BTech 450

Final Report

Edmond Chan

October 2002

A project report submitted in partial fulfilment of the requirements for the degree of Bachelor of Technology in Information Technology, The University of Auckland, 2002

Abstract

This BTech 450 final report details the project I completed in year 2002 for the degree of Bachelor of Technology in Information Technology, at The University of Auckland. The project was sponsored and supervised by Computers New Zealand.

The first part of our project is to establish the infrastructure of an engineering and IT based system design and project management operation. The second part is to provide IT services for a proposed hostel building development. The key to solving these problems is to apply the theories and techniques we have learnt from our BTech programme to solve real life technical problems.

For the hostel project I have done background research on available technologies, how technologies are applied, and how they integrate together in a system. I was working with the Common Cable Design standard AS/NZS 3080, Request for Proposals and the reviewing of proposals submitted by contractors.

For the business infrastructure project, I have learned about company procedures and how a company culture develops in the early stages. I gained a lot of practical experience on PHP programming, how to construct and use a Gantt chart to organize the team, and personally constructed an intranet server by reusing old hardware. A Linux O/S was installed and configured with Apache, MySQL and PHP to provide the platform for our Intranet Web Application project.

This project is the most rewarding course I have studied during my 4 years at the University of Auckland. It bridges the gap between tertiary study and industrial work, by leading us to use the theories we learnt in real life applications. The end project deliverable is also a big achievement, as according to the supervisor it could only be done by IT consultants with at least 5 years of experience.

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1. Introduction

1.1 About the Author

The following is a summary of me for the year 2002 at the University of Auckland.

Name:	Edmond Yik Man Chan
ID:	2382989
UPI:	echa050
Degree:	BTech IT (Year 4)

Semester 1 Papers:	**Semester 2 Papers:**
• BTECH 450A • SCIGEN 201 • COMPSCI 708 • INFOSYS 339	• BTECH 450B • COMPSCI 775 • COMPSCI 742

1.2 About the Project

My project is sponsored by Computers New Zealand (CNZ). Supervision is provided by Mr. TN Chan (Managing Director of CNZ) and Dr. S Manoharan (BTech Coordinator, University of Auckland). Contact details are found in section 1.4.

Computers New Zealand wishes to establish an infrastructure for an engineering division for IT system design and project management operation. As well as this infrastructure, students will be required to propose a scheme for providing facilities such as computers, internet and security to a future student hostel in central Auckland. Students will be required to do business planning, research and marketing, project management and design as well as interfacing with customers and third party suppliers.

BTech IT Project 2002:	Computers New Zealand
Project Period:	04/03/2002 - 26/10/2002
Workload:	10 hours per week
Supervisors:	Mr. TN Chan Dr S Manoharan
Students:	Ahmed Yousif Edmond Chan Jimmy Lim Michael Yip

1.3 About the Company

Computers New Zealand is based in Albany, Auckland. Housed in the NZ-Compucon building, CNZ is a total information solutions provider with skills and capabilities to implement information and automation systems for meeting clients' business objectives and increasing their productivity and competitiveness.

The CNZ group is directed and managed by principles that each has more than 10 years of experience within the information technology industry. Clients already served include large corporations, local governments, down to small business and home based business operations.

Services offered by CNZ:

- Full Consultancy - review of client workflow structure, appraisal of existing information systems, planning of platform installation or migration, preparation of IT policies and procedures.
- Solution Provision - customized information technology solutions from conception to turnkey delivery to staff training.
- Full Liaison - a single channel for the supply of IT equipment and services including fileservers, desktops, vendor installation, facility management, usage audits, on-site support and staff training.

1.4 Contact Details

Supervisor, Mr TN Chan (CNZ)

Email:	tn@cnz.co.nz
Company:	Computers New Zealand
Website:	http://www.cnz.co.nz/
Address:	234 Bush Road Albany Auckland New Zealand
Phone:	09 415-3303
Fax:	09 415-2202

Supervisor, Dr S Manoharan (University of Auckland)

Email:	mano@cs.auckland.ac.nz
BTech Website:	http://www.cs.auckland.ac.nz/btech450dt/
Room:	Tamaki 731.342
Telephone:	UoA Ext. 6837

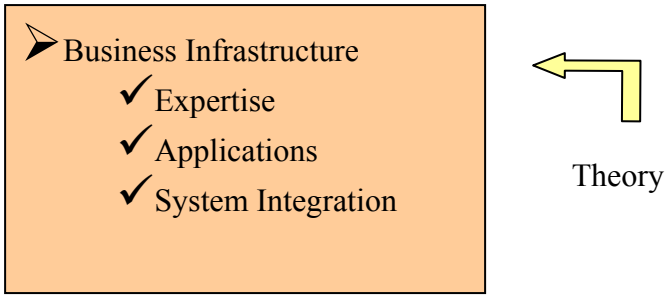
Myself, Edmond Chan

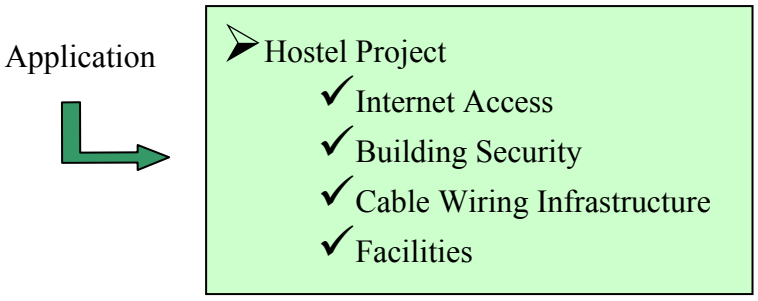
Email:	edmond@cnz.co.nz
Mobile:	021 2132055

2. Project Objectives

There are two parts to this project. The first part is to establish the infrastructure for engineering and IT based system design and project management operation. The second part is to provide IT services for a proposed hostel building development. The primary objectives are to: Apply theories and techniques to solve real life technical problems; Plan the project and team collaboration; Interface with the IT and engineering industry in NZ.

1. Theory	2. Application
The main purpose of the project is to design a Business Infrastructure, which refers to: • **Expertise:** This is identifying technical expertise and know how in the company. • **Applications:** The development of state-of-the-art technology applications. • **System Integration:** Procedures involved in system integration and project implementation.	The 2nd area is a project that provides a total solution to a 12-storey student hostel. This involves: • Internet access • Building security • Cable Wiring Infrastructure • Computing Facilities • Fire Detection and Fire Safety





2.1 My Motivation

At the end of the project, I will learn:

- **Application of Theories:**

  I will get an opportunity to apply the knowledge gained at university to solve real life technical problems and management of projects.

- **Industry Experience:**

  I will gain invaluable experience through interfacing directly with the IT and engineering industry of New Zealand. We will learn how things are handled in real life outside the scope of our university studies.

- **Teamwork:**

  Through project planning, team collaboration and individual responsibilities, we will learn how to work better in a group while in a working environment.

- **Project Management:**

  I will learn how to handle each step in the procedures from project design and planning to system integration and project implementation.

2.2 Scope of Learning Topics

These are the topics I wish to learn by the end of the project period:

Technical:

- Data communication
- Internet access and security
- LAN/WAN
- Database development
- Software programming and scripting
- Web Services
- System integration and interfacing design.

Commercial:

- The IT and engineering user market
- Value adding concept and vertical solutions
- Worldwide technology and developments
- Return on Investment
- Business models

Management:

- Time scheduling and control
- Specification control and Quality assurance
- Contracting and Cost control
- Human resource organisation

2.3 Project Deliverables

The following are my allocated project deliverables. Some deliverables may include areas of common work. In these instances, my contributions will be clearly detailed.

Part A: Business Infrastructure

a) Website planning document for Intranet
b) Intranet Web Application for Technical Reference
c) Technology Deployment Overview diagram
d) Knowledge Database of Technology
e) Project Co-ordination / Project Management
f) Reference Documents

Part B: Hostel Project

a) Request for Proposal – Information and Communication
b) Technical Design Reference Document
c) Hostel Contractor Proposal Review

Each of these deliverables will be explained in detail in the rest of the report. They will be discussed in the order of task completion.

3. Project Schedule

The two parts of the project are closely related to each other. In fact, each step of the way through each of the projects assists me in the understanding of the whole project. For example, researching and compiling the Request for Proposals for the Hostel Project allowed me to understand the procedures involved in contracting out design and implementation projects to sub-contractors that we seek. The knowledge I gained in the RFP process would then be used in the Business Infrastructure project, by compiling technical or reference documents.

In other words, the two projects are intertwined, and must co-exist to assist us in the understanding process. The business infrastructure project will run in parallel to the hostel program throughout the year. It will enable us to make use of the theory we learn in a real world application in the industry.

This is an integral learning objective in our project. To learn how to apply what we learn. A more detailed project schedule is available in Appendix A: Weekly Report and Discussion.

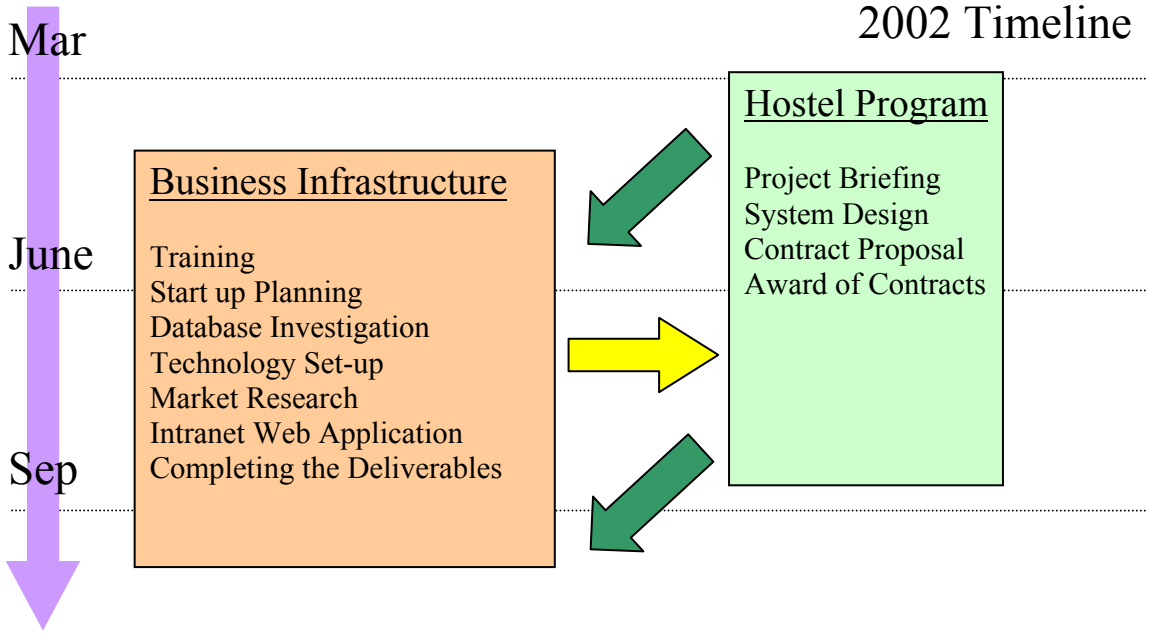
Infrastructure Project

Period	Objectives
March	Project briefing, Training, Start up planning Allocation of responsibilities
April	Project Requirement, Database Investigation
May	Finalise Web and Database Structures
June	Market Research Web and Database Design Proposals
July	Technology and Application Data Research
August	Intranet Construction
September	Fine-tune and commission Intranet v1.0 Summarise achievements

Hostel Project

Period	Objectives
March	Project briefing, Allocation of responsibilities
April	Market Research, System Design
May	Issue RFP, Budgetary Costing
June	Finalise User Requirements, Issue Tenders
July	Award Supply and Installation Contracts
August	Preparation of Operation Manuals
September	Supervision of Contractor Progress
October - December	Supervision of Installation, Commissioning and Operator Training

And the overall program flow:



4. Hostel Project – Introduction

Background

The planned building will have 121 rooms over 10 floors. It is located in the central city and is close to the University campus. It is a commercial project entirely funded by people who invest in real estate for a level of financial return that is better than bank deposits and at a risk lower than the share-market. When completed, the building owners will appoint a building manager and will rent rooms out to students on a quarterly or annual basis. The building will have a café and facilities comparable to or better than most student hostels. The top floor will have offices for up to 10 persons plus residence or the building owner. The building will have the following control and monitoring facilities.

Information Technologies for Control and Monitoring

1. Physical Security – Building front door access control, individual room access control, room lighting enabling control, central access code maintenance.
2. Phone System – PABX system for up to 10 phones on the top floor and up to 3 phones per floor. It is likely that the floor phones will be pay phones using pre-paid cards.
3. Internet Connection – Bandwidth will be rented for domestic traffic (512KB/s) and international traffic (256KB/s). We will most likely use Wireless for price and scalability reasons. We will install an antenna on the roof that points to a transmission tower within line of sight. Each room will have an Internet access point in the form of a RJ45 socket and will be given a maximum of 500MB (for instance only) per month free. Usage exceeding the maximum allowance will be chargeable. This means traffic per room will be monitored and recorded for billing purposes.
4. Smoke and Fire Detector – Each room will have a detector and may be an indicator outside the room. When it detects smoke, it will light up the indicator outside the room and trigger an audible alarm on the floor. It will provide the same visible and audible signals to a monitoring panel located on the ground floor and the manager's office on the top floor. Ideally, the events will be recorded in a computer.
5. Computer – Up to 60 rooms will have a computer installed. We have to find out whether we can link with the University intranet web content for local user access.
6. Cabling and marshalling – There should be one marshalling box per floor for organising all cabling and connections. The box may include a 12-port Ethernet hub.

The following sections will describe problems and solutions I produced relating to the Student Hostel Project. The individual problems and tasks described in this section has been sorted into per-deliverable for ease of reading, since the order of individual project objectives and the scheduling of individual tasks during the year usually carry on over long periods and/or overlap other tasks, which can be confusing.

4.1 Hostel Services – General

Problem

We are acting as a Systems Integrator to supply information technology and engineering services for the student hostel. We need to research relevant technology and study current examples of student hostels in Auckland.

The amount of information we need to obtain should be sufficient for us to draft 'User Requirement Specifications' and to specify the type of technologies to use. We need to know commercial products and their specifications that are being used in various student hostels and find out who are the service providers who did the installation for these hostels.

Methodology

We looked at a list of student hostels in central Auckland. We chose only two hostels to study, since the time assigned for this task was limited. Methodology involved researching on the internet, email enquiries and in-person interviews. We interviewed Mike, the IT manager of Railway Campus, and Michael Cochrane, the residential assistant of Grafton Hall.

Solution

The reports I compiled for this task included:

- general hostel information
- facilities for students
- costs to students
- telephone facilities
- local area network infrastructure
- internet access
- security
- network equipment/hardware installed
- installation contractor used

4.2 Hostel Services – Local Area Network Infrastructure

Problem

The student hostel will install and maintain a local area network serving approximately 150 computers including servers. These computers will have restricted access as the network also includes a permanent internet connection which may introduce extra security risks. We need to study typical network infrastructures and design one for our hostel.

Methodology

Having studied three data communication courses at the University, a lot of technical knowledge I had previously learnt definitely helped with this problem. In particular, theory in the 'INFOSYS 339 Special Topic in Computer Networks' course and the Cisco CCNA Semester 4 curriculum contained particularly relevant material. In addition, we have also collected sufficient information from Grafton Hall and the Railway Campus to obtain a general overview of their local area network infrastructures.

To produce the best network infrastructure design was not the most important task of all, because this task is to be undertaken by a sub-contractor whom we appoint. The main learning task of this problem was to gain sufficient knowledge in the design of a LAN so that I can produce a 'Request for Proposal' for sending out to, and reviewing of, potential sub-contractors.

Solution

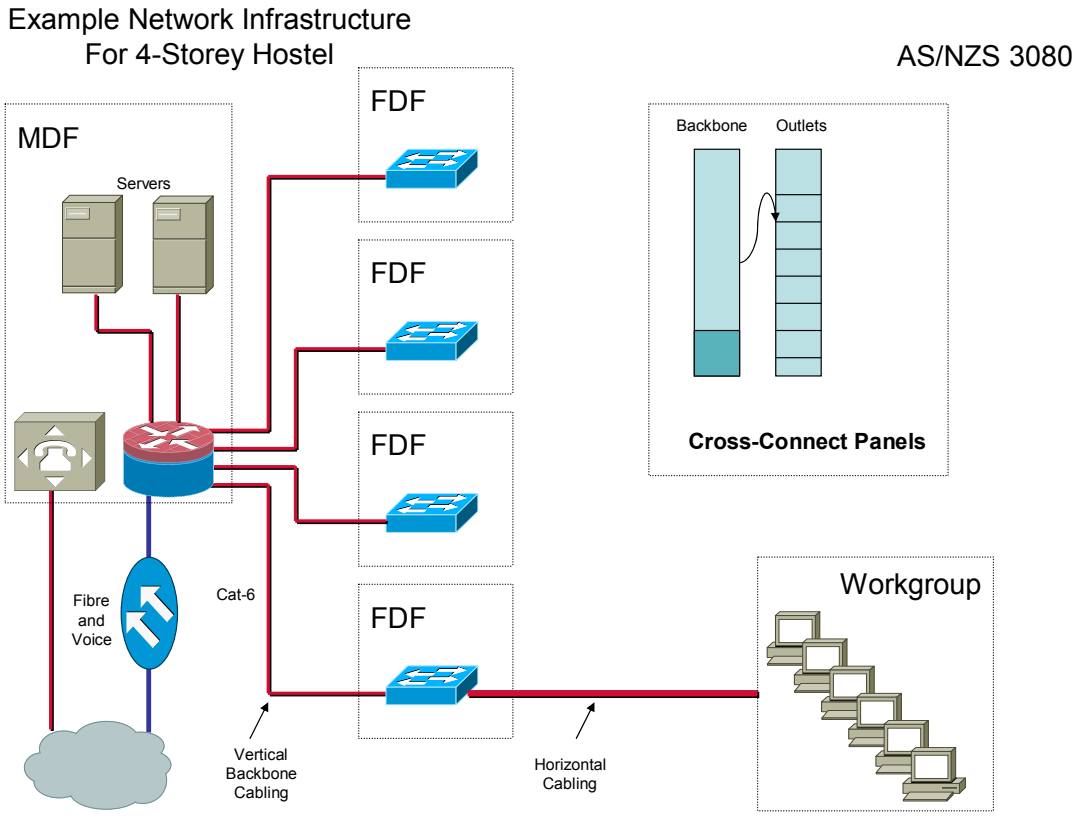
The hostel is planning to implement a Local Area Network (LAN) in the building and a Wide Area Network (WAN) connection to the internet.

