

GüçlüKadro



***CENG 491
SENIOR DESIGN PROJECT
REQUIREMENT ANALYSIS REPORT***

GROUP MEMBERS

***RECEP ALABAŞ
YAŞAT KADİR BİLGİN
BERK ÇAKIR
ÖZER DURMAZ***

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1. INTRODUCTION

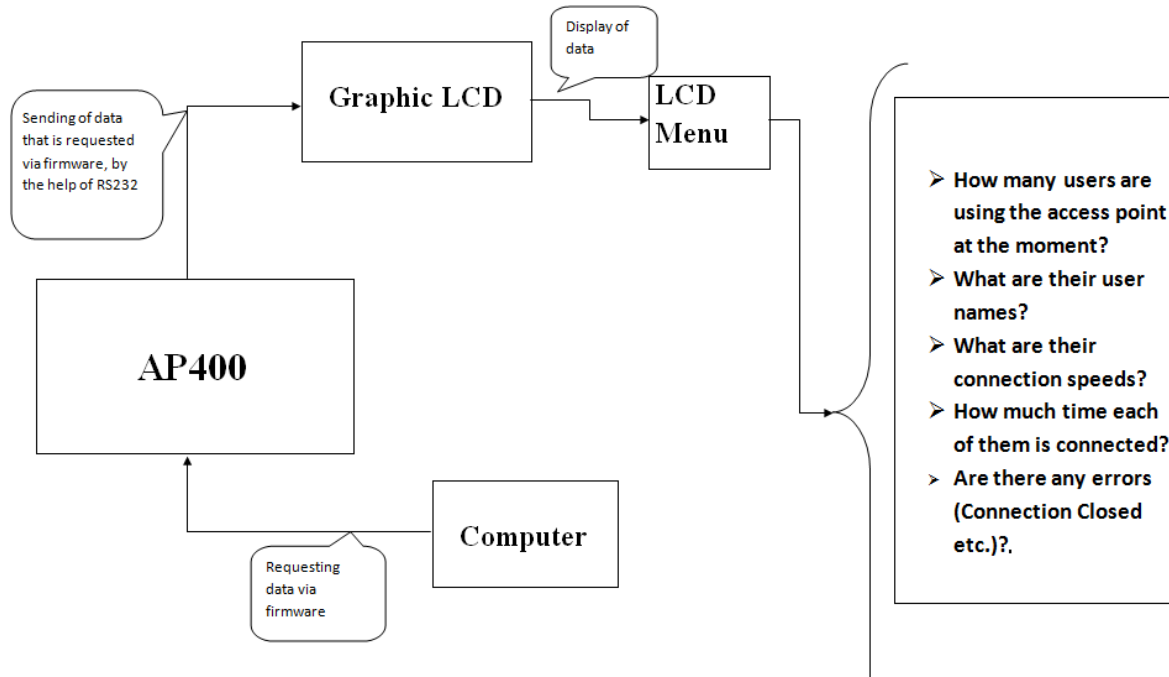
This document is the requirement analysis report of CENGAP project. Firstly, it provides information about problem definition and the application areas of the project. Secondly, team organization part can be founded. Thirdly, our detailed market research can be founded. After that our project requirements, risk management, project scheduling, and project modeling comes alternately. Data Flow Diagrams (DFA's) can be founded in the last part of our report.

1.1 Project Title

CENGAP by GüçlüKadro Yazılım

1.2 Project Definition

Wireless communications is a rapidly growing part of the communication systems. While the wireless communication quality improves, the demand of using wireless technology increases. For that reason wireless access points have an important part at the market. However, it is important to develop a different type of wireless access point to have a big portion from the market. Our prototype will be different by its LCD monitor. The user can access some kind data from this monitor namely, the number of users, their names and their connection speeds connected to the access point. Also, it will be give information about their connection period of times and about the errors in the connection. The following schema shows the general view of our project.



1.3 APPLICATION AREAS OF OUR PRODUCT

When we first started to this project, we were worried about the demand to these kind of products was very low. However, searching the internet and asking questions to Mustafa Kuşçu (Project Manager of Air Ties Company), we saw that we were wrong. According to Mustafa Kuşçu, some kinds of customers have an excessive demand to these kinds of products. We saw that it will be a product which has an LCD monitor that many of other access point do not have. In the market of 11 G AP access points, our prototype will be unique. Our prototype is a kind of product that shows its difference to the user. If we create a Turkish menu for the device, it will be a very big advantage of us. According to our market research we found only one product similar to our future product named Belkin N1 Vision. Its price is very high; this means these kinds of products are preferable by high income customers. However, the market demand for this

product is very high. For example, internet café owners will choose our product. Moreover, it will be used in professional areas where data like noise, signal and strength are needed. Our product will be able to understand the effect of military radars on its inclusion area, so this one is another usage area.

