

DESIGN AND DEVELOPMENT OF THE ICT NETWORK INFRASTRUCTURE PROJECT OF CTU – ARGAO CAMPUS

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ABSTRACT

The main objective of the study was to design and develop an Improved ICT Network Infrastructure in the University. The establishment of this Improved ICT Network Infrastructure will help enhance the competence of the Cebu Technological University (CTU) – Argao Campus in the performance of its mandate as an institution of higher learning.

The design was created through a state of the art network infrastructure with 802.1x wired and wireless networks, and built a new data center for our Management Information System (MIS), Web Server for the campus website and an LCMS online course for instructional use. The components of the design and development of such infrastructure involves a Network Improvement Program: (Wired Cablings, Wireless LAN, & Edge Infrastructure Project) which prioritizes the identification and replacement of old cablings, with departmental network equipment and resilient campus routes to follow. Then a wireless LAN will be established for users having wireless gadgets like laptops, notebooks, and the like. Another component of the project was the Topology and Physical Layout Design which uses networking technology tools and simulation software to assist in the design topology, layout and configurations to optimize the network performance.

The new network brings greater uptime, reliability and functionality to the students. Each department of the campus uses the network in different ways and these uses are starting to take on a lot of sophistication in terms of technologies such as multicast traffic, video streaming, wireless devices such as wireless laptops, pervasive devices such as PDAs, PC tablets, collaborative teaching, etc.

Thus, the new CTU – Argao Campus Network will not only increase reliability, but benefit the research and educational goals of the university. There will be increased productivity in terms of education and development of multimedia instructional materials with the aid of ICT facilities and equipment in the improved ICT Network Infrastructure. A better and appropriately managed R&D activities leading to a coordinated R&D program, and an effective technology transfer through the provision of improved ICT Network Infrastructure and facilities.

INTRODUCTION

The Cebu Technological University (CTU) – Argao Campus is an institution of higher learning situated at Argao, Cebu. It is geared towards relevant instruction, research, technology transfer, production, conservation and utilization of resources in the fields of agro-forestry, industrial education and teacher training.

The University offers four-year degree courses in agriculture, forestry, elementary and secondary education, industrial technology and engineering, and hospitality management having a total population of about 2,500 students.

The University also conducts research, development and extension (RDE) activities. In fact, it is a member of the Central Visayas—Consortium for Integrated Regional Research and Development (CV-CIRRD) whose current thrusts are in the fields of agro-forestry and water resources development through the effective use of Information and Communication Technology (ICT). The College also hosts the Farmers' Information and Technology Services (FITS) Techno Pinoy Center for the province of Cebu.

In terms of production, the University also engages in income generating projects (IGPs). Most of these projects are in agricultural production and Internet Café handled by designated project leaders from the academe.

Because of the fourfold function of the University, which is, instruction, research, extension and production; it is the University's aim to further improve and intensify its functions through the establishment and effective use of an improved Information and Communication Technology (ICT) Network Infrastructure. This is to effectively carry-out its mandate and to meet the current demands of a fast-developing society.

Computers on the CTU - Argao Campus are brimming over with gigabytes of data, millions of images, music of every genre, papers, theses, spreadsheets, great novels and, of course, mountains of e-mail messages. Over the past 10 years, the CTU – Argao Campus networking infrastructure has been improved here and there, as needed, to meet the increasingly data-driven requirements of students, faculty and staff.

Still, the role of information and communication technology at CTU - Argao Campus has steadily outpaced the growth of the existing network. As existing network equipment breaks down and system weaknesses are patched, new demands are being made on the network, including increasingly collaborative research, data-driven business applications and innovative teaching and learning initiatives rooted in computing services.

As more CTU - Argao educators and researchers tap into the campus network for their work, the strain on existing resources begins to affect everyone who uses the network. Networks connect people, and they provide the mechanism for archiving and sharing an ever-increasing amount of data, information and knowledge. There is a need to add more capacity to reliable networks to keep ahead of demand. The current 'commodity' Internet is only about 10 years old, and it is already so saturated with traffic that it is largely unusable for many research and collaborative efforts. It has been and will continue to be higher education's role to push the capacity of networks and stay ahead of the commodity curve.

In order to create and disseminate new knowledge, educators and researchers need a solid network that works for them, allowing access to primary and secondary scholarly materials, providing connections to colleagues for collaborative efforts and providing a mechanism for them to share their insights and experience with interested learners. Creating a new network infrastructure here at CTU - Argao will provide both a robust and reliable network, accompanied by an increase capacity to enhance learning and research (<http://www.media.rice.edu/media/NewsBot.asp?MODE=VIEW&ID=7385>).