Access to the internet is an integral part of the implementation. Once the network is in place, the hostel will implement a series of servers to facilitate online automation and academic curricular functions for University students.

Since this network implementation will have to continue to be functional for a minimum of 10 years, all design considerations should include a minimum of 100x (times) growth in the LAN throughput, 10x (times) growth in the Internet Connection throughput. This is to support possible applications used in the building, such as computer interactive learning in the future.

The minimum requirement for initial implementation design will be 10Mbps to any host computer in the network and 100Mbps to any server host in the network. The only OSI layer 3&4 protocol to be implemented in this network is TCP/IP.

Figure 1: A typical network infrastructure



Common Cable Design standard AS/NZS 3080 is used. It is the Commercial Building Telecommunications Cabling Standard, which cover the specifications for categories 3, 4, and 5 Unshielded Twisted-Pair (UTP) cables and connecting hardware. Apart from the hardware infrastructure, security is also just as important.

External Threats – Internet Connectivity shall utilize a double firewall implementation with all Internet-exposed applications residing on a public backbone network. In this implementation, all connections initiated from the Internet into the building's private network will be refused. This model will dictate that two physical LAN infrastructures be installed, with one designated for the office, one for the students.

By utilizing Access Control Lists (ACLs) on the routers, all traffic from the student LAN will be prohibited on the business LAN. Exceptions to this ACL can be made on an individual basis. Applications such as E-Mail and Directory services will be allowed to pass freely since they pose no risk. A user ID and Password Policy will be published and strictly enforced on all computers in the Building. All computers in the building network will have full access to the Internet. All ACLs will be controlled at the Building Manager's Office.

4.5 Hostel Services – Automation Services

Problem

How does Information lead to Automation Applications?

The intention is to build a fully automated system for hostel facilities such as automatic lighting control, physical access control, PABX extension number telephone system (or Voice over IP telephony if suitable), security camera recordings, and internet usage metering etc. The main objective is to research commercial products to deepen our understanding.

Methodology

We stay at the stage of research and information gathering but outside the scope of the hostel project. Each member of the team looked at different streams of applications: Building Automation (such as eHome) by Ahmed, Information Kiosk (such as for airports and banks), health and safety (such as hospitals and clinics) by Jimmy, commercial and industrial (such as warehouse and POS) by Michael.

Solutions covered in my submitted report included:

- Home Appliances
- Kiosk Solutions
- Human Machine Interfaces
- Panel PCs

Solution

The following is a very small part of my submitted report to illustrate the idea of this deliverable.

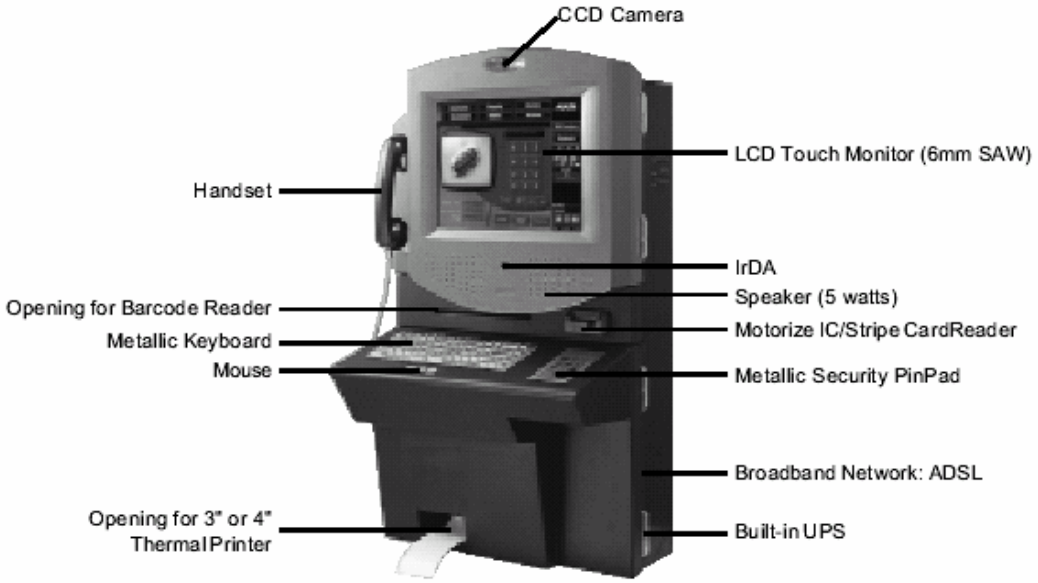
Information Kiosk

The Information Kiosk/Web Pay-Phone may or may not be applicable to the student hostel, but I have studied this commercial product and it is rather interesting.

The Advantech ES-510 is an interactive multimedia web pay phone that combines conventional telephony with the latest e-features. It provides Internet access over an ADSL broadband network, on-line shopping service via its LCD touch screen, a card reader facility, and data communication and transforming service with IrDA linked to your IA,

mobile phone, or notebook PC. The embedded CCD Camera even allows for video calls, video-mail, and remote viewing. All payments can be settled with the motorized IC/Stripe card reader and are protected by the equipment of metallic security Pin Pad, together with a built-in UPS to avoid accidental transaction interruptions.

Its internal bar code reader can also read any A4-sized bills printed with a bar code to settle your bills by using your bank debit card or credit card. The touch screen can be used as an advertisement stage creating limitless marketing opportunities. Furthermore, a robust watch-dog timer will reboot the ES-510 immediately in case of system hang-up. Its sturdy chassis and touch screen makes the ES-510 vandalism-resistant yet accessible with a friendly HMI (Human Machine Interface) design for the public. The ES-510 provides telecom companies, ISPs, and banks with the opportunities to link their businesses with one of the most advanced solutions to the e-World and ensures the enjoyment of the general public to enjoy the convenience of the e-World in their daily lives.



Automation Server

The hostel building intends to implement a totally automated server-based building automation system. The Automation server will house the electricity usage tracking, water usage tracking, surveillance camera recording, fire and alarm alert tracking and other building administrative functions. This server will be running TCP/IP as its OSI layer 3&4 protocol and will only be made available to the building manager.

4.6 Request for Proposal – Information and Communication

Problem

Each member will produce a Request for Proposal for each area allocated to us for the Hostel Project. I was allocated the Information and Communication RFP. The RFP must describe what facilities the hostel owner intends to build and supply to residents and how residents will use the facility.

Methodology

This task became an iterative process of revising and improving each of our versions of RFPs over a span of roughly 4 weeks. Our supervisor led us to prepare well for this task by setting guidelines during the earlier weeks of the year on what to research and learn.

By the time we started work on Request for Proposals, we each had a good idea of our allocated areas. I performed more internet research to learn the formatting and style of an industrial standard RFP. As weeks passed by, our supervisor gave us guidelines on how to improve each of our versions of RFPs.

Solution

The purpose of my 'Information and Communication' Request for Proposal is to solicit proposals from companies in New Zealand that can provide a Local Area Network solution to a new hostel building in central Auckland. The hostel is a 13-Storey building and will be mainly occupied by students.

Due to possible confidentiality reasons, the RFP has not been attached. The minimum requirements requested from contractors who wish to submit their proposal are as follows:

(a) Executive Summary of the scope of proposal and implementation methodology
(b) Clause by clause response
(c) Sequence of implementation with time frame and critical pre-requisite events
(d) Cost Breakdown and Payment terms
(e) Details of solutions proposed
(f) Company details and evidence of competence
(g) Requirements on the Building Developers to comply (if any)
(h) Requirements on other Building contractors to comply (if any)
(i) Contact person for clarification of Proposal

4.7 Request for Proposal – Design Reference

Problem

Apart from the Request for Proposal outlined in the previous section, a design reference document is needed to compliment the RFP. This is used for reviewing proposals that are submitted by contractors, i.e. a benchmark.

Methodology

All research results obtained for my Information and Communication RFP were included in this document. Report details such as User Requirements, Logical Design, Physical Design, Cabling, IP Addressing, Security etc were submitted.

Solution

Examples from the design reference document:

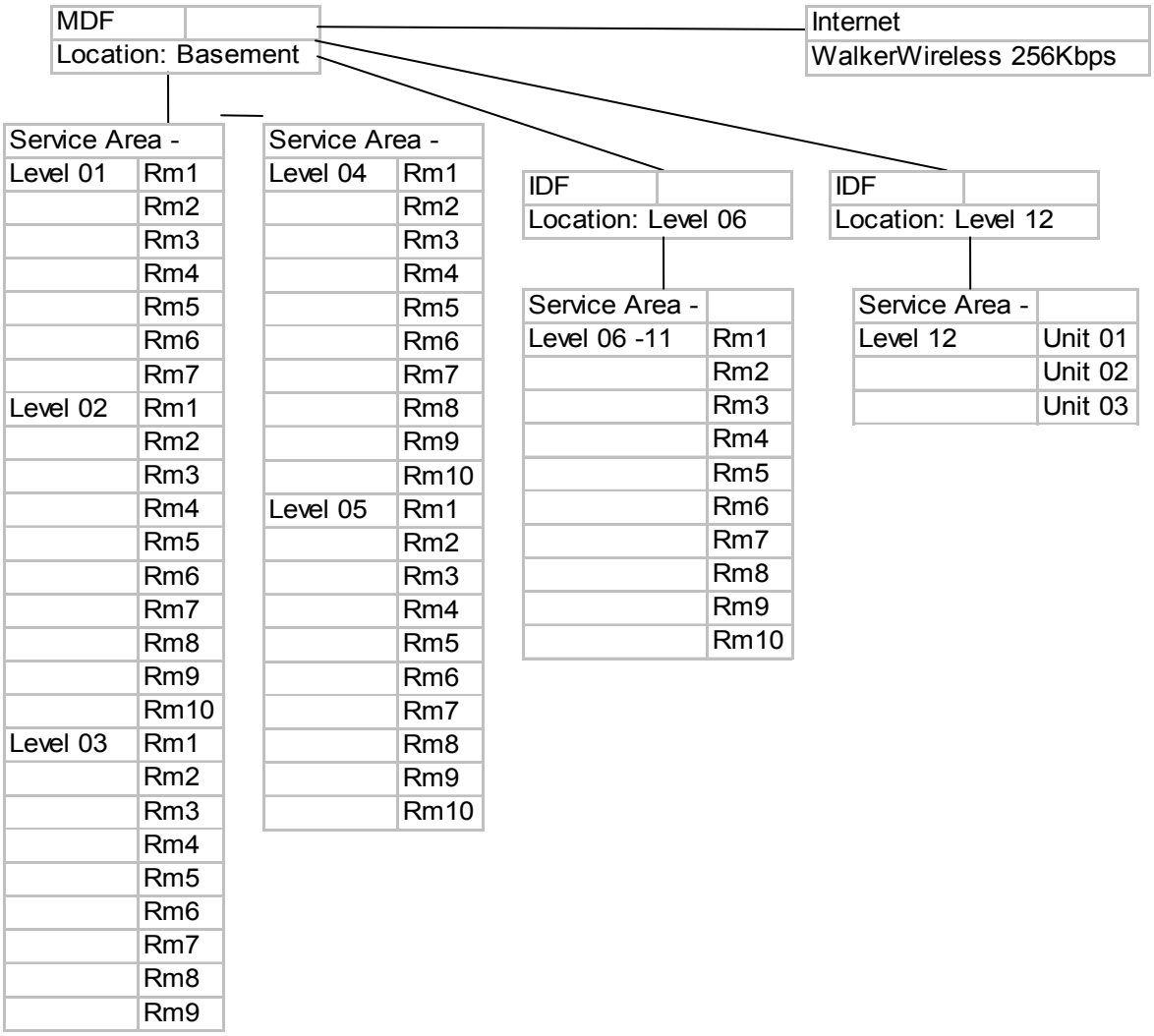
Specifications on Cabling

Table 1: Design Reference - Cabling Specifications

Drop Name	Nearest DF	Horizontal Length (m)	Vertical Length (m)	Total Length (m)	Wiring Type
MTP1	MDF	38.42	5.49	43.91	CAT6
MTP2	MDF	27.67	5.49	33.16	CAT6
MTP3	MDF	22.45	5.49	27.94	CAT6
MTP4	MDF	27.96	5.49	33.45	CAT6
MTP5	MDF	16.66	5.49	22.15	CAT6
MTP6	MDF	15.70	5.49	21.19	CAT6
MTP9	IDF1	17.77	5.49	23.26	CAT6
MTP10	IDF1	23.26	5.49	28.75	CAT6
MTP11	IDF1	38.23	5.49	43.72	CAT6
MTP16	IDF2	8.38	5.49	13.87	CAT6
MTP17	IDF2	7.49	5.49	12.98	CAT6

Logical Design

Figure 2: Design Reference – Logical Network Design



4.8 Real Life Data – Hostel Contractors (Review)

Problem

We received a proposal for developing a local area network infrastructure for the building after Request for Proposals were sent out. I was allocated the task of reviewing a proposal by this contractor company.

Methodology

This was my first time reviewing a professional proposal for a total networking solution. Guidance was provided by our supervisor TN, and I learned a lot when performing this task.

Solution

Any results/outcomes from this exercise are considered to be confidential to the company and have not been included in this report.

4.9 Real Life Data – Hostel Equipment

Problem

After reviewing contractor proposals, it seemed that contracts should be awarded to multiple parties so as to minimise overall cost of the development. The challenge is to minimise overall cost of the development by searching and selecting appropriate contractors.

Methodology

Apart from reviewing received proposals from multiple parties, my assigned task included searching for more contractors and prices for comparison on the internet.

Solution

Any results/outcomes from this exercise are considered to be confidential to the company and have not been included in this report.

4.10 Hostel Project – Conclusion

At this point, the building construction timetable is not yet confirmed and commencement of construction is most likely deferred to the beginning of next year. We may have to call for Tenders again in 2 months later. Therefore, we may stop at RFP Version 1.2 as our final deliverable as far as this BTech 450 project is concerned.

The following table shows our progress on the Hostel project.

Hostel Progress

Period	Objectives	Status
March	Project briefing, Allocation of responsibilities	Completed
April	Market Research, System Design	Completed
May	Issue RFP, Budgetary Costing	Completed
June	Finalise User Requirements, Issue Tenders	Completed
July	Award Supply and Installation Contracts	Pending
August	Preparation of Operation Manuals	Cancelled
September	Supervision of Contractor Progress	Cancelled
October - December	Supervision of Installation, Commissioning and Operator Training	Cancelled

There is a possible chance for continuation of this project after the University project.

5. Business Infrastructure – Introduction

This project is to start-up a System Integration business serving the IT and Engineering industries. Through business planning and marketing, the group of students are to act as a small company providing integration services offering added value solutions that potential customers may require. The students are to contact 3rd party suppliers to deliver added value solutions, real-world applications and final products/services inside today's vertical markets.

The following sections will describe problems and solutions I produced relating to the Business Infrastructure project. The individual problems and tasks described in this section has been sorted into per-deliverable for ease of reading, since the order of individual project objectives and the scheduling of individual tasks during the year usually carry on over long periods and/or overlap other tasks, which can be confusing.

5.1 Installation – Intranet Server (H/W and S/W)

Problem

As we are starting up a new division of Computers New Zealand, some deliverables are to develop a public internet web application, a private intranet web application and a database to store the company knowledge base. All these deliverables mentioned will need to be run on a platform, and so the first step of our implementation was to build a server to accommodate the web application and database that we build.

Methodology

This task involved assembling a server out of computer components supplied by our supervisor. The server specifications are as follows:

Hardware:

- Intel Celeron 300A
- 128MB PC133 SDRAM
- Asus P2B-F
- Matrox G200 8MB
- Seagate U6 20GB
- Accton EN1207D-TX

The next step was to install necessary software to run our web application developments.

Our decision on the software to install after discussion is as follows:

- Linux Red Hat 7.3

  Version 7.3 was actually released with a recent version of the 2.4 kernel, 2.4.18-3. This is probably due to 2.4.18 having been "around" for a while. The newer kernel has more and improved support for devices, file systems, and other technologies.

- Kernel 2.4.18

  This was a natural choice. It is distributed with Linux Red Hat 7.3, and is also the latest stable version of the Linux Kernel officially released.

- Apache 2.0.39

  Apache 2.0 has been running on the Apache.org website since December of 2000 and has proven to be very reliable. This version of Apache is principally a security and bug fix release.

- PHP 4.2.2

  Open source software all have one thing in common. It is updated frequently, with new features, better performance and bug fixes. The newest version of PHP 4.x is the best choice. The reason is because PHP 4 is more superior to PHP 3 in every way, and every new version of PHP4 includes bug fixes. The PHP community also recommends new implementations to use the latest version available. There is no tried and true stable version, because bugs have been found in all of the older versions.