2. TEAM ORGANIZATION

2.1 TEAM STRUCTURE

We adapted to a controlled decentralized structure, because it is the most appropriate structure for our team. Our team leader is Recep Alabas, who is responsible for coordinating the team and assigning duties to the team members. However, all the team members take decisions (which are very important for our project) together.

2.2 MEMBER ROLES

Team Leader, Initiator: Recep ALABAŞ

Gate Keeper, Devil's Advocate: Yaşat Kadir BİLGİN

Process Guide, Summarizer: Berk ÇAKIR

Time Keeper, Recorder: Özer DURMAZ

2.3 PROCESS MODEL

Our project has certain steps; namely requirement analysis, initial design, detailed design, implementation and testing. These steps have strict deadlines. Moreover, these steps are organized in a way that one step is finished and the other starts. In order to do this, it is important to choose a suitable process model. Because of the reasons, Waterfall Model (Linear Sequential Model) is the most suitable process model for our project.

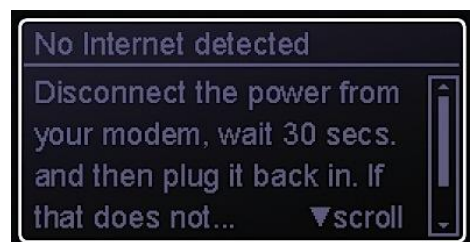
3. Market Research

3.1. Literature Survey

Market research helps us to have general information about similar systems in the market. We searched the internet, but we can found only one product. There is exactly one example in the market which is created by Belkin. By examining that, we get more information about the requirements of our project. We can clearly see what we are going to work on. By the help of that, our imagination ability is improved about our project. We only examined Belkin N1 Vision and the followings are the descriptions of it.



Belkin N1 Vision: Because it has an LCD monitor, the user can see the broadband speed, computer bandwidth usage and the status of its connected devices. It has a CD-less set up which makes it user-friendly. It allows maximum users of 253 LAN and 16 WLAN. The user can also see the download/upload limit, network displays, and guest access networks from the LCD. It has some security features as well, it has an easy security set up that supports for Wi-Fi protected set up and Multiple SSID. After having all these abilities, Belkin N1 Vision's price is a bit expensive. It has a price of 179.99 dollars. Some pictures of Belkin N1 Vision:





4. PROJECT REQUIREMENTS

Since our project is improving an existing wireless access point, it is better we start with a definition of an wireless access point and continue with giving our's details before we get to requirement details.

A Wireless Access Point (WAP or AP) is a special hardware and software combination that connects wireless communication devices together to form a wireless network. AP is basically a special embedded computer system designed to provide wireless network access. Actually when an access point does not exist, Wireless Lan (WLAN) clients can operate in ad-hoc mode but in order this wireless network access to be stable and dependable, at least one Wireless Access Point must be used. So if a wireless network has to be setup, one AP must be used and there are numerous AP alternatives in market today. These APs differ in price and functionality (which is discussed in the market research part). And in this project we will deal with the functionality part.

Our project is improving an AP (Airties AP-400 technical details listed below) by adding an LCD and monitoring the wireless traffic. The user(s) will be able the monitor some details of the wireless network traffic by an LCD.

4.1 Specifications of AP-400

- ✓ IEEE 802.11b/g compliant, 54Mbps Wireless Access Point, Repeater, Bridge
- ✓ WPA (Wi-Fi Protected Access), WPA2 (IEEE 802.11i), WEP (Wired Equivalent Privacy) encryption and 802.1x standards
- ✓ Wireless operating ranges of up to 400 meters outdoors and 100 meters indoors
- ✓ Automatic local IP address assignment by the DHCP server

- ✓ Wireless data rates: 1, 2, 5.5, 6, 9, 11, 12, 24, 36, 48, 54Mbps (auto speed adjustment)
- ✓ Easy to use Web-based user interface
- ✓ Runs Linux

4.2 Hardware Requirements

AP-400's minimum hardware requirements will not change so the client computers must have:

- ✓ Any version of Windows, UNIX, Linux, or MAC operating systems
- ✓ An Ethernet card or a Wireless Network Adapter

Airties AP-400 can fulfill many needs but we will improve it in order make it more user-friendly. As mentioned earlier adding new features to AP-400 will increase its functionality and will improve its position in market. A small definition of our “improve” here is, placing an LCD into AP-400 and displaying some information (discussed below) about wireless network traffic which we believe is important. This will customize AP-400 and will aim more customers. The later parts of this chapter will discuss our model's specifications.