The MIS – ICT Department at CTU - Argao Campus began designing a new network infrastructure to overhaul the existing 10-year-old system and install a more adaptable solution to support research, teaching, learning and administration with free-flowing data and limited bottlenecks. The project began last semester break and summer with the replacement of cables, switches and routers to put into place a higher bandwidth network that will be faster than what is currently in place. The campus network at Cebu Technological University (CTU) – Argao Campus serves over 200 faculty (Full-Time and Part-Time) and staff and around 2,500 students.

Objectives

General:

To enhance the competence of the Cebu Technological University (CTU) – Argao Campus in the performance of its mandate as an institution of higher learning through the establishment of an Improved ICT Network Infrastructure.

Specific:

To establish an Improved ICT Network Infrastructure in the University;
To improve the quality of instruction and other services of the University;
To improve RDE management and services through ICT.

MATERIALS AND METHODS

The University's Vision for education and research challenged us to upgrade the current network. We decided to forego traditional switched networking in order to leverage carrier class technology that virtualizes the network. As the one of the external campuses of the system to utilize MIS, ICT, VPN and other web-based applications, we created a state of the art network infrastructure with 802.1x wired and wireless networks, and built a new data center for our Management Information System (MIS) and LCMS online course for instructional use.

Components

Network Improvement Program: (Wired Cablings, Wireless LAN, & Edge Infrastructure Project) Project Scope

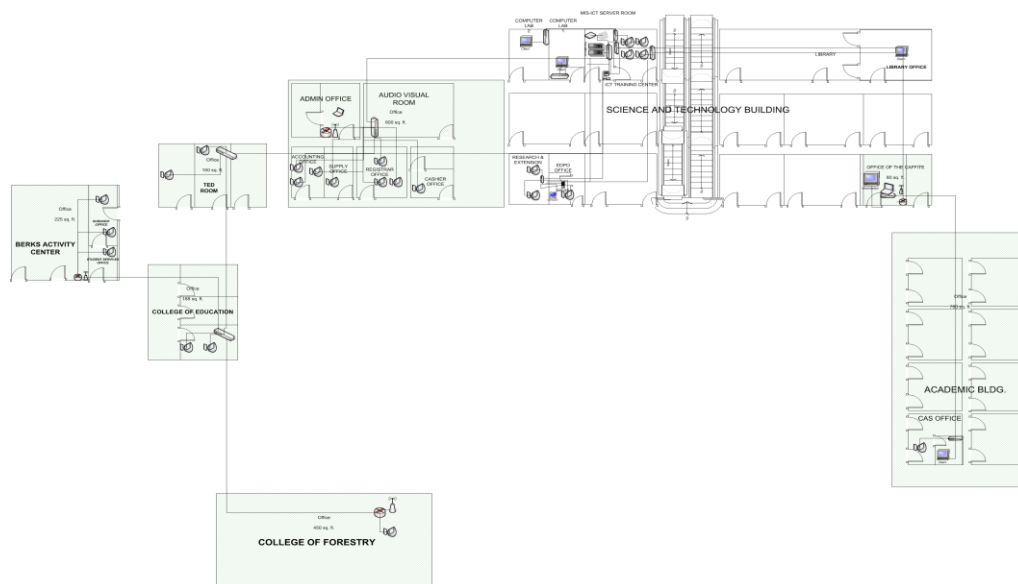
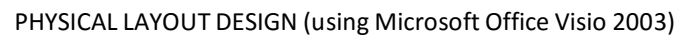
This project aims to assess the current state of the University computer network as a whole and to make informed decisions that will allow us to provide a high quality, reliable and resilient computer network to the desktop. Initial priority will be given to identifying and replacing old cablings, with departmental network equipment and resilient campus routes to follow. Then a wireless LAN will be established for users having wireless gadgets like laptops, notebooks, and the like.

Project Objectives

- To prioritize and implement a program of network cabling replacement to ensure that all computer cabling within buildings meets a minimum standard of Category-5e.
- To implement a cable management system for all campus network cablings.
- To implement Wireless LAN infrastructure that will serve as a free WiFi Internet Zone Access Points.
- To provide a test facility that aids future network developments.
- To provide resilient cable routes around the campus on which we can build a resilient computer data network.
- To produce a complete campus-wide cabling and network equipment audit, with suitable tools and procedures to allow frequent updates in a timely fashion.
- To replace all non-standard computer networking equipment.
- To agree and document a roadmap for future campus network developments, ensuring that where possible, the underlying infrastructure will meet any reasonable demands placed upon it.