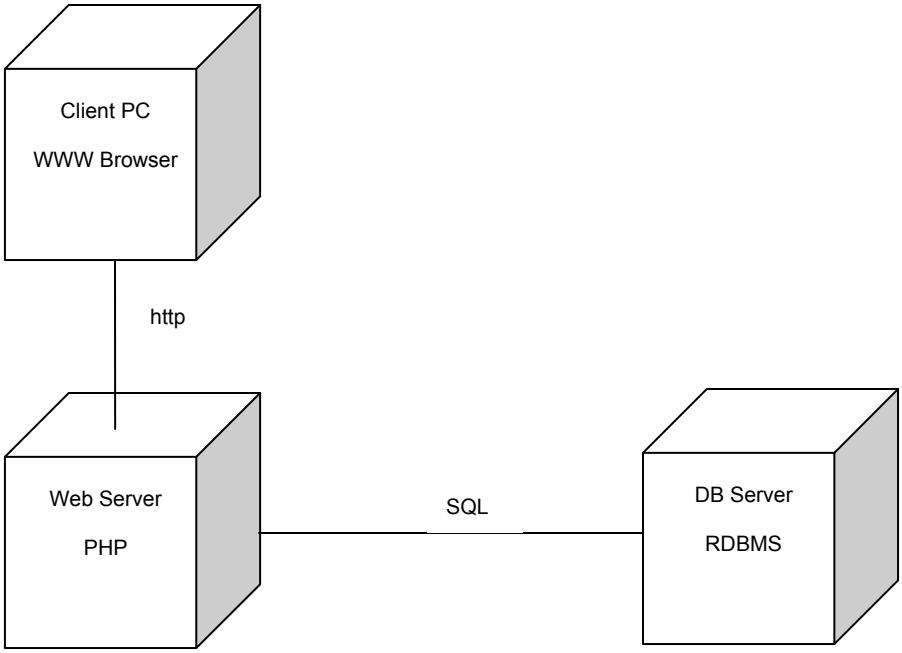
- MySQL 3.23.51

  MySQL is the world's most popular Open Source Database, designed for speed, power and precision in mission critical, heavy load use. As with PHP, the latest stable version is always best. Currently it is 3.23.51.

All hardware and software installation and configuration was done by me.

Solution

The overall web application architecture will be a 3-tier system designed for thin clients with just a web browser. All dynamic generation of web pages and database access is processed by the server.



Note that in our implementation, both the HTTP/PHP server and the RDBMS reside on the same server.

5.2 Design – Internet Web Design

Problem

As we are starting up a new division of Computers New Zealand, we need to develop an internet web application, as a part of the marketing plan, with open access to the general public for advertising the services we offer. The intranet server that has already been built will serve as the hardware platform.

Methodology

This task involved creating and manipulating images with image editing software packages, drawing simple navigational diagrams and use-case diagrams as part of the planning process, and developing pages of HTML with a text editor.

Solution

The Concept

Defining the purpose of the web site

The purpose of our ITE Division website is to advertise and communicate. The initial and fundamental functionality we require is a portfolio of the wide range of services and solutions we offer and a way for visitors to contact CNZ for solutions they may require. This is the main goal. The web site must portray our mission statement, and the design must efficiently present our solutions to visitors of the site to attract potential customers.

Once the initial functionality is met, we should expand the web application to support existing customers. The web site should enable existing customers to log-in for order tracking. I.e. to check the status of projects currently underway.

Our final goal is to integrate our Knowledge Database of Technology Disciplines by providing secured (!) remote access to our 'searchable' database. Access restriction is important here, so if remote access is not a requirement, this searchable database should be implemented on our intranet instead.

The Audience

Defining the target audience of the web site

Our audience, other than services to existing customers, are all visitors that may be potential customers. Therefore the web site must clearly display our portfolio to grab the attention of visitors.

The Content

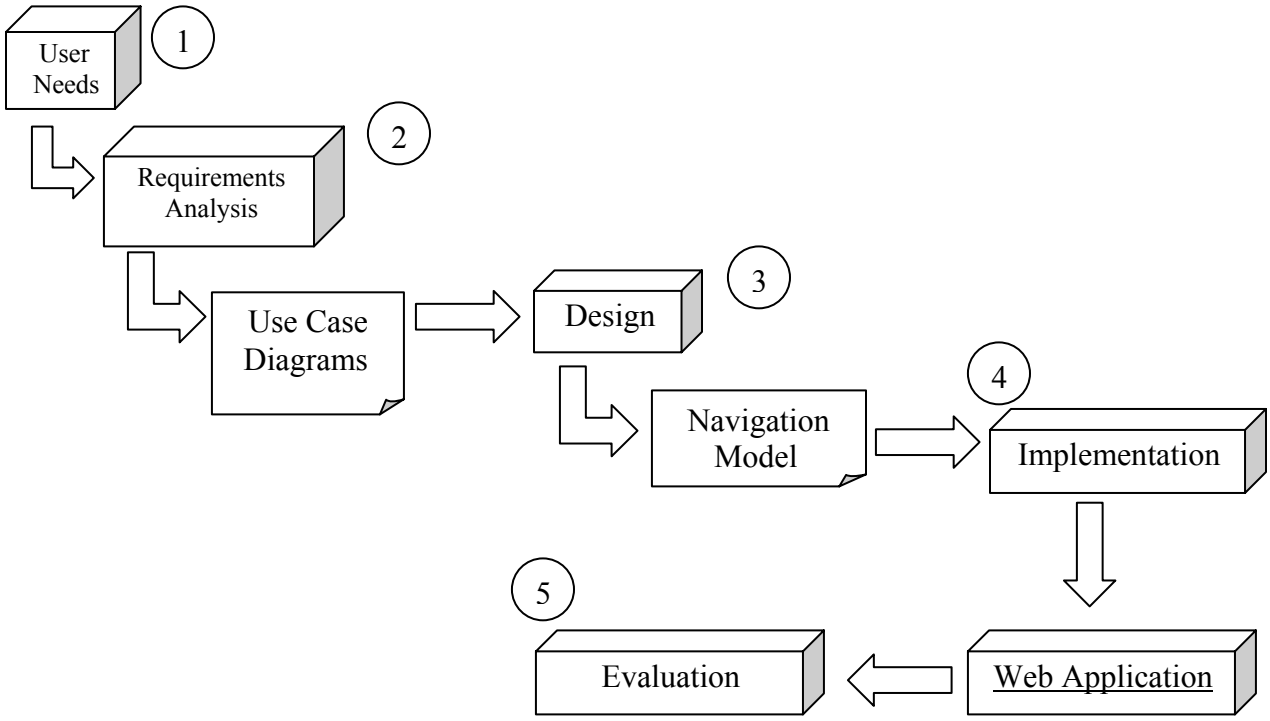
Defining the content for the audience

The web site is a marketing and communication channel. Marketing-wise, the web site design must be professional as the first impression is very important. Communication-wise, the design must allow efficient access to and use of the services offered to existing users.

The Implementation

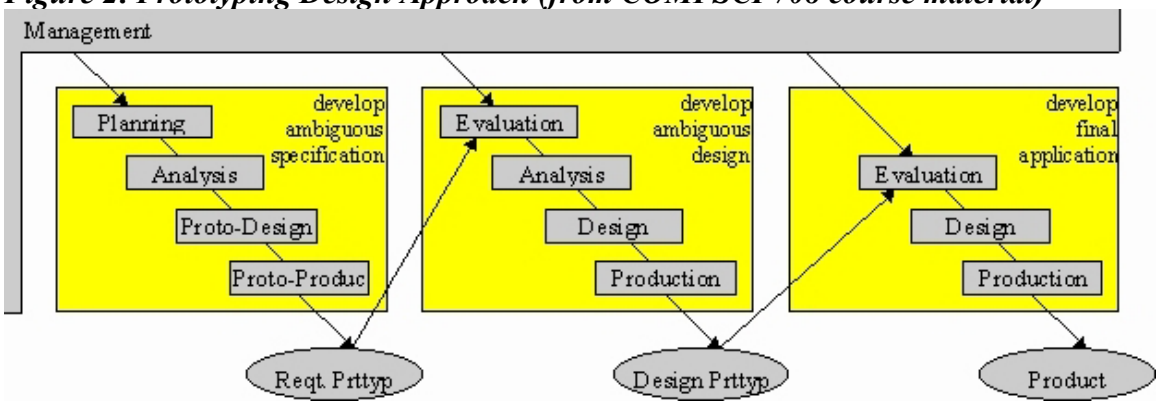
Defining our next step

Keeping the concepts previously established in mind, we can move forward to develop the first prototype of our web site. I propose the following project model for developing our web application:



However, because of the short development time we have for this project, a better approach to implementation might be prototyping as shown in the following diagram. In short, it allows us to produce an initial and functional website while adding functionality step-by-step as we go.

Figure 2: Prototyping Design Approach (from COMPSCI 708 course material)



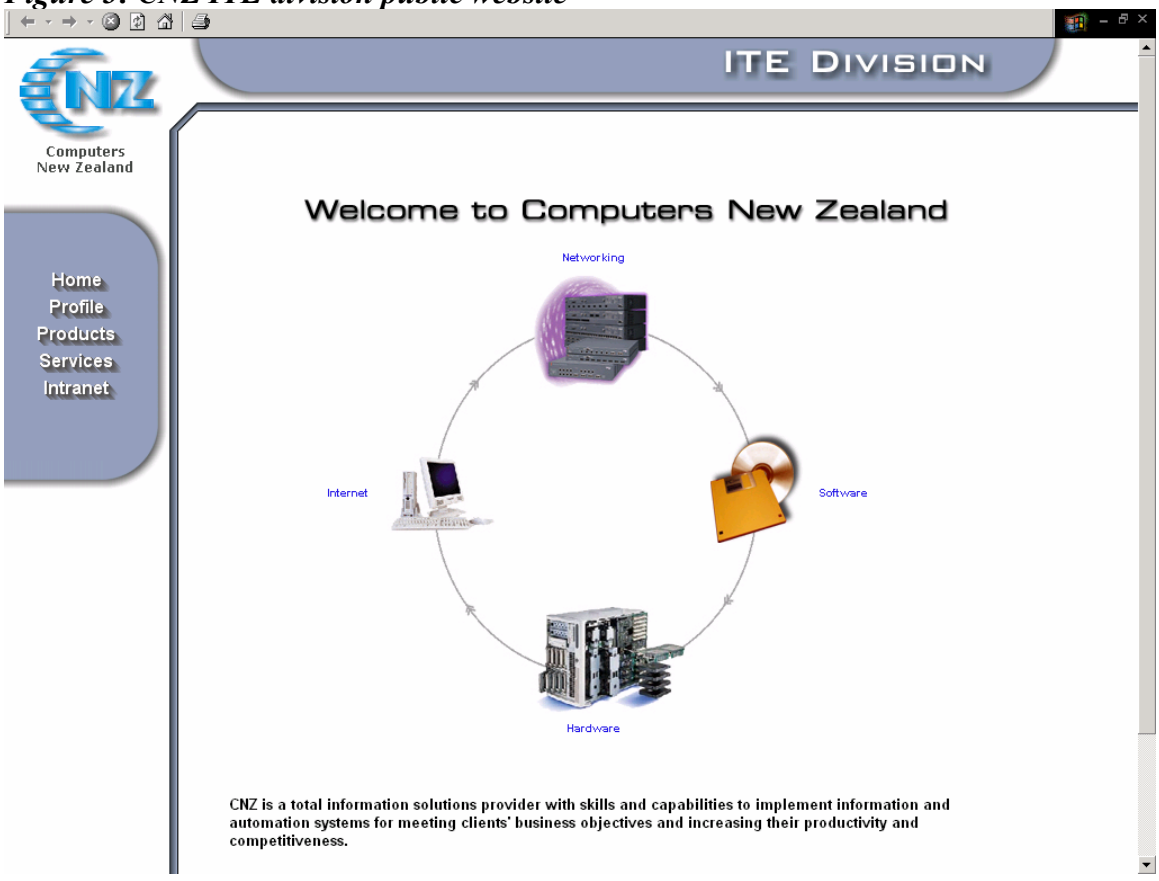
The Prototyping Approach:

- Each iteration produces a final product which can be evaluated.
- Helps ensure that the developer understands the project.

End Result

A screenshot of the website is shown below:

Figure 3: CNZ ITE division public website



5.3 Design – Intranet Web Design

Problem

One of the main and final deliverables of the whole Business Infrastructure project is to develop and support a total information and project content management web application system. The Intranet Web Design is a part of this deliverable, as it provides the user interface to the web application. This deliverable will be uploaded to the intranet server described previously in Section 2.1.

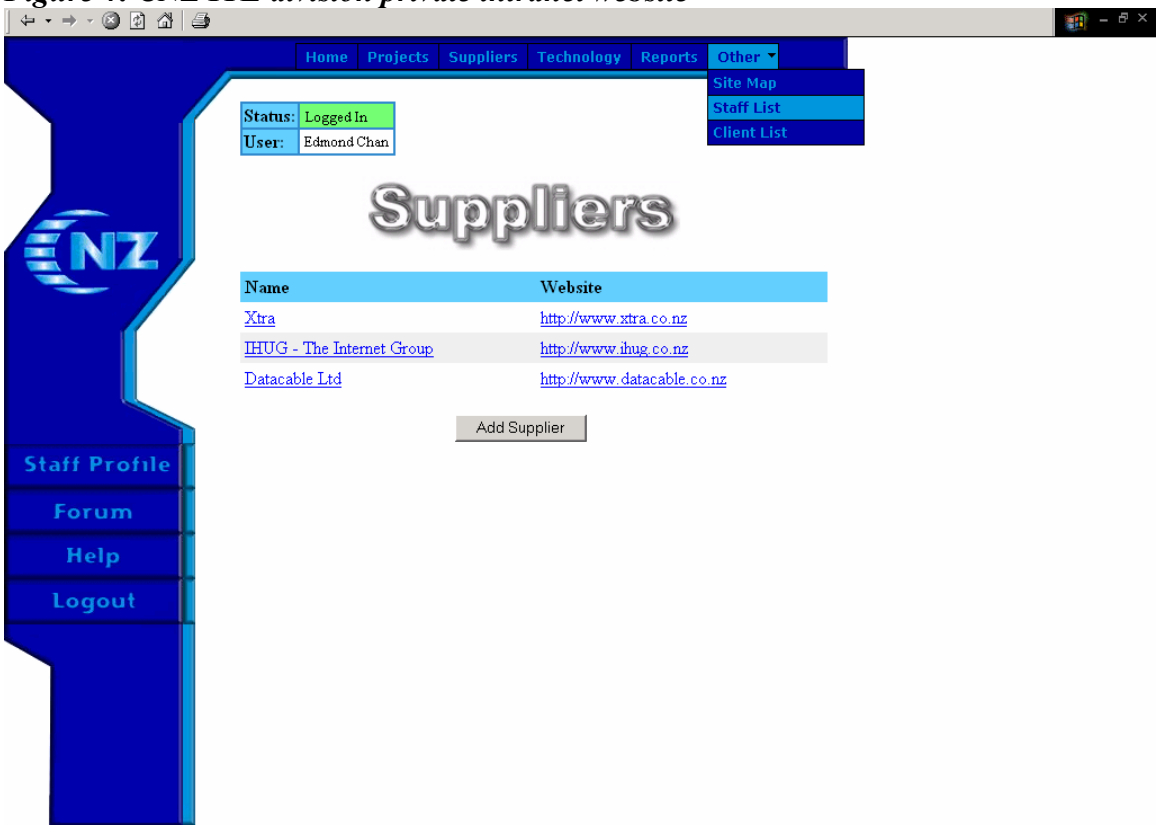
Methodology

This task was originally allocated to my team mate Ahmed Yousif, so my contribution to this task is relatively little. The original design of the website layout was designed by Ahmed, and my involvement was mainly improving the look and feel of his design by manipulating images and cleaning up HTML code.

Solution

As my contribution to this task was not as much as my team mate Ahmed, he will be presenting more of the private intranet website design in his report. Here is a screenshot:

Figure 4: CNZ ITE division private intranet website



5.4 Design – Intranet User Discussion Forum

Problem

The total Intranet solution required a user discussion forum where users using the web application can read, post and reply to topics raised by another user. This type of application, known as a user discussion forum or a user bulletin board, is to facilitate and improve the efficiency of the transfer of information or knowledge between a group of users. In our case, we are required to develop and configure a discussion forum for CNZ staff and clients to use.

Methodology

The allocated timeframe for this task was less than 2 weeks, so I decided to use open source projects distributed on the internet. Not only does this save time, but the end result is a much more functional and fully-featured discussion forum. A complex discussion forum will take at least months to develop, so this was out of the question.

