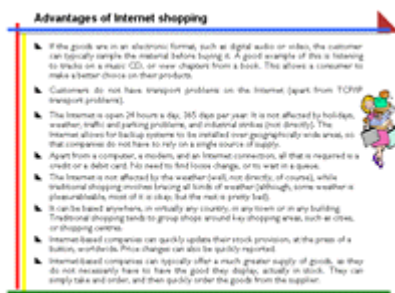
Slide 5

From cash-based to cashless



The Internet and networks are changing the way that we do business, and our home lives. A major change has been in the move away from a cash-based society, where we pass pieces of coloured paper, to one which is based on the electronic exchange of money. At one time the exchange of electronic finance was achieved over private network, but now it is much less expensive to transmit these transactions over the Internet. As the Internet is an unsecure system, the transaction must be encrypted in some way.

Slide 6 OSI Model



So everyone understands the advantages of electronic commerce for businesses, but what about users buying things from home? Well in many cases Internet-based shopping is better than normal physical shops, especially if the goods are in a digital already. It is easy now to sample music from an on-line server, and decide whether they want to buy the product, or not.

The Internet is also open every day of the week, at

every hour, so you can shop whenever you want. There's also no transport problems (apart from TCP/IP communication problems), and the weather can never affective your shopping (which is an important factor if your shopping in Edinburgh). Some of the other advantages are outlined in this slide.

The Internet also does not respect any borders around countries, so you can shop where want, at the time you want.

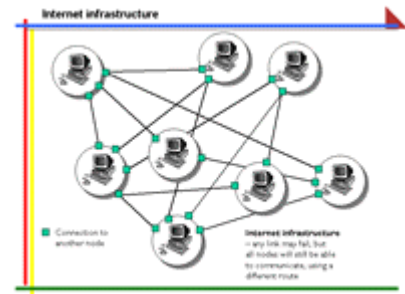
Slide 7 OSI Model



So what about the disadvantages? Well, in many cases, you can't really beat touching, seeing, and selling a real product. For many products the price reduction on Internet-based shopping can be overruled by the cost of the postage and packing.

Initially too there were many problems with Internet shopping, with WWW-based system, but many of these systems can now cope with the demand.

Slide 8 OSI Model



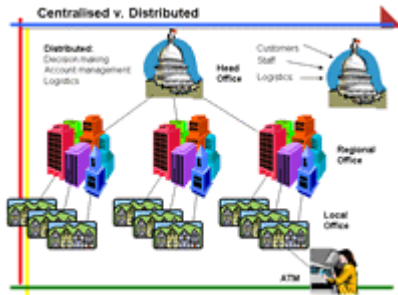
Is what is the Internet? Well it's really just a collect of devices who use a common networking protocol (TCP/IP), and who have been granted a special network address (known as an IP address). This network address is unique, at any given time, to the computer which connects to the Internet, and can either be fixed (that is, assigned permanently to the computer), or it could be assigned from a server, or from an ISP, for the time of the connection.

The Internet has been designed to withstand a fault on any part of it, and the network will recover, and find alternative routes from a source to a destination. Thus there is no real structure to the Internet (as a formal structure would likely cause weaknesses in its architecture). Devices called routers support this random architecture, as they pass information to each other on the best way to get to a destination. But remember that the best route might not actually mean the fastest route, it may also relate to the

cheapest route, or the most reliable, or the one which will not be swamped by other data, and so on.

Slide 9

Centralized v. Distributed



The Internet is one of the largest distributed systems ever created. So what's a distributed system? Well if you think of it like a bank. If the bank was a centralised business then all of its employees and customers would have to do business with the main office. All of the logistics would be run from the central place. The major problem with this is that the whole system is dependant on the central office. If it were to have problems, such as local transport problems, or if their computer failed, then the whole of the bank would be affected. It is also likely that the central office could not cope with all its customers at the same time. Thus a much better model is to distribute the functions of the bank. Normally this done through regional and local offices. Many of the decision making facilities will be devolved to the regional offices, and the local offices actually deal the customers. This system works much

better as many parts of it can work independently from the others. A problem in one local branch will not effect other branches. This is similar to the Internet, where things like processing and data can be distributed around the network. A fault in one part will not really cause problems in other parts.

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Subject
CNDS

Lecture
Pre-introduction