Project Topology and Physical Layout Design:

TOPOLOGY DESIGN (using Cisco Packet Tracer Simulation) - employ segmenting the whole campus network into several number of nodes using routers (including configurations) to boost network performance and increases the bandwidth available to each user for network and internet connection



RESULTS AND DISCUSSION

Project Innovation Deliverables

1. An end-to-end computer network running at a minimum of 100Mbps that ICT Services can manage reliably for the benefit of the University.
2. A structured cable management system that will allow ICT Services staff to manage networking requirements, and utilize staffing resources, more efficiently.
3. A high-standard test facility allowing all future networking developments to be fully tested in a contained environment prior to deployment.
4. A resilient campus network infrastructure, removing where possible any major single points of failure.

CONCLUSIONS AND RECOMMENDATIONS

A Degree of Difference

The new network brings greater uptime, reliability and functionality to the students, faculty and staff at CTU – Argao Campus. As network resources become an increasingly integral part of the University's educational mission as well as its daily operation, it is essential that the network remain highly available. The CTU – Argao Campus community now receives around-the-clock stability and reliability.

Benefits

It is very clear that the environment for higher education is rapidly changing. The CTU – Argao Campus University's network infrastructure aims to meet current academic, research, and operational demands. This system that used to enhance education, facilitate research, and support operations has now begun to upgrade the school's utilization of cyber infrastructure. The CTU – Argao Campus community has hundreds of applications systems (e.g., e-mail, Student Information System (SIS) with student registration and accounts, financial management, admissions, recruitment, human resources, online library, Learning Content Management System (LCMS), school website, and other online applications), and research projects that demand far more than what the current network is capable of.

The list of departments that use the network for support and services encompasses the entire campus. Each department uses the network in different ways and these uses are starting to take on a lot of sophistication in terms of technologies such as multicast traffic, video streaming, wireless devices such as wireless laptops, pervasive devices such as PDAs, PC tablets, collaborative teaching, etc.

These departments include:

Offices:

- Office of the Campus Director and Administration Office
- MIS – ICT Server Room
- Library
- EDP Office
- Research and Extension Office
- Office of the Assistant Campus Director and Director of Technical Instruction
- Office of the Director for Academic and Professional Discipline
- Registrar
- Accounting
- Cashier

Supply Office and Property Custodian
Student Affairs Office and Guidance Services
Supreme Student Council
School Publication
NSTP
IGP and Production Office
Practice Hotel

Instruction Division Offices:

- College of Advance Studies: *Doctor in Developmental Education, Master in Education (M.Ed.), Master in Public Administration (M.P.A.)*
- College of Education: *Bachelor in Secondary Education (BEED), Bachelor in Elementary Education (BSED)*
- College of Forestry: *Bachelor of Science in Forestry*
- College of Agriculture: *Bachelor in Agricultural Technology*
- College of Industrial Technology and Engineering:
 - o *Bachelor of Science in Industrial Technology - Drafting Technology*
 - o *Bachelor of Science in Industrial Technology - Garments Technology*
 - o *Bachelor of Science in Industrial Technology - Electronics Technology*
 - o *Bachelor of Science in Industrial Technology - Computer Technology*
 - o *Bachelor of Science in Information & Communication Technology*
 - o *Bachelor of Science in Industrial Engineering*

College of Hospitality Management: *Bachelor of Science In Hospitality Management*

Impacts

The current network has served the CTU- Argao Campus community well since 2000. Throughout the years, a few of the network switches were replaced as part of maintenance or as new network needs arise; however, a large number of the "old" network switches are still functioning. Some of these network switches have passed their useful age and now beginning to show signs of stress. With the demands and the continuous operation, it is only a matter of time before the next switch fails. Because of these, innovations in the network infrastructure are highly needed to cater the demands of the increasing number of PCs in the university especially in the areas of instruction where there is the need of additional computer laboratories and the need of network connected PC's in almost all offices of the university and the emergence of wireless technologies.

The new CTU – Argao Campus Network will not only increase reliability, but benefit the research and educational goals of the university.

There will be increased productivity in terms of education and development of multimedia instructional materials with the aid of ICT facilities and equipment in the improved ICT Network Infrastructure. A better and appropriately managed R&D activities leading to a coordinated R&D program, and an effective technology transfer through the provision of improved ICT Network Infrastructure and facilities.

It is suggested that future planning for campus ICT network developments should always be given importance in order to be abreast with new developments in ICT and other innovations in information and online technologies, thus, still ensuring that where possible, the underlying infrastructure will always meet any reasonable demands placed upon it.

REFERENCES

Books

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Internet Resources

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