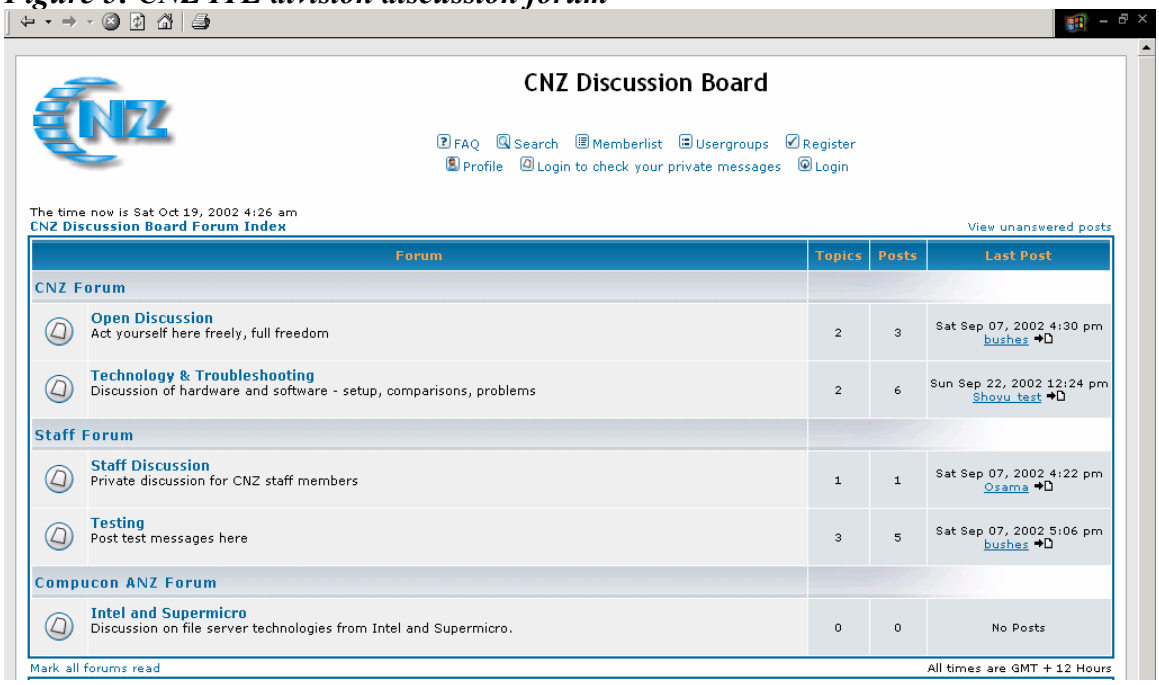
Solution

I researched on the internet for popular and stable discussion forums that are open-source projects. After thorough research, the 3 best choices were:

1. vBulletin Instant Community – http://www.vbulletin.com/
2. phpBB: PHP Bulletin Board – http://www.phpbb.com/
3. Invision Power Services – http://www.invisionboard.com/

Both vBulletin and phpBB are very popular and thus have been thoroughly tested to guarantee stability. However, I chose to implement phpBB because vBulletin required a licence fee. Here is a screenshot of the final 'configured' forum page:

Figure 5: CNZ ITE division discussion forum



5.5 Co-ordination – Technology Deployment Diagram

Problem

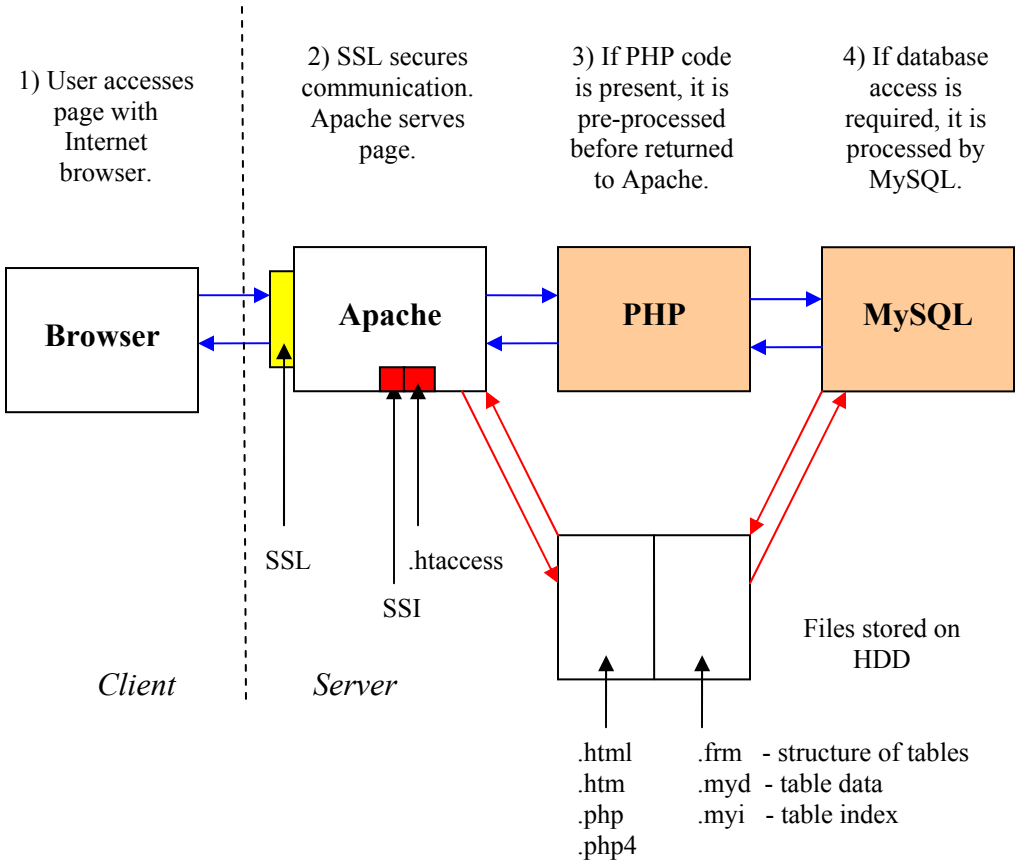
Our supervisor TN required us to document as much of our work as possible, and one task I was assigned to do was to research the relationships between the hardware, operating system and software such as Apache, PHP and MySQL. It is important to fully understand the architecture, or how the technologies we are using all fit together. This task was to make sure that all members of the team understood the technologies we are using.

Methodology

This task mainly involved researching on the internet at each of the software websites. This includes http://www.apache.org, http://www.php.net, and http://www.mysql.net.

Solution

The hardware and operating system is on a different layer, and to represent them we would need a 3D model. Basically, the operating system acts as a layer that accesses and controls the hardware, providing a platform for software to perform tasks.



5.6 Co-ordination – Project Co-ordination (Gantt Chart)

Problem

Near the final stages of the project, our last and biggest goal was to develop a fully integrated intranet web application that provides an interface for adding, removing and updating of projects, staff, clients, technologies for technology database, suppliers, and research reports. To accomplish this goal, we needed to work on several streams of tasks that could be worked on individually, and then combine all the work together to form the end deliverable when ready. I was asked to study how to co-ordinate projects like this one, and to produce a critical path analysis or Gantt chart to assist the team in planning the project properly with all tasks clearly displayed with deadlines.

Methodology

The project at this stage has become more complicated than before, with every group member working on different aspects of our final Intranet prototype. The streaming of tasks is very important if we wish to complete the project on time. To co-ordinate the final stages of the project by drawing up a Gantt Chart, I researched on the Internet for articles that teach project management skills. In the end, I found

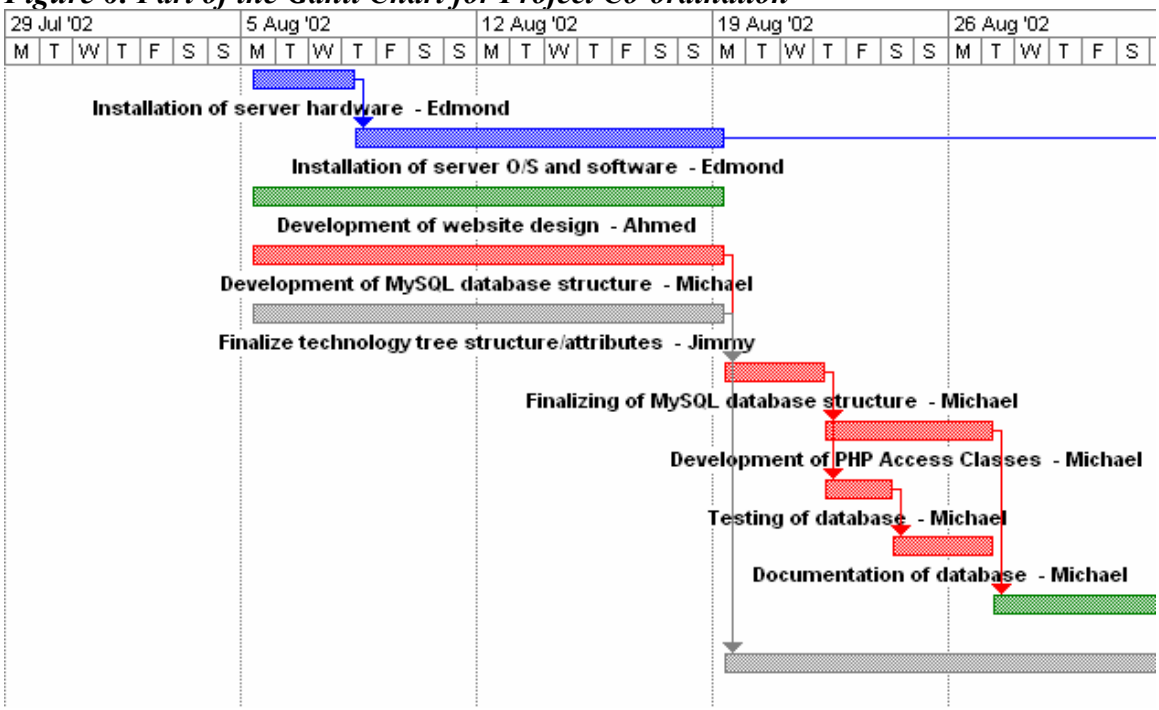
http://www.mindtools.com/. I learned how to draw a Gantt Chart using Microsoft Project 2000.

Solution

The Gantt Chart using Microsoft Project 2000 will:

- help us lay out the tasks that need to be completed
- give us a basis for scheduling when these tasks should be carried out
- allow us to plan the allocation of resources needed to complete the project
- help us to work out the critical path for a project where we must complete it by a particular date.

Figure 6: Part of the Gantt Chart for Project Co-ordination



5.7 Programming – Intranet Web Application (PHP)

Problem

As mentioned in the previous deliverable 5.6, our last and biggest goal was to develop a fully integrated intranet web application that provides an interface for adding, removing and updating of projects, staff, clients, technologies for technology database, suppliers, and research reports. To accomplish this goal, we needed to work on several streams of tasks that could be worked on individually, and then combine all the work together to

form the end deliverable when ready. The task of coding the PHP web application was originally assigned to Ahmed, but we soon realised that this task required a lot more time to develop than any other task. Therefore, the whole team became involved in programming the code.

Methodology

Michael wrote a "data access class" that contains reusable code for accessing each attribute of the database that he developed. Jimmy worked on a couple of the PHP pages, and most notably the management of files on the server by assigning rules to make sure no report would be overwritten by applying timestamps on every file. I too worked on a couple of the PHP pages, and cleaning up code and adding documentation here and there. Every member of the team spent at least 40 hours on coding PHP.

Solution

The intranet web site and PHP code has not been included in this report. Ahmed would provide all the details of this web application in his report, and a screenshot of it was included in the deliverable discussed in section 5.3.

5.8 Real Life Data – Template for Entry of Data

Problem

This task was originally planned for the application database (now merged with technology database). We needed to collect some industry data comprised of potential customers and suppliers, and so a template for the collection of data was established. Basically, this is a template/document that describes what specific information is to be collected from each customer/supplier.

Methodology

This task was performed by both Michael and myself. Our methodology was an iterative process where we first design a template of questions to ask, and then contact potential customers for information. If the potential customer was providing more information than we wanted to know, we update our template to accommodate the new information. This expanded the template as we continued to collect more information. The template was useful for the development of our database, and is documented for future reference.

Solution

After a few iterations of collecting information and designing the template for entry of data, our template structure is similar to this one:

Template for Entry of Data:

Application Database - Potential Customers

1) Information Source:

Date
Name of Person
Company Position
Contact Phone
Contact Mobile
Contact E-Mail

2) Company Information:

Name of Company
Company Website
Company Email
Company Phone
Physical Address
Postal Address

3) Company Operational Procedures:

Business Scope
Business Procedures

- Manual Procedures
- Automated Procedures

Current I.T. solution(s)

- Description
- Name of System Implemented
- Technologies Involved
  - Name
  - Description
  - Type
  - Hardware
  - Software
  - Protocols and Interconnect Requirements
  - Supplier (link)

Possible I.T. solution(s)

- Description

- Technologies Involved
  - Name
  - Description
  - Type
  - Hardware
  - Software
  - Protocols and Interconnect Requirements
  - Supplier (link)

5.9 Real Life Data – Potential Customers (Survey)

Problem

As mentioned in the previous deliverable in section 5.8, we needed to collect some industry data comprised of potential customers and suppliers. This industry data was collected as part of our total intranet solution.

Methodology

We obtained a list of contacts from the yellow pages and the Internet. I then designed and sent out a short survey to every potential customer in attempt to establish the "template for entry of data" while collecting data for the database. Michael made phone calls to half of our list of contacts that did not have an email address, while I emailed the survey I designed to the other half of the list.

Solution

The following is part of the survey used:

Questionnaire

- Please fill in your answers in the spaces provided after the blue arrow >.
- Your answers will be kept confidential, and used only for our project purposes.

Personal Information (optional)

1. Full Name:

>

2. Company Position:

>

3. Phone Contact:

>

4. E-mail Contact:

>

Company Information

3. Company Name:

>

4. Physical Address:

>

5. Postal Address:

>

6. What is the scope of the company's business? I.e. industry, services offered, products

7. Is your company currently using I.T./engineering solutions/services, such as computer networks or building automation? If yes, please be more specific and provide a list.

8. Are there any potential IT-related services or solutions your company may be interested in? Please provide a list or comments.

END OF QUESTIONAIRE

Thank you very much for your time. We appreciate your assistance.

5.10 Real Life Data – Technology Tree

Problem

This task was originally planned for our technology database (now merged with application database). The purpose of the technology tree is to illustrate the technology hierarchy (i.e. where each technology belongs and how it relates to other technologies) and organise our knowledge of technologies encountered (i.e. an organised view of all technologies for the database structure).

Methodology

This deliverable mainly involved internet research. We collected and organised all technical information we learned about into the technology data collation document. All information will then be inserted into our database for our 'knowledge-base' intranet near the end of the project.

Solution

The technology tree is only 3 layers with the bottom layer containing all the information of the technology. Each technology starts with 1 parent technology type and then a technology subtype at level 2 which may be the values "hardware", "software" or "architecture".

The data attributes for each technology are:
Name, Parent, Subtype, Description, Picture, OSI layer, Standards, Date last modified.

The technology tree version is now up to 1.02. The following is a small portion of the technology tree to illustrate the idea. Note that most of the tree was developed by Jimmy. I was involved only in the final stages.

- LAN
  - Hardware
    - → Switch
    - → Hub
    - → NIC
    - → Firewall
    - → Bridge
  - Software
    - → Novell Netware
  - Architecture
    - → Bus Topology
    - → Ring Topology

→ Star Topology
→ Extended Star Topology
→ Mesh Topology
→ Token Ring
→ Simple Network Management Protocol (SNMP)
→ Ethernet
→ Virtual LAN (VLAN)

- Internet
  - Hardware
    → Modem
    → ADSL Router
    → ISDN Modem
  - Software
    → Internet Sharing
    → P2P Software
    → Remote Control
  - Architecture
    → ADSL
    → Frame Relay
    → Wireless
    → ISDN

5.11 Infrastructure - Project Management QA Manual

Problem

Compile a 'Project Management Quality Assurance Manual' that describes the procedures in managing the typical projects the ITE division undertake. Include all tasks and processes the team is experiencing in this BTech project. Include all forms and templates used. The end goal of this deliverable is to produce a manual that teaches any person to successfully co-ordinate future projects.

Methodology

The manual documents the planning, implementation, and assessment procedures for a typical project, as well as any specific quality assurance and quality control activities. It is also about scheduling events and resources so that multiple events can proceed without being interrupted by other events or lack of resources.

The main method of completing this deliverable is to experience the student hostel project myself, and include all the details relating to the procedures we undertook from start to finish.

Solution

The development of the Project Management QA Manual is not finished at this point, main reason due to the delay of the student hostel project. To provide an idea of what the Project Management QA Manual is, here are some of the contents:

DESIGN

- Client Requirements and Budget
- Detailed Design and Budgetary Costing
- Contract Proposal (RFP)
- Award of Supply and Installation
- Overview – Scope/Timetable/Cost
- Client Agreement
- Installation Requirements

IMPLEMENTATION

- Timetable Establishment (CPA)
- Contractor Job Scope
- Contractor Breakpoints
- Progress Monitoring
- Equipment Delivery
- Integration of Deliverables
- Integration Test
- Customer Configuration

DELIVERABLE

- Witness and Acceptance Test
- Client User Training
- Client System Operation Training
- Final Deliverable

5.12 Business Infrastructure – Conclusion

Up to this point, all objectives set by our supervisor TN at the beginning of the year have been completed except for the Project Management QA Manual and some small functions of the Intranet Web Application. While the QA Manual was cancelled due to the delayed Hostel Project which made the deliverable inappropriate, the team intends to spend some time near the end of the year (2002) to completely finalise the Web Application deliverable.

Infrastructure Progress

Period	Objectives	Status
March	Project briefing, Training, Start up planning Allocation of responsibilities	Completed
April	Project Requirement, Database Investigation	Completed
May	Finalise Web and Database Structures	Completed
June	Market Research Web and Database Design Proposals	Completed
July	Technology and Application Data Research	Completed
August	Intranet Construction	Completed
September	Fine-tune and commission Intranet v1.0 Summarise achievements	Completed

6. Company Research

Apart from the Student Hostel project and the Business Infrastructure project, there was a lot of other research work done in order to gain more knowledge or to complete an assigned task.

This section of the report describes my individual researching activities. For each section, the methodology was usually comprised of internet research only, and this aspect was consistent for all reports produced for each deliverable. Internet URLs for research sources are listed in the Appendix: References.

6.1 Intranet – Server-side Scripting Languages

Problem

Before the implementation of the private intranet - web application began, there were several important decisions to make. One important decision to agree on was the server-side scripting language to use. TN wanted each of us to produce a report on the comparison of several popular scripting languages, and to suggest reasons for choosing one over another.

Solution

The 5 most established server scripting languages all do pretty much the same thing. They interface with databases, they access the file system of the OS, and they create dynamic pages. The reasons why we choose one over another will be pretty subjective — it depends on who we are and what we are trying to do.

The source of information presented in my comparison report was from various comparisons done on the Internet and general user opinions. The comparison tries to ignore any bias towards a specific language. An in-depth analysis of each language was included in the report (not this one).

Quick Summary

- **Perl**: a mature, cross-platform language that can be hard to learn
- **ASP**: Microsoft's powerful, Windows-based framework
- **Cold Fusion**: a powerful, tag-based option for non-programmers
- **PHP**: a cross-platform, open-source alternative with lots of features built in
- **Java**: the ultimate in power and flexibility, for serious programmers

Discussion

To decide which scripting language we should use for our ITE division website and database integration, our main restrictions are cost and development time. Our choice should enable us to implement our website free of charge. This restriction alone leaves us with Perl, PHP and Java as the only wise choices.

The best language to use is actually the one we know best. No one in the team knows Perl. All 3 choices are free of charge and can implement the functionality of our website, but Perl is outdated and a clumsy way of implementing a simple web application such as the one we need and Java will obviously involve a much longer development period.

Conclusion

In conclusion, PHP seems to be the best choice in our case. One thing we need to be aware of with this choice however is that PHP is still under constant development. Bugs are more likely to be found in PHP compared to the other, more mature, choices. The person in charge of implementation and maintenance should actively participate in the PHP Development Community (http://www.php.net).

6.2 Intranet – PHP Deployment

Problem

After deciding on which server-side scripting language to use (section 6.1), TN assigned me the task of researching on all aspects of PHP deployment. I.e. the background of PHP, popularity / usage statistics, known issues or exploits, installation procedures, support information, version histories and so on.

Solution

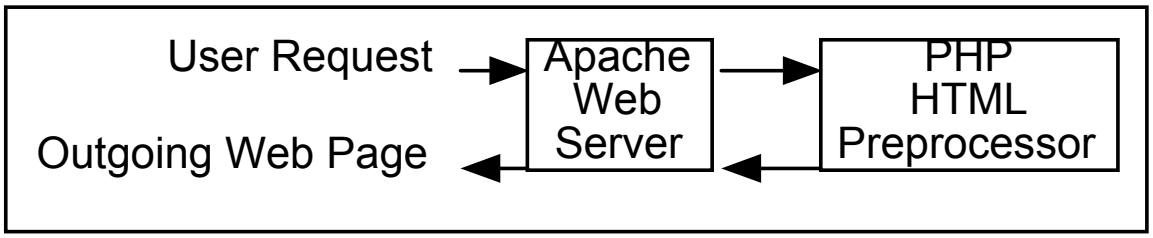
The following is a very small part of my submitted report to illustrate the idea of this deliverable.

What is PHP?

- PHP: Hypertext Pre-processor
- Open Source Scripting Language
- Syntactically similar to C, Java & Perl
- Main purpose is to dynamically generate web pages.

Concept

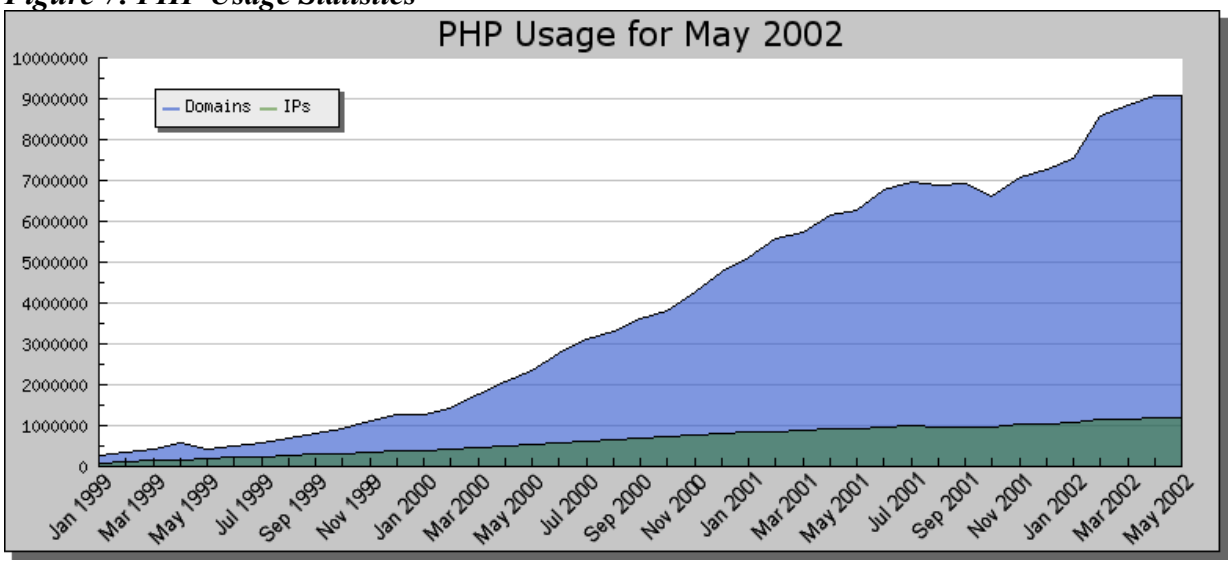
Web page files containing PHP code (<?php code ?>) are executed by the PHP engine each time they are requested for, before the final generated pages are sent out.



PHP Usage Statistics

9,059,850 Domains and **1,188,121 IP Addresses**
Source: Netcraft

Figure 7: PHP Usage Statistics

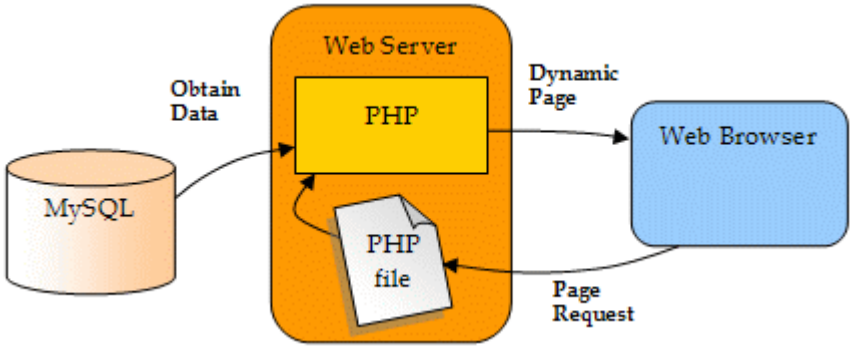


Other Facts
Source: E-Soft , http://www.securityspace.com/
Date: May 2002

- Apache has a web server market share of 66.5%. Next is Microsoft IIS with 25%.
- 43.7% of Apache implementations use the PHP module.

Implementation

Figure 8: Implementation Architecture Diagram



6.3 Intranet – Server Side Includes

Problem

Computer New Zealand's public website utilises the 'Server Side Includes' function which provides useful features to the web developer. I was assigned the task of conducting research to learn more about SSI, and advise on whether or not we should use it for our own implementation.

Solution

The following is a very small part of my submitted report to illustrate the idea of this deliverable.

Introduction

Server Side Includes (SSI) is extremely useful. SSI is a server side method of manipulating web pages which means that you do not need a specific browser to use them, and they will run on any computer.

You will never have noticed SSI before on a web page because nothing special appears. What SSI does is it tells the server to replace the SSI tag with something else, for example a piece of text. This is done when the page is requested and the user will see nothing different to if the text (or code) was already there.

What can SSI do?

There are two great benefits of SSI. Firstly, you can get many pages to include the information from a single file so that you could, for example, include a standard footer on

each page with your copyright information. You could then update all the pages by just changing this one page.

Secondly, you can get your SSI to execute a CGI script on your server. This allows you to have text counters, advanced advert rotations, random text and images and several other extras on your web pages. This is one of the best uses of SSI.

Conclusion

We did not use SSI in our own implementation because we did not require the two main features that it offers. Including files with a single tag in html is also available in PHP, and executing CGI scripts was not one of our requirements.

6.4 Intranet – Apache .htaccess

Problem

For both the public ITE division web site and the private intranet web application, there were sections that provide staff or administrative functions. These sections need to be secured with some form of security and/or access restriction with passwords. I was allocated this task; to research and develop ways of providing security and password access restriction.

Solution

The following is a very small part of my submitted report to illustrate the idea of this deliverable.

Introduction

The .htaccess file has power to improve our website. Although .htaccess is only a file, it can change settings on the servers and allow you to do many different things, the most popular being able to have your own custom 404 error pages.

What can .htaccess do?

There is a huge range of things .htaccess can do, including:

- password protecting folders
- redirecting users automatically
- custom error pages
- changing your file extensions
- banning users with certain IP addresses
- only allowing users with certain IP addresses

- stopping directory listings
- Using a different file as the index file.

Feature 1) Custom Error Pages

This feature will allow you to have your own, personal error pages (for example when a file is not found) instead of using your host's error pages or having no page. This will make your site seem much more professional in the unlikely event of an error. It will also allow you to create scripts to notify you if there is an error.

You can use custom error pages for any error as long as you know its number (like 404 for page not found) by adding the commands to the .htaccess file.

These are some of the most common errors:

401 - Authorization Required
400 - Bad request
403 - Forbidden
500 - Internal Server Error
404 - Wrong page

Feature 2) Stop a Directory Index from being shown

Sometimes, for one reason or another, you will have no index file in your directory. This will, of course, mean that if someone types the directory name into their browser, a full listing of all the files in that directory will be shown. This could be a security risk for your site.

To prevent against this without creating lots of new 'index' files, you can enter a command into your .htaccess file to stop the directory list from being shown.

Feature 3) Deny/Allow Certain IP Addresses

In some situations, you may want to only allow people with specific IP addresses to access your site (for example, only allowing people using a particular ISP to get into a certain directory) or you may want to ban certain IP addresses (for example, keeping disruptive members out of your message boards). Of course, this will only work if you know the IP addresses you want to ban and, as most people on the internet now have a dynamic IP address, this is not always the best way to limit usage.

Feature 4) Alternative Index Files

You may not always want to use index.htm or index.html as your index file for a directory, for example if you are using PHP files in your site, you may want index.php to

be the index file for a directory. You are not limited to 'index' files though. Using .htaccess you can set foofoo.blah to be your index file if you want to!

Alternate index files are entered in a list. The server will work from left to right, checking to see if each file exists; if none of them exist it will display a directory listing (unless, of course, you have turned this off).

Feature 5) Redirection

One of the most useful functions of the .htaccess file is to redirect requests to different files, either on the same server, or on a completely different web site. It can be extremely useful if you change the name of one of your files but allow users to still find it. Another use is to redirect to a longer URL, for example in my newsletters I can use a very short URL for my affiliate links.

Feature 6) Password Protection

Adding password protection to a directory using .htaccess takes two stages. The first part is to add the appropriate lines to your .htaccess file in the directory you would like to protect. Everything below this directory will be password protected:

```
AuthName "Section Name"
AuthType Basic
AuthUserFile /full/path/to/.htpasswd
Require valid-user
```

There are a few parts of this which you will need to change for our site. We should replace "Section Name" with the name of the part of the site we are protecting e.g. "Members Area". The /full/parth/to/.htpasswd should be changed to reflect the full server path to the .htpasswd file.

The .htpasswd File

Password protecting a directory takes a little more work than any of the other .htaccess functions because you must also create a file to contain the usernames and passwords which are allowed to access the site. These should be placed in a file which (by default) should be called .htpasswd. Like the .htaccess file, this is a file with no name and an 8 letter extension. This can be placed anywhere within you website (as the passwords are encrypted) but it is advisable to store it outside the web root so that it is impossible to access it from the web.

Entering Usernames and Passwords

Once you have created your .htpasswd file (you can do this in a standard text editor) you must enter the usernames and passwords to access the site. They should be entered as follows:

```
username : password
```

Where the password is the encrypted format of the password. To encrypt the password you will either need to use one of the pre-made scripts available on the web or write your own. I used a binary command line file included in Apache.

For multiple users, just add extra lines to your .htpasswd file in the same format as the first. There are even scripts available for free which will manage the .htpasswd file and will allow automatic adding/removing of users etc.

Accessing the Site

When you try to access a site which has been protected by .htaccess your browser will pop up a standard username/password dialog box. If you don't like this, there are certain web server modules available which allow you to embed a username/password box in a website to do the authentication. You can also send the username and password (unencrypted) in the URL as follows:

```
http://username:password@www.website.com/directory/
```

Summary

'.htaccess' is one of the most useful files a webmaster can use. There are a wide variety of different uses for it which can save time and increase security on our website.

To make it easier to implement password protection, PHP Access is a program to assist in the creation of .htaccess user accounts with passwords.

We will be using .htaccess functions for sections of our web implementations.

6.5 Intranet – Secure Sockets Layer (and TLS)

Problem

To secure data sent to and from our public internet and private intranet web applications, the SSL protocol needs to be implemented. I was assigned the task of conducting research on this topic, providing background information, usage statistics and procedures in implementing it for our projects.

Solution

The following is a small part of my submitted report to illustrate the idea of this deliverable.

How it works

Secure Sockets Layer

Digital certificates encrypt data using Secure Sockets Layer (SSL) technology, the industry-standard method for protecting web communications developed by Netscape Communications Corporation. The SSL security protocol provides data encryption, server authentication, message integrity, and optional client authentication for a TCP/IP connection. Because SSL is built into all major browsers and web servers, simply installing a digital certificate turns on their SSL capabilities.

SSL comes in two strengths, 40-bit and 128-bit, which refer to the length of the "session key" generated by every encrypted transaction. The longer the key, the more difficult it is to break the encryption code. Most browsers support 40-bit SSL sessions, and the latest browsers enable users to encrypt transactions in 128-bit sessions - trillions of times stronger than 40-bit sessions. Global companies that require international transactions over the web can use global server certificates program to offer strong encryption to their customers.

Server Certificates

Server certificates are designed to protect you and visitors to your site. Installing a digital certificate on your server lets you:

- Authenticate your site. A digital certificate on your server automatically communicates your site's authenticity to visitors' web browsers, confirming that the visitor is actually communicating with you, and not with a fraudulent site stealing credit card numbers or personal information.

- Keep private communications private. Digital certificates encrypt the data that visitors exchange with your site to keep it safe from interception or tampering using SSL (Secure Sockets Layer) technology, the industry-standard method for protecting web communications.

Virtually all web servers and the leading browsers are optimised and ready for SSL. To activate SSL sessions with visitors to your site, all you need is a digital certificate for your server.

How Server Certificates Work

Server certificates take advantage of SSL to work seamlessly between your site and your visitors' web browsers.

Here's how the process works:

1. A customer contacts your site, accessing a secured URL (indicated by a URL that begins with "https:" instead of just "http:" or by a message from the browser).

2. Your server responds, automatically sending the customer your site's digital certificate, which authenticates your site.
3. Your customer's web browser generates a unique "session key" to encrypt all communications with the site.
4. The user's browser encrypts the session key itself with the site's public key so only the site can read the session key.
5. A secure session is now established. It all takes only seconds and requires no action by the user. Depending on the browser, the user may see a key icon becoming whole or a padlock closing, indicating that the session is secure.

If your site doesn't have a digital certificate, visitors will see a warning message when they attempt to offer credit card or personal information.

How Digital Certificates Work

Digital certificates are based on public/private key technology, the same technology used to protect nuclear missile sites. Each key is like a unique encryption device. No two keys are ever identical, which is why a key can be used to identify its owner.

Keys always work in pairs, one called the private key, and the other called the public key. What a public key encrypts, only the corresponding private key can decrypt, and vice versa. Public keys are distributed freely to anyone who wants to exchange secure information with you. Your private key is never copied or distributed and remains secure on your computer or server.

Digital certificates automate the process of distributing public keys and exchanging secure information. When you install a digital certificate on your computer or server, your computer or web site now has its own private key. Its matching public key is freely available as part of your digital certificate posted on your computer or web site.

When another computer wants to exchange information with your computer, it accesses your digital certificate, which contains your public key. The other computer uses your public key to validate your identity and to encrypt the information it wants to share with you using SSL (Secure Sockets Layer) technology. Only your private key can decrypt this information, so it remains secure from interception or tampering while travelling across the Internet.

Public/Private Key Technology

The problems of authentication and large network privacy protection were addressed theoretically in 1976 by Whitfield Diffie and Martin Hellman when they published their concepts for a method of exchanging secret messages without exchanging secret keys. The idea came to fruition in 1977 with the invention of the RSA Public Key Cryptosystem by Ronald Rivest, Adi Shamir, and Len Adleman, then professors at the Massachusetts Institute of Technology.

Rather than using the same key to both encrypt and decrypt the data, the RSA system uses a matched pair of encryption and decryption keys. Each key performs a one-way transformation upon the data. Each key is the inverse function of the other; what one does, only the other can undo.

The RSA Public Key is made publicly available by its owner, while the RSA Private Key is kept secret. To send a private message, an author scrambles the message with the intended recipient's Public Key. Once so encrypted, the message can only be decoded with the recipient's Private Key.

Inversely, the user can also scramble data using their Private Key; in other words, RSA keys work in either direction. This provides the basis for the "digital signature," for if the user can unscramble a message with someone's Public Key, the other user must have used their Private Key to scramble it in the first place. Since only the owner can utilize their own private key, the scrambled message becomes a kind of electronic signature -- a document that nobody else can produce.

Summary

To implement SSL, we need to sign up for a server certificate from a Certificate Authority, such as VeriSign or Thawte. VeriSign is the most popular CA, but Thawte has been gaining market share. One reason could be the much cheaper price at around USD $100 per year.

Figure 9: Digital Signature Process

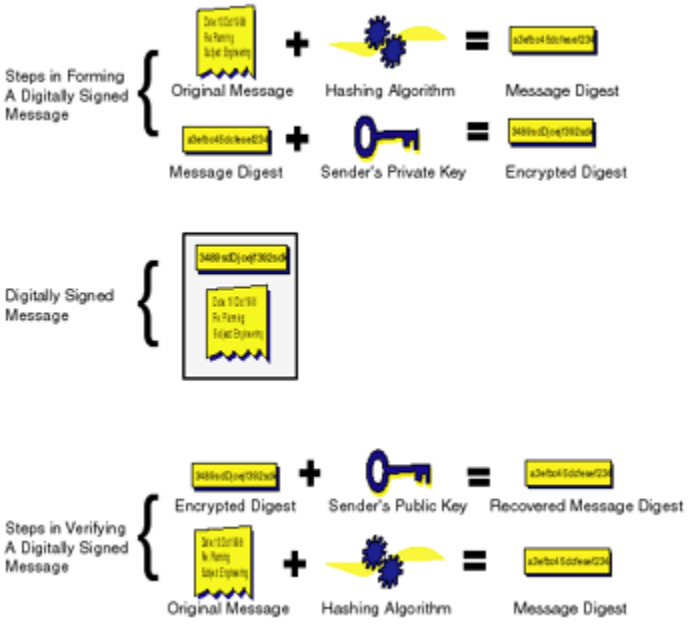
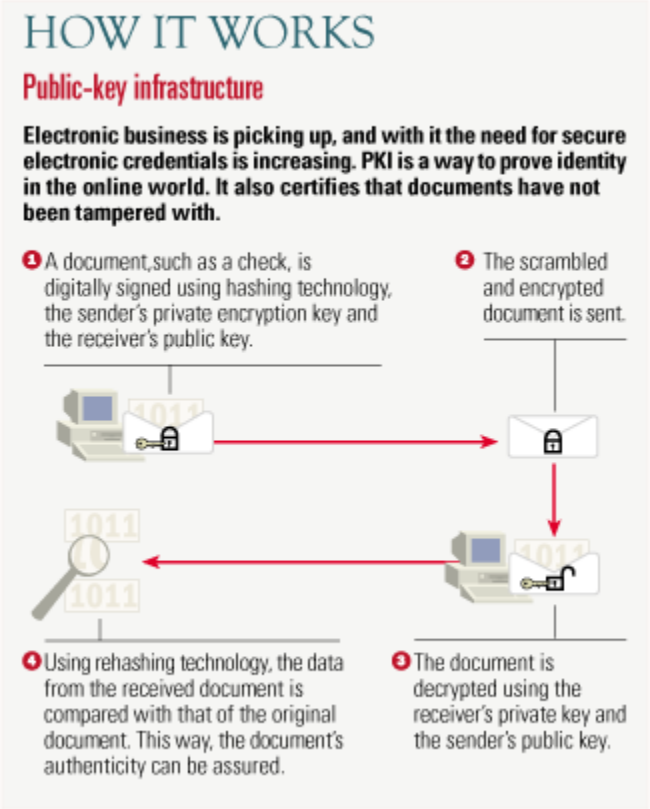


Figure 10: Public-key Infrastructure



6.6 Intranet – Networking, SMB, and NFS

Problem

This research activity is mainly to assist us in becoming more productive when we do the actual programming and implementation of the PHP intranet website. This task was allocated to me; to conduct research on how to share file and print services between incompatible operating systems. The task came about because the team typically worked on Windows platforms, while the intranet server is running Red Hat Linux. We need to have easy access to the files stored on the Intranet server rather than accessing via FTP or SSH.

Solution

The following is a very small part of my submitted report to illustrate the idea of this deliverable.

Networking: Sharing files and print services

There are two main file-sharing protocols in use today; Server Message Block (SMB) and the Network File System (NFS) protocols. These two file-sharing protocols were developed by two of the biggest rivals in the computer industry: Microsoft and Sun Microsystems, both appearing in 1984. (IBM and Microsoft developed SMB, and Sun developed NFS.)

SMB/CIFS

When you use your Windows browser to go to "Network Neighbourhood" and can read from and write to drives that are actually on other computers, you are probably using the SMB protocol. The first mention of the SMB protocol was in an IBM technical reference in 1984, and it was originally designed to be a network naming and browsing protocol. Shortly thereafter, it was adapted by Microsoft to become a file sharing protocol. Several versions of the SMB protocol have been released throughout the years, and it has become the common file sharing protocol for all Microsoft Windows operating systems (Windows 3.1, 95, 98, Me, NT, 2000, and XP) and IBM OS/2 systems. Microsoft recently changed its name to the Common Internet File System (CIFS).

Like many Microsoft applications, CIFS was designed for simplicity. To allow others to access a drive on your system, simply right-click on a drive icon and select “Sharing”. You then decide whether the drive should be shared read-only or read-write, and what passwords should control access. You can share a complete drive (e.g., C:\) or just a part of the drive (e.g., C:\MYMUSIC).

CIFS was not originally designed for performance. It was designed with multiple-user access in mind—at the expense of performance. However, Microsoft and other companies have made a number of performance improvements to CIFS in recent years.

The popularity of CIFS has led to many companies installing large, centralized CIFS servers that share drives to hundreds or thousands of PC clients. The most common reason to do this is to centralize the storage of important files. Users are encouraged to save anything important on the "network drive" because many don't back up their desktops. The administration staff, however, backs up the CIFS server.

Another type of CIFS server is a Unix/Linux box running Samba, which gets its name from the SMB protocol. Such a system can also share its drives with hundreds or thousands of PC clients, who will see it as nothing other than another PC sharing drives. Since both Linux and Samba are free, this solution has become quite popular.
To summarize, SMB has evolved into CIFS and become the predominant way to share files between Windows-based desktops and laptops.

Conclusion

Procedures on how to install and configure SMB was included in the report, and we successfully configured it for use during our long programming nights!

6.7 Intranet – Red Hat Package Manager

Problem

Apart from the installation and configuration of Red Hat Linux 7.3, maintenance is also an important requirement. Red Hat Package Manager was the key to simple maintenance of the Linux operating system as if simplifies the task of updating Linux modules/packages.

Solution

Package Management with RPM

The **Red Hat Package Manager** (**RPM**) is an open packaging system, available for anyone to use, which runs on Red Hat Linux as well as other Linux and UNIX systems. Red Hat, Inc. encourages other vendors to use RPM for their own products. RPM is distributable under the terms of the GPL.

For the end user, RPM makes system updates easy. Installing, uninstalling, and upgrading RPM packages can be accomplished with short commands. RPM maintains a database of installed packages and their files, so you can invoke powerful queries and verifications on your system. If you prefer a graphical interface, you can use Gnome-RPM to perform many RPM commands.

During upgrades, RPM handles configuration files carefully, so that you never lose your customizations — something that you will not accomplish with regular .tar.gz files.

For the developer, RPM allows you to take software source code and package it into source and binary packages for end users. This process is quite simple and is driven from a single file and optional patches that you create. This clear delineation of "pristine" sources and your patches and build instructions eases the maintenance of the package as new versions of the software are released.

7. Project Skills Developed

The following sections will summarise my total project involvement throughout the whole year. My contributions to the project and the team, knowledge learned and practiced, and personal skills that I developed during the course of this project will be outlined.

7.1 Technical Knowledge Learned

1. Touch screen technologies: Resistive, Capacitive, Sound Acoustic Wave.
2. Application of Microsoft Windows CE and Linux for embedded applications.
3. Specifications for industrial-grade Human Machine Interface platforms.
4. Current technology for VoIP with Avaya's IP Office product.
5. Real-life network infrastructure of a student hostel by studying 'Grafton Hall'.
6. Increased my knowledge on student hostel services and building requirements.
7. Background on internet access metering software by studying University of Auckland's Net Account software.
8. MDF, IDF, POP, cross-connects, patch panels, and rack-mounted equipment.
9. Q.Sig Networking and Call Routing technologies.
10. The Common Cable Design standard, AS/NZS 3080.
11. RJ11 sockets, 3-way wall panels.
12. Cat-6 UTP cabling and advantages of fibre optics over traditional copper networks.
13. 'Blown Fibre', a technology that allows ease-of-upgrading an optical fibre network.
14. The specifications and construction of 'Web Kiosks'.
15. Understanding of an RFP – Request for Proposal.
16. Network cabling - CAT 5e, 6, 6e, 7 and Gigabit Ethernet.
17. Better understanding of server-side scripting languages such as ASP, PHP, Perl/CGI, ColdFusion, JSP.
18. Transport Layer Security (TLS) and Secure Sockets Layer (SSL) technologies, .htaccess feature of Apache, Server-Side Includes (SSI) feature.
19. Background information on Apache, PHP, and MySQL.
20. Network File System (NFS) and Server Message Block (SMB) file sharing protocols.
21. Red Hat Package Manager (RPM).
22. The installation of open source PHP discussion forum software.
23. Learned project co-ordination and time scheduling skills and tools such as with the use of a GANNT chart.
24. Increased my knowledge of PHP programming by programming a project-oriented solution.

7.2 Technical Knowledge Practiced

1. Drafting of the Network Request for Proposal required the use of my knowledge learnt at the University. Course material from courses such as Data Communications Fundamentals (COMPSCI 314), Advanced Data Communications (INFOSYS 329), and Special Topic in Computer Networks (INFOSYS 339) are relevant. Knowledge about Local Area Networks, equipment such as switches, routers and cabling, distribution facilities, wiring closets, IP addressing schemas, security measures such as Access Control Lists and Virtual LANs, and drawing of logical and physical network design diagrams.

2. The installation of Linux, Apache, PHP and MySQL for our Intranet Server required a lot of Internet research for the technical knowledge. I learned a lot more with regards to the Linux operating system (Red Hat 7.3) and its commands in the Linux environment. Also learned the compilation process of open source software and the configuration involved.

3. The construction of our Intranet required the use of my PHP knowledge learned from my Multimedia and Hypermedia Systems course (COMPSCI 708) at the University of Auckland. Further research on the Internet was required for applying the theory in the practical problem I encountered. Simply understanding the theory was often not enough. Knowledge of web application planning considerations, use-case diagrams, and navigation diagrams was used.

4. Applied the knowledge learnt from researching NFS and SMB, and was able to share files between multiple operating systems; Microsoft Windows 2000/XP and Linux.

5. Applied the knowledge learnt from researching .htaccess, and was able to enable access security on specific web server folders to provide access security.

6. Applied the knowledge learnt from researching online discussion forum software by successfully installing and configuring a discussion forum for our Intranet use.

7. Applied the knowledge learnt from researching on project management topics such as project co-ordination and time-scheduling. Learned how to use Microsoft Project 2000 and produced a GANNT chart to direct our team, making sure we are on the right track and on schedule.

7.3 Personal Technical Skills Developed

1. The drawing of Logical and Physical Diagrams of a Network Implementation.
2. The installation and configuration of a full-function Internet Web Server using Linux, apache, PHP and MySQL.
3. Strengthened my knowledge on the PHP programming language for the display of dynamic information and database access via SQL.
4. Installation and configuration of a platform independent file and printer sharing service, SMB.
5. The configuration of .htaccess and .htpasswd files for applying access restrictions on Internet websites.
6. The ability to setup and configure a fully functional web-based discussion forum built on PHP and MySQL technology.
7. Project co-ordination and time scheduling skills, giving me more confidence with future projects.
8. The use of Microsoft Project 2000 to draw GANNT charts, further assisting project management and scheduling skills as a team leader.

7.4 Personal Non-technical Skills Developed

1. Learnt how to work in a team environment
2. Improved my research skills
3. Better communication skills
4. Increased my report writing and report presentation skills
5. Increased confidence for presentations
6. More confidence in asking questions or voicing concerns

8. Project Contribution

8.1 Personal Contribution to the CNZ Project

1. Request for Proposal – Information and Communication document.
2. Design Reference Report – collation of information researched for the development of RFPs.
3. Server-Side Scripting Language Comparison – a document comparing ASP, ColdFusion, JSP, Perl/CGI and PHP languages for web development.
4. CNZ Intranet web site planning document.
5. PHP Deployment Research document.
6. SSI Research report.
7. SSL background research report.
8. .htaccess Research report.
9. Survey Questionnaire for Potential CNZ Customers.
10. Template for Entry of Data into the database for Potential Customers.
11. Technology Deployment Diagram showing the relationships between hardware and software such as Apache, PHP, MySQL.
12. Database Data Collection of Potential Customers document.
13. Document of a list of potential hostel contractors.
14. Hostel Proposal review of a contractor's proposal.
15. Networking, SMB and NFS research report.
16. Red Hat Package Manager research report.
17. Microsoft Project document – GANNT Chart.
18. Research reference reports for the version histories of PHP, MySQL and Apache.
19. Research reference report of Project Management skills.
20. PHP programming for the Intranet.
21. Intranet web design, images, buttons, JavaScript etc.
22. Real data collection and entry.

8.2 Summary of My Reports Delivered to CNZ

Week	Period	Report Topic
Week 1	03/03/2002 – 09/03/2002	[DOC] Advantech Research Report
Week 2	10/03/2002 – 16/03/2002	[DOC] Hostel Research Report
Week 3	17/03/2002 – 23/03/2002	[DOC] Network & Phone Research Report
Week 4	24/03/2002 – 30/03/2002	[DOC] Automation Applications in e-Service
Week 5	31/03/2002 – 06/04/2002	[DOC] Request For Proposal - Network Draft
Week 6	07/04/2002 – 13/04/2002	[DOC] Project Management QA Manual [DOC] Request For Proposal - Network
Week 7-8	14/04/2002 - 27/04/2002	[DOC] Revised Project Management QA Manual [DOC] RFP - Network [DOC] RFP - Network - Expected Deliverables
Week 9-10	28/04/2002 - 11/05/2002	[DOC] Design Reference [DOC] RFP - Information & Communication
Week 11-12	12/05/2002 - 25/05/2002	[DOC] Server Scripting Languages Comparison [DOC] Website Planning
Week 13-15	26/05/2002 - 16/06/2002	[DOC] .htaccess Research [DOC] PHP Deployment Research [DOC] SSI Research [DOC] SSL Background Research
Week 16-17	8/07/2002 - 21/07/2002	[DOC] Potential Customers [DOC] Survey Questionnaire [DOC] Survey Results [DOC] Technology Overview [DOC] Template for entry of data [DOC] Website Planning (Consolidated)
Week 18-19	22/07/2002 - 4/08/2002	[DOC] Database Data Collected [DOC] Hostel Contractors [DOC] Hostel Proposal Review [DOC] ITE Technology Deployment [DOC] ITE Technology Overview [DOC] RFP - Information & Communication 1.2 [DOC] Template for entry of data
Week 20-21	5/08/2002 - 18/08/2002	[DOC] ITE Technology Overview [DOC] Networking, SMB, NFS [DOC] Overall Team Progress [DOC] Red Hat Package Manager
Week 22-24	19/08/2002 - 08/09/2002	[DOC] Gantt Chart [DOC] Hostel Equipment Price Comparison [DOC] ITE Technology Overview [DOC] Reference - Apache Version History [DOC] Reference - MySQL Version History [DOC] Reference - PHP Version History [DOC] Reference - Project Management
Week 25-28	09/08/2002 - 06/10/2002	[DOC] Total Project Involvement [DOC] Gantt Chart (revised)

9. Project Conclusion

The greatest reward from undertaking the CNZ project is the shear amount of knowledge gained and the end deliverables produced. The knowledge I gained was not only technical knowledge, but also project management and practical industrial knowledge. The end deliverable is also a big achievement, as according to the supervisor it could only be done by IT consultants with at least 5 years of experience. Of course, our implementation needs to be perfected in many areas, but our effort is on the right track thanks to the guidance from our supervisor TN.

One notable point regarding the intranet web application we developed is that it was completed in a very short amount of time. The end result was produced in roughly 40 hours per team member, and this would not have been possible without good project co-ordination by our supervisor TN, who provided us with a well designed project schedule that led us to do relevant research before doing any actual work, in combination with our team's good time management.

For the hostel project I have done background research on available technologies, how technologies are applied, and how they integrate together in a system. I have also learned the purpose of a Request for Proposal (one of the main deliverables) and developed one from scratch. All the work that I have done has led me to understand more about the way companies function, and how companies communicate and interact with each other. I have also learnt a lot about technologies that make up the systems in use today. Most importantly, I was applying technical knowledge in real life problems involving industry standards, such as the Common Cable Design standard AS/NZS 3080. Another example of industrial work was reviewing a proposed solution (by a contractor) to distribute data communications media throughout the hostel building. This was a very good experience as the proposal was professionally done.

I was able to apply the knowledge I learnt from the following courses that I studied for my BTech degree in the University of Auckland:

- Data Communications (INFOSYS 224)
- Data Communications Fundamentals (COMPSCI 314)
- Advanced Data Communications (INFOSYS 329)
- Special Topic in Computer Networks (INFOSYS 339)
- Data Communications and Networks (COMPSCI 742)

For the business infrastructure project, I have learned about company procedures and how a company culture develops in the early stages. I have also gained a tremendous amount of technical knowledge from doing individual research, and gained practical experience on PHP programming, which will give me much more confidence to tackle similar projects in the future. I learnt how to construct and use a Gantt chart to organize the team, and personally constructed a server by reusing old hardware. A Linux O/S was

installed and configured with Apache, MySQL and PHP to provide the platform for our Intranet Web Application project.

The work involved allowed me to apply the theory I had learnt in the University about website and database design. Courses I have taken at the University of Auckland that were able to assist me include:

- Database Systems (INFOSYS 222)
- Distributed Objects and Algorithms (COMPSCI 335)
- Multimedia and Hypermedia Systems (COMPSCI 708)

The working environment today is often complex and we continually have to look for new and better ways of doing things. An instance of when I had to develop a better way to solve a problem occurred during the early stages of the web application development. During the early stages of the PHP programming, our immediate goal was to configure the Linux server so that our required functions would be supported correctly. However, the Linux server was located away from our workstations, and time was wasted whenever access to the Linux terminal was required. This became an iterative process. Whenever I discovered bugs, access to the terminal was required for reconfiguration of the software. This wasted a lot of time during each iteration of the process.

In order to save time, I discovered how to configure an ssh-daemon that supports secure shell connections on the Linux system. From then on our team was able to access the terminal remotely without much effort, greatly improving our productivity during that stage.

In conclusion, as a result of this project I have compiled and submitted a total of 45 reports plus weekly status reports. Our supervisor TN is satisfied with our performance throughout the year, and there is a possibility for project continuation next year!

This project serves as an excellent catalyst in filling in the gap between theory learnt at the University of Auckland and commercial applications in the IT industry. It has definitely been a rewarding experience, and is definitely the best course of the entire Bachelor programme. I heavily recommend future BTech. IT students to try and score a project with CNZ as they will no doubt learn much more than they could imagine!

10. References

.htaccess	http://www.freewebmasterhelp.com/tutorials/htaccess/
AS/NZS 3080:	http://www.generalcable.co.nz/Technical/cable_standard.htm
ASP.net:	http://www.asp.net/
ASP FAQ:	http://www.4guysfromrolla.com/webtech/faq/faqtoc.shtml
Cold Fusion:	http://www.macromedia.com/support/coldfusion/
JSP:	http://java.sun.com/products/jsp/
Perl:	http://www.perl.org/
PHP:	http://www.php.net/
Project Management:	http://www.mindtools.com
Server-Side Scripting:	http://www.webmasterbase.com/article/546
SMB/NFS:	http://safari.oreilly.com/
SSI:	http://www.freewebmasterhelp.com/tutorials/ssi
SSL:	http://www.securityspace.com
Web Kiosk:	http://www.advantech.com.tw/products/ES-510.asp

University of Auckland:

COMPSCI.708	http://www.cs.auckland.ac.nz/compsci708fc/
COMPSCI.335	http://www.cs.auckland.ac.nz/compsci335st/
COMPSCI.314	http://www.cs.auckland.ac.nz/compsci314st/
COMPSCI.742	http://www.cs.auckland.ac.nz/compsci742sc/
INFOSYS.222	INFOSYS 222
INFOSYS.224	INFOSYS 224
INFOSYS.329	INFOSYS 329
INFOSYS.339	INFOSYS 339

Appendix A: Weekly Report and Discussion

The following contents of my report will discuss on a weekly-basis, the objectives outlined to me, the approaches I took in completing the tasks, the achievements at the end of the week, and what I gained in terms of knowledge.

It has been included in this final report because it describes the order of the deliverables completed during the year. This is an aspect that has not been addressed in Sections 4, 5 and 6 of this report.

Overview Timeline

Weekly Objectives

Week 1
4 March

To gain new knowledge from Advantech project/product samples available on their corporate website, and relating to academic studies whenever possible.

Week 2
11 March

To research and gain understanding on current university hostels in regards to control and monitoring, putting special focus on the phone systems, networking equipment and cabling, in attempt to aid the design of our own hostel project.

Week 3
18 March

To collect information for drafting user requirement specifications and type of technologies to use. Need to know commercial products and their specifications being used in various student hostels and find out service providers who do the installation.

Week 4
25 March

To research and gather information outside the scope of our hostel project. We will identify some real life applications and find out their use of information, data communication and Internet technologies.

Week 5
1 April

To draft a Request for Proposal, stating the requirements of network and telephone cabling for the student hostel. The RFP must describe what facilities the hostel owner intends to build and supply to residents and how residents will use the facility.

Week 6
8 April

To complete/expand Network and Telephone Request for Proposals. Also to plan how to develop the Project Management QA Manual.

Week 7
15 April

Week 8
22 April

To expand Network RFP to include user requirements, technical specifications and installation points. There shall be a separate reference paper to show commercial products and services that would meet our requirements and budgetary costing. To expand the Project Management QA Manual to include user brief, table of contents, technical specifications, sequence of actions for implementation and budgetary costing.

Week 9
29 April

Week 10
7 May

Consolidate RFP into 2 streams; and keep non-RFP information into a separate Design Reference Report for each stream:

- Safety and Security
- Information and Communication

Week 11
13 May

To compile two proposals to challenge the database and website proposals (by Michael and Ahmed) with the objective of improving the overall quality.

Week 12
20 May

Week 13
26 May

Week 14
2 June

Week 15
9 June

Web Design – to provide more competitor references, complete prototyping, PHP deployment research, SSL background research, and proposal consolidation.

Tasks are split up among us. I will be in charge of prototyping, PHP deployment research and SSL background research. However, I will also work with Ahmed to complete the proposal consolidation because it needs to be agreed upon by the two of us.

Week 16
7 July

Week 17
14 July

1. Discuss and consolidate technical web design plan with Ahmed.
2. Work with Michael to (a) establish the template for entry of data and (b) research New Zealand customers for real-life data for our application database (potential customers). Focus on building automation.

Week 18
21 July

Week 19
28 July

1. Review the proposal for data cabling, and upgrade our RFP to version 2.
2. Search for solutions that will include coordinated cabling for analog and digital multi-media services such as TV.
3. Search for real-life data from websites and surveying as discussed. Extend beyond building automation but confine to Information Technologies.

Week 20
4 August

Week 21
11 August

Each person in the group will take up one portfolio.

a) Database builder – develop and test database (Michael)
b) Web site builder – develop and test web site (Ahmed)
c) Technology and Data Collector – (Jimmy)
d) Development Coordinator – (Edmond)

Week 22
18 August

Week 23
25 August

Week 24
1 September

a) Research version history of Apache, PHP and MySQL.
b) Revise the CNZ ITE Knowledge Base Infrastructure block diagram.
c) Set-up the PHP forum and database for our Intranet.
d) Assist Ahmed with PHP coding.
e) Co-ordinate the final stages of the project with a Gantt chart.
f) Compare price of TV cable to GE SMART price.

Week 25
8 September

Week 26
15 September

Week 27
22 September

Week 28
29 September

a) Continuation of effort with reference to GANNT Chart.
b) Documentation of Database Development (Michael)
c) Documentation of Web Site Development (Ahmed)
d) Collation and Entry of data to Database (Jimmy and Edmond)
e) Total Project Involvement Report – technical knowledge learned and practised, personal skills developed and your personal contribution to CNZ Infrastructure project including a list of deliverables such as reference documents.

Week 1: Research of Commercial Industry Projects

3 March 2002 - 9 March 2002

Objectives

To gain new knowledge from Advantech project/product samples available on their corporate website, and relating to academic studies whenever possible.

Methodology

The first week of the project started off with learning industrial products and applications by Advantech, a world-wide ODM (Original Design Manufacturer) based in Taiwan. The intention was to familiarize ourselves with solutions offered on the market. Our first task was to browse the partner zone of http://www.advantech.com using a login and password supplied to us by our supervisor.

Solutions covered in my submitted report included:

- Home Appliances
- Kiosk Solutions
- Human Machine Interfaces
- Panel PCs

I also studied the structure of Advantech's public website and corporate website (partner zone). We will be implementing our own public and private website for the business infrastructure in the future, so studying Advantech's website should allow us to come up with a good design.

Achievements

- Browsing of Advantech website to learn their products and project samples.
- Understanding of the structure of the Advantech website.
- The reading of successful application stories by Advantech.
- Learning topics include:
    - Resistive, Capacitive, SAW touch screens.
    - Windows CE, Linux for embedded applications.
    - Human Machine Interface platforms.

I have learned a lot of industry products by studying Advantech's portfolio. The Human Machine Interface platforms were specialised computers to suit factory environments. I specifically gained knowledge of technology behind different types of touch panel displays.

Week 2: Research on University Hostel Buildings

10 March 2002 - 16 March 2002

Objectives

This week's objectives is to do research and gain understanding on current university student hostels in regards to control and monitoring, putting special focus on the phone systems, network equipment and cabling, in attempt to aid the design of our own student hostel project.

Methodology

This week involved some team collaboration and time management. We interviewed relevant hostel managers to gain a deeper understanding of the behind-the-scenes operation, and also attended a product launch of an IP telephony product by Avaya. Tasks include:

- Group discussions and planning.
- Interview Mike, IT manager of the Railway Campus.
- Attended IP Office product launch by Agile NZ Ltd. with Avaya.
- Communication with Michael Cochrane, residential assistant of Grafton Hall Hostel for general information and specifics such as brand/model and suppliers of specific equipment used in Grafton Hall.
- Interview with Yong Bao, University of Auckland 'Net Account' administrator for information on internet access for students at the University of Auckland.

Achievements

- Collected information on facilities, phone system, network infrastructure, Internet access and security on Grafton Hall and the Railway Campus.
- Learned a new product, the Avaya IP Office which is an all-in-one solution comprised of voice, data and applications built for small to medium size businesses, designed to allow full analogue, digital or IP connectivity.
- Understanding of the way "Net Account" works at the University of Auckland.

To conclude, the information gathered this week significantly aids the design of our own project solution.

Week 3: User Requirement Specifications and Technologies

17 March 2002 - 23 March 2002

Objectives

This week's aim is to collect enough information for drafting user requirement specifications and type of technologies to use at the end of the week. We need to know commercial products and their specifications being used in various student hostels and find out the service providers who did the installation.

Methodology

Apart from communicating with ITSS and Grafton Hall, we also did a lot of research on the Internet for commercial products. Tasks include:

- Visited the ITSS office at 24 Symond Street, Auckland.
- Contacted Michael Fann, Manager Networking and Telecommunications of ITSS.
- Contacted Michael Cochrane, Resident Assistant of Grafton Hall.
- Internet research.

Achievements

- Understanding of the equipment used at Grafton Hall for the network infrastructure, such as switches, hubs and patch-panels in the Grafton Hall computing lab.
- Learnt about the service providers who installed the systems.
- Was able to relate my networking knowledge with real life application.

This week's achievements include a more thorough understanding of the network infrastructure established in the student hostel 'Grafton Hall'. This is in regards to the equipment used and the service providers involved. Internet research also taught me about technologies incorporated into products such as the Avaya IP Office; more specifically Q.Sig Networking and Call Routing technologies.

In conclusion, the information learnt and gathered this week should assist us in the drafting of user requirement specifications and technologies.

Week 4: Real Life Applications of Information and Technology

24 March 2002 - 30 March 2002

Objectives

This week's aim is to do research and gather information outside the scope of our hostel project. We will identify some real life applications and find out their use of information, data communication and Internet technologies.

Methodology

This week's approach consisted of more Internet research. The interview with the ITSS manager and network engineer also gave me more insight on building-wide computer networks. Tasks include:

- Meeting with Mike Fann, ITSS Manager Networking and Telecommunications.
- Communication with Michael Cochrane (Grafton Hall).
- Internet research.

Achievements

- Learned technical information on the network infrastructure of a typical building. This includes cable marshalling, distribution facilities within the building, and the common cable design standard, AS/NZS 3080.
- Learned the function of a PABX system, demarcation points, and patch panels.
- Learned the technical aspects of Fibre Optic cabling and their advantages over conventional copper wiring for networks.
- Learned a new technique of installing Optical Fibre in buildings called "Blown Fibre".
- Understanding of the Advantech product "Web Kiosk".

The experiential experience I gained this week was great. I learned a new way of learning in the interviewing and communication process. I also was amazed by the simplicity of how a Web Kiosk functions; the integration of different modules makes a very interesting product. In conclusion, this week I have managed to gain understanding of the:

- Network infrastructure of a hostel.
- Cross-connect / patch panels.
- Fibre Optic and CAT-6 cabling.
- Building standard, AS/NZS 3080.
- "Blown Fibre" by Brex Cable and Technology Ltd.
- Advantech ES-510 Web Kiosk.

Week 5: Request for Proposal Process

31 March 2002 - 6 April 2002

Objectives

Hostel Project

To draft a RFP (Request for Proposal) stating the requirements of network and telephone cabling for the student hostel. The RFP must describe what facilities the hostel owner intends to build and supply to residents and how residents will use the facility.

Methodology

Request for Proposals is a new thing to me because I have never read or written a RFP before. The problem/task to draft a RFP was definitely challenging, and I started off by doing some research on the internet for some typical RFP formats. With a good idea of the basic layout of such a document, I then revised the Cisco CCNA curriculum (from my INFOSYS 339 course) for technical data on data communications which may assist in the writing of the networking RFP I was in charge of.

Achievements

- Researched into theory behind network cabling such as CAT5, CAT6/e and Gigabit Ethernet.
- Researched network products on the market (CAT 5e, 6, 6e, 7).
- The drafting of the Network Request for Proposal.

At the end of Week 5, I was able to draft a Request for Proposal stating the requirements of the network implementation intended for the Student Hostel project. I was able to apply knowledge I learnt from my Advanced Data Communications paper (INFOSYS 339), specifically from the CCNA Curriculum (Cisco Certified Network Associate). The theory learnt from the paper helped me complete the task.

I also gained knowledge with respect to commercial products on the market, such as the cabling standards CAT5, 5e and 6 etc.

Week 6: Project Management QA Manual

7 April 2002 - 13 April 2002

Objectives

Hostel Project

To complete/expand Network and Telephone Request for Proposals. Answer questions and provide more support for recommendations.

ITE Division

Plan how to develop the Project Management QA Manual.

Methodology

Thinking and planning played a big role this week. A Project Management QA Manual is yet another new thing to me, and theoretically, this deliverable is very hard to complete as it requires me to fully understand the complete project life-cycle. The QA Manual is a document that documents the processes we complete, step-by-step, during the course of a typical project such as the student hostel project we are currently working on. For example, the whole RFP process will need to be documented, with typical templates and so on.

Achievements

- Expansion of the Network RFP.
- Planning of the Project Management QA Manual.

At the end of Week 6, I am more confident with the development of the Project Management QA Manual deliverable. It documents the planning, implementation, and assessment procedures for a typical project, as well as any specific quality assurance and quality control activities. It is also about scheduling events and resources so that multiple events can proceed without being interrupted by other events or lack of resources.

The Network RFP I produced last week has been improved in terms of the document structure and RFP process. I gained knowledge in this area with respect to the standard RFP process through the development of a template for team-use. I believe this week's RFP revision is a good step forward to the final deliverable I want to achieve.

Week 7-8: Finalising of Request for Proposals

14 April 2002 - 27 April 2002

Objectives

Hostel Project To expand Network RFP to include user requirements, technical specifications and installation points. There shall be a separate reference paper to show commercial products and services that would meet our requirements and budgetary costing.

ITE Division To expand the Project Management QA Manual to include user brief, table of contents, technical specifications, sequence of actions for implementation and budgetary costing.

Methodology

Research, thinking and planning is what this project has cultivated me into doing every week. Although it is quite challenging, I find it to be much more meaningful to make use of theory in practice, rather than to study more theory without any application.

The expected deliverables document is a supplement to the Network RFP. It is intended for internal use and not to be sent out with the RFP. The document is an example of the minimum deliverables expected from third party proposal submissions, and is used for benchmarking and reviewing of submitted proposals received by us in the future. My methodology was to use the knowledge I gained from the Cisco CCNA curriculum as it contained very relevant material.

Achievements

- A revised version of the Network RFP.
- Completed the Network RFP Expected Deliverables document.
- Revised my Project Management QA manual.

I managed to expand and include more technical specifications for the Network RFP. The Request for Proposals should not include too much technical specifications; otherwise it will severely limit the options a sub-contractor can offer in their unique solution/design. I therefore compiled an “Expected Deliverables” document instead of adding too much technical details into my RFP.

The tasks this week made me think more on the business side of things. The RFP process and award of contract supply is a standard business procedure that I have learnt and will certainly experience more of in my future career. The Project Management QA Manual will contain most of the knowledge my team will learn in the near future.

Week 9-10: Drafting of Knowledge Base Infrastructure

28 April 2002 - 11 May 2002

Objectives

Hostel Project

Consolidate RFP into 2 streams; and keep non-RFP information into a separate Design Reference Report for each stream:

- Safety and Security (Access control, intercom, fire, monitoring)
- Information and Communication (Internet, LAN, computers, phone, TV, cabling infrastructure)

ITE Division

- Draft Web site structure proposal report (Ahmed)
- Draft Database structure proposal report (Michael)

Methodology

The Request for Proposal document is quite important since any mistake in the proposal may be costly. Jimmy and I worked together to complete the two RFP documents. He completed most of the Safety and Security RFP, while I completed most of the Information and Communication RFP. The consolidation and finalising is quite important as the RFPs will be sent out to sub-contractors next week.

Achievements

- Completed Information and Communication RFP
- Completed Design Reference Report

The Information and Communication RFP specifies our requirements for Internet, LAN, computers, phone, TV and cabling infrastructure. The document is complete and can be sent out to building developers.

The Design and Reference Report consolidates information I have researched and collected over the past couple of weeks. Jimmy and I have worked together on this, and the document covers information on LAN design, LAN management, cabling infrastructures, Internet connectivity, fire and safety, building security and telephone system.

Week 11-12: Knowledge Base Infrastructure Proposals

12 May 2002 - 25 May 2002

Objectives

Hostel Project

RFPs have been sent out to sub-contractors, and TN will discuss the RFP with the building developer and amend as necessary over the next 2 weeks.

ITE Division

The objective is to challenge the database/website proposals (by Michael and Ahmed submitted last week) in the form of a report with the objective of improving the quality of the proposals.

Methodology

This week involved some more research and the objectives also gave me a chance to apply more theory learnt at the University of Auckland. Main tasks I completed this period include:

- Internet research on server-side scripting languages
- Studied Hypermedia lecture material (COMPSCI 708) for Web Site planning
- Compiled report on server-side scripting languages
- Finished web site planning report
- Wrapping up all reports and log

Achievements

- Web site planning considerations
- Actor Definition (Use Case Diagrams)
- Navigation Diagram
- Server-scripting Comparison Report (ASP, ColdFusion, JSP, PHP, Perl/CGI)

The Server-side scripting report compares the 5 most established server scripting languages (which all do much of the same thing). They interface with databases and create dynamic content. The reasons why we choose one over another will pretty much be subjective — it depends on who we are and what we are trying to do.

I compiled my own proposal by applying knowledge I learnt from my Hypermedia and Multimedia paper (COMPSCI 708) at the University of Auckland. My proposal includes the next steps we should take in developing the web site towards the final deliverable.

Mid-Year Progress

Infrastructure Progress

Period	Objectives	Status
March	Project briefing, Training, Start up planning Allocation of responsibilities	Completed
April	Project Requirement, Database Investigation	Completed
May	Finalise Web and Database Structures	Completed
June	Research techniques, consolidate database and website design proposals	Pending
July	Research technology and application data	Not Started
August	Construction of database and website	Not Started
September	Fine-tune and commission database and web	Not Started

Hostel Progress

Period	Objectives	Status
March	Project briefing, Allocation of responsibilities	Completed
April	Market Research, System Design	Completed
May	Issue RFP, Budgetary Costing	Completed
June	Finalise User Requirements, Issue Tenders	Pending
July	Award Supply and Installation Contracts	Not Started
August	Preparation of Operation Manuals	Not Started
September	Supervision of Contractor Progress	Not Started
October - December	Supervision of Installation, Commissioning and Operator Training	Not Started

Mid-Year Discussion

The project has been proceeding smoothly. In terms of the Hostel Project, the Request for Proposals for Information, Communication, Fire and Security have been completed and sent out to sub-contractors who are interested. In terms of the IT-Engineering Business Infrastructure set-up, we have already designed the website structure in the form of navigation diagrams and use-case diagrams. The database implementation design is also near completion, with OOA, OOD and ER Diagrams completed. We are now, for the next 2 weeks, up to the implementation of the website and the integration of the back-end database with the intranet website following.

Through this project I have learnt a great deal of knowledge. I have learnt a lot of invaluable experience in the IT and engineering industry and more importantly, a new way of learning by doing research and communicating with knowledgeable persons. This BTech Project has led me through this new learning process, skills that I will certainly be able to make use of for the rest of my life.

Team collaboration is something I experienced thoroughly in the course of the project. The team seminar meetings we had every week kept me up to date on the progress and the road ahead us. Our objectives were clearly outlined every week by our supervisor, and there was always something new to learn every single week of the semester.

The knowledge I gained was mostly experiential knowledge. Pure research or reading could not teach me the process and procedures of real life industry projects without going through the process myself, learning as the team moves along. I am very happy that I was able to apply theory I have learnt at the University of Auckland into the non-academic and commercial aspects that I have experienced in this project.

Week 13-15: Knowledge Base Infrastructure Proposals

26 May 2002 - 16 June 2002

Objectives

ITE Division Web Design (Ahmed and Edmond) – more competitor references, prototyping, PHP deployment research, SSL background research, and proposal consolidation (Issue 1).

Ahmed and I decided to split the tasks among us. I will be in charge of prototyping, PHP deployment research and SSL background research. However, I will also work with Ahmed on the proposal consolidation because it needs to be agreed upon by the two of us.

Methodology

- PHP deployment research
- SSL background research
- SSI and .htaccess research
- Prototyping website
- Setting up Apache, PHP and MySQL
- Compiling reports

Achievements

- Learned the background of Secure Sockets Layer technology.
- Learned PHP in more detail.
- Learned .htaccess and SSI.
- Compiled end of semester report for BTech 450 paper.
- Successfully set-up a server running Apache, PHP and MySQL.
- Developed the first prototype of CNZ's ITE division website, with access restriction to the Intranet site.

My achievements have met the objectives and I have learned a lot regarding the PHP scripting language and SSL technology. My Hypermedia paper at University included some lecture material relevant to my PHP research, and those have been included in my reports. Something additional that may be of interest to us is the Transport Layer Security (TLS). It is the open-standard replacement for SSL from the Internet Engineering Task Force. The .htaccess file helps us password protect our Intranet, and SSI will simplify our website coding because it helps with code reuse. (CNZ public website at http://www.cnz.co.nz also uses SSI)

My prototype implementation used Easy PHP 1.6.0.0, which incorporates Apache 1.3.24, PHP 4.2.0 and MySQL 3.23.39. This made the installation process much easier. The next challenge is to configure Apache, PHP and MySQL on a Linux platform. I have also managed to restrict access to the Intranet using .htaccess. This is also what http://channel.cnz.co.nz uses.

Week 16-17: Real Life Data for Technology and Application Databases

8 July 2002 - 21 July 2002

Objectives

ITE Division

1. Discuss and consolidate technical web design plan with Ahmed.
2. Work with Michael to (a) establish the template for entry of data and (b) research New Zealand customers for real-life data for our application database (potential customers). For this period, focus on "Building Automation" only.

Ahmed and Jimmy will research New Zealand suppliers for our technology database (products).

Methodology

- For potential customers, we obtained a list of contacts from the yellow pages and the Internet. I then designed and sent out a short survey to every potential customer in attempt to establish the "template for entry of data" for the database, while we hopefully receive sample real data before the end of week 17.
- Once we are able to receive the first batch of information from potential customers, we will investigate and develop further, the database template for entry of data and our data collection methods.

Achievements

- List of potential customers with contact details.
- Template for entry of data document.
- Set of collected real data for our Application database.
- Completed web design plan consolidation.

This week we set out in attempt to contact and obtain information from companies that could potentially be a customer to us in the future. This objective proved to be difficult in the end as companies were rather reluctant to release any sensitive information. We will make sure we learn from the responses obtained in our previous surveys, and will updated/improve our method of data collection for better success rates in the future.

By the end of the week, we were able to obtain information from 5 companies via the phone from 18 attempts, while we have not yet received a response from our email survey from the 26 emails sent out. Hopefully we will receive replies by next week.

Week 18-19: Hostel Building RFP and Real Life Data for Application DB

22 July 2002 - 4 August 2002

Objectives

Hostel Project
1. Review the proposal for data cabling, and upgrade our RFP to version 2 as necessary.
2. Search for solutions that will include coordinated cabling for analog and digital multi-media services such as TV.

ITE Division
3. Refine the template for entry of data.
4. Search for real-life data such as from websites and surveying as discussed. Extend beyond building automation but confine to Information Technologies.

We must establish the first version of templates and have collected some real-life data to enable us to proceed to the next phase. The next phase is building the real thing.

Methodology

1. Reviewed proposal submitted by 'Contractor 1' according to our defined assessment outlined in RFP version 1.1.
2. Searched the Internet for contractors who can provide solutions for coordinated cabling for analog and digital multimedia. I have compiled a list.
3. Updated the Information and Communication RFP to version 1.2. Grammatical mistakes were corrected, and clause 3.2.2 was added.
4. From discussions at the last supervisor meeting, I have revised both the technology deployment block diagram that shows an overview of the technologies, and compiled a report on which versions of software to deploy after discussing with my team members.
5. Worked with Michael to revise our database template for entry of data while searching for further data on the Internet through websites. We managed to receive one reply in our email survey, from The Warehouse Ltd.

Achievements

- Composed Hostel Proposal Review
- Created list of Hostel Contractors
- Revised RFP – Information and Communication v1.2
- Revised Technology Deployment Overview document

- Composed ITE Technology Deployment document
- Compiled report for the Template and Data of the Application Database

Conclusion

From the surveys sent out before the last meeting, we have received only one reply. This has been added into our collection of data for the database, and we have further added more data from website research. The template has also been updated to reflect the type of data obtainable.

The Hostel Proposal received from 'Contractor 1' was compiled together professionally. The proposed solution to distribute data communications media throughout the building was substantial, and reviewing this proposal was a very good experience. It also confirms that our RFP version 1.1 was quite accurate and complete, as only a minor clause required updating. Our latest RFP version is now 1.2 after reviewing this proposal.

Searching for suitable contractors was not an easy task unfortunately. Tyco International is one of the best examples, while there are many other smaller companies around Auckland that provide similar solutions on a much smaller scale. All these companies were added to the list with a reference URL, because the list is too large. I was unsure of the task at hand though, because it seems that telephone and TV wiring would be done by electricians contracted by the building contractor, i.e. we do not need to search for a separate contractor.

Finally, discussions from the last meeting carried on throughout the week. We decided on which versions of software to deploy, namely Red Hat 7.3, Apache 2.0.39, PHP 4.2.2, and MySQL 3.23.51.

Week 20-21: Database and Website Building, Hostel Cabling RFP

5 August 2002 - 18 August 2002

Objectives

ITE Division

Each person in the group will take up one portfolio.

a) Database builder – develop and test database with web site builder (Michael)
b) Web site builder – develop and test web site with database builder (Ahmed)
c) Technology and Data Collector – technology hierarchy, control, templates and collect data (Jimmy)
d) Development Coordinator – hardware, testing, overall progress documentation (Edmond)

Methodology

1. Download required software. All software used in this project is to be free and open source. Downloaded software include: Red Hat Linux 7.3, Apache 2.0.40, PHP 4.2.2, and MySQL 3.23.51.
2. Set up the required hardware. For our project testing purposes, I have built a server out of spare PC components. The server specifications are as follows:
    - Intel Celeron 300A
    - 256MB PC133 SDRAM
    - Asus P2B-F
    - Matrox G200 8MB
    - Seagate U6 20GB
    - Accton EN1207D-TX
3. Installing Red Hat Linux 7.3. A custom installation was chosen, with standard packages plus necessary packages for Apache, PHP and MySQL installed.
4. Setting up server settings for Apache and MySQL. For Apache, the httpd.conf file needed customisation, and for MySQL, setting a root password was necessary. PHP was pre-configured and ready to run by default. From this point on, the services only needed to be started for the Apache, PHP and MySQL server to function.
5. Basic testing performed. Accessed the web server from another workstation, and the html page displayed fine.
6. PHP testing performed. A basic PHP testing page was uploaded to the server to test the PHP pre-processor and basic functionality.
7. MySQL testing performed. PHPMyAdmin, an open source PHP interface for issuing SQL commands, was used to test the management and creation of tables. Everything works fine.

8. Did research on file sharing with NFS and Samba, and package updating with RPM. RPM is used for updating individual packages. (Packages are modules to be installed on top of a Linux kernel to offer additional features)
9. Finalised the 'ITE Technology Deployment Overview' diagram, as discussed in our last BTech Project meeting.
10. Compiled documentation on NFS, SMB, and Samba for network file sharing.
11. Compiled documentation on RPM (Red Hat Package Manager).
12. Compiled overall team progress documentation.

Achievements

- Successfully set up a Linux server as a web server supporting PHP/MySQL.
- Compiled documentation on NFS, SMB and RPM.
- Revised Technology Deployment Overview document.
- Compiled Overall Progress Document.

Conclusion

My progress this week has been quite substantial. I have successfully set-up our project test server with Red Hat Linux 7.3 installed. The Apache server with PHP and MySQL has been tested for basic functionality.

Our team has not yet completed a functional version of our PHP intranet site yet, and so further testing has not been done.

At the moment, the Apache, PHP and MySQL installed versions are not the versions that we agreed upon; this was due to two reasons. 1) The RPM packages for our specific versions were not yet available. Without the RPM packages, the installation process becomes much more complex. 2) Apache 2.0.40 has been released. This is now the latest version available, and is better than our defined version of 2.0.39. To install the latest versions available, I will need to do research on how to install them. It involves compiling the source files of each package and installing the packages manually without the help of RPM. It is more complex than it seems, as RPM actually handles a lot of work behind the scene, such as checking for dependencies between packages, and restoring original configuration files after updating.

I have tried to document most of the work I have done, and so far I have compiled two reports. The first, the 'Networking' document, introduces a way for sharing files or print services with either SMB or NFS. Both are popular protocols for connecting and sharing resources between different operating systems. I.e. they are platform independent. The second document was extracted from the Red Hat manual, introducing the Red Hat Package Manager and Gnome-RPM.

Week 22-24: Database and Website Building Continued

19 August 2002 - 08 September 2002

Objectives

ITE Division

a) Research version history of Apache, PHP and MySQL to find out the differences between the versions we installed and the versions we agreed on.
b) Revise the CNZ ITE Knowledge Base Infrastructure block diagram.
c) Set-up the PHP forum and database for our Intranet.
d) Assist Ahmed with PHP coding.
e) Co-ordinate the final stages of the project by drawing up a Gantt chart.

Hostel Project

a) Compare price of TV cable to GE SMART price.

Methodology

a) The aim of this task is to find out whether the installed versions of each software package (Apache, PHP and MySQL) satisfies our requirements, and whether there are any subtle differences we need to take note of. I searched on the Internet for the complete version histories from each of their official sites. I then re-organised the information into a word document, and summarised my findings in the conclusion at the end of this document.
b) As discussed at the last meeting, some minor changes have been made to the block diagram. Hopefully this diagram will make the infrastructure clear to everyone.
c) A discussion forum can be a very simple page with messages posted by users, or a more complex one that provides much more features and functionality. Writing PHP code for a complex one may take a few months however, so I decided to use open source projects available on the Internet. "PHP Bulletin Board" is one of the most popular discussion forums used on the Internet. It is open source and available for download at http://www.phpbb.com. I've successfully configured one for our use, and it is already up and running on our intranet server.
d) Ahmed was probably assigned the biggest workload, so each of us tried to help him with our spare time. I coded 3 PHP pages for the Intranet, which took quite a long time because of the way we reused code. I was required to learn the data classes that Mike wrote before I could do any coding.
e) The project at this stage has become more complicated than before, with every group member working on different aspects of our final Intranet prototype. The streaming of tasks is very important if we wish to complete the project on time. I researched on the Internet for articles that teach project management skills. In the end, I found

http://www.mindtools.com/. I learned how to draw a Gantt Chart using Microsoft Project 2000, which will:

- help us lay out the tasks that need to be completed
- give us a basis for scheduling when these tasks should be carried out
- allow us to plan the allocation of resources needed to complete the project
- help us to work out the critical path for a project where we must complete it by a particular date.

f) The chart I drew has been included as an attached image.

g) I compared prices between the solutions from GESMART and a contractor in Albany, and searched for an Auckland retailer that can provide the missing (from the contractor's proposal) TV coaxial cabling.

Achievements

- Successfully set up a discussion forum for our project.
- Compiled reference documentation on project management, apache, PHP and MySQL version histories.
- Finalized Knowledge Base Infrastructure diagram.
- Completed Gantt chart for project co-ordination and time scheduling.
- Compared prices of contractor proposals.

Conclusion

This week I have successfully set-up our discussion forum for the intranet on our test server. I have learnt a great deal towards better project management and also the use of Microsoft Project 2000, a tool that would be very useful in the future. My new found skill will serve the purpose of co-ordinating projects, whether small or large, in the future.

The overall team progress is slightly behind schedule at this moment. As of 8th September 2002, all tasks are practically on schedule, with the only possible exception being the 'development of PHP website pages'. Currently, only the login and 5 other pages are complete. Visual presentation of those pages also need improving, and a number of bugs still exist.

After reviewing the changes between the software versions we specified and the versions we installed, the conclusion is that no significant changes should affect the purpose of our project; however, the software should be upgraded as soon as possible to avoid any possible security leaks or bugs. The newer versions mainly contain a number of bug fixes. PHP updates contained a number of new functions, but we will not be using them anyway.

Week 25-28: Database and Website Building Conclusion

09 September 2002 - 06 October 2002

Objectives

ITE Division

b) Continuation of effort with reference to GANNT Chart.
c) Documentation of Database Development (Michael)
d) Documentation of Web Site Development (Ahmed)
e) Collation and Entry of data to Database (Jimmy and Edmond)
f) Total Project Involvement Report – technical knowledge learned and practised, personal skills developed and your personal contribution to CNZ Infrastructure project including a list of deliverables such as reference documents.

Methodology

b) Ahmed needed assistance with the Intranet development (PHP programming), so the whole team became involved. I spent no less than 40 hours working on various pages of the Intranet.
c) Data collation also needed a lot of attention as not a lot of information has been collected so far. I spent a couple of hours collecting more information.

Achievements

- Worked as a team to complete 80% of the CNZ ITE Intranet.
- Worked with Jimmy to collate 45 pages of information so far.
- Completed my 'Total Project Involvement Report'.

Conclusion

The team is slightly behind schedule at the end of this four-week period. The Intranet coding is approximately 80 percent completed, and roughly needs another 15 hours per person to complete. Data collection and collation also needs a couple of hours per person in order to collect satisfactory amounts of data for our Intranet's early stages.

Learning during this period did not amount as much as other periods, but we were able to apply our knowledge of PHP programming learnt at our University course "Multimedia and Hypermedia Systems" COMPSCI 708. I am confident that every member of the team has significantly strengthened their knowledge and skills in PHP programming.