4.3 Nonfunctional Requirements

4.3.1 User Interface

Since we want to make AP more user-friendly we will use a graphic LCD for displaying related information. User will be able to change the screen when he/she wants. The Information that will be displayed is below:

- **Date / Time (Default):** If the AP is idle for a while, the date and time will be displayed on the screen. This is also the default screen which will be displayed at openings.
- **Broadband Speed:** The average download and upload speeds will be displayed if wanted
- **Connections with Speeds:** This will display the users who are using the AP at that moment and their connections speeds.
- **Usage Time in the Last 24 Hours:** If this option is chosen than the users using the AP will be displayed with the time passed since when their connection established in the last 24 hours

There are two main problems about placing an LCD into AP-400: Since placing LCD into AP-400 is a complicated hardware implementation we plan to get help from our teaching assistant for implementation. Also we need to care the appearance of our AP after placing the LCD because appearance is important for the customer. We believe we will study for industrial design or get some help from someone for the last design of our model.

4.4 Functional Requirements

Since we will work on a Linux based Wireless Access Point and this AP is an embedded system, all our work will related with embedded Linux Programming. Our AP is already running Linux so we will just write some scripts in order to get the information we will be using for the display data.

Embedded Systems

An embedded system is a device that has computer intelligence and is dedicated to performing a single task, or a group of related tasks. Embedded systems often perform monitoring and control functions such as gathering and reporting sensor readings or controlling motors and switches. They're called embedded systems because the program code is an integral part of, or embedded in, the devices.

An Embedded Linux system simply designates an embedded system based on the Linux kernel and does not imply the use of any specific library or user tools with this kernel.

We will write scripts for changing and adapting our AP's functionality and with the help of these scripts we will get the information and display it.

4.5 Embedded Linux Tools

The Esfia RedBlue Linux: It is an important distribution for wireless communication systems. It has an advantage of being usable with processors with memory management unit or without memory management unit. Moreover; it is compatible with RAM and flash systems.

Lineo Embedded Linux: It is a very high performance embedded Linux distribution. It provides a Linux kernel, Linux device driver, system libraries, real-time services, a linker an assembler and kernel space debuggers. It has board support packages which give the capability of debugging the address spaces to the coder.

BlueCat Linux 4.0: It is useful for us because it has some tools and board support packages for debugging and developing Linux into Embedded Linux systems. It has a JTAG support and a watchdog timer and kernel debugging capabilities.

Coventive XLinux embedded operating system: It offers a small and functional embedded Linux kernel. Its kernel is the smallest kernel in the world with a size of 143 Kb. It will help us to work on our limited storage device

REDICE-Linux: It will save the hardware cost of our project by its resource and budget control systems. The REDICE-Linux provides a short response time, a precise time control and a flexible scheduler.

5. RISK MANAGEMENT PLAN

5.1 Risk Management

Risk management is vital for our project. Because of the restrictions on time, unexpected situations can inhibit our work. Although our team members live together, everyone make their own work alone and give information to others at the meetings. Due to this procedure we must have a well organized RMMM plan to make everyone in the group aware of the problem as soon as possible. This section will provide information about our RMMM plan and also a risk management table is included.

5.2 Risk Estimation

Company Location:

Due to location of AirTies it would be difficult provide a healthy communication with them. So our questions about AP400 may not be answered immediately. Also if we give damage to AP400's features we must send it to Istanbul to be repaired by AirTies. This event will take a lot of time of us and our project will be delayed. Therefore, we will be careful to not give any damage to AP400 while working on it.

Staff Size:

Our group consists of four fourth year computer engineering students. All of us are working on this project because it is a must of our CENG490 course .It is possible that one of us may drop the course and quit his work on project. Under this circumstances, other team members responsibilities will increase and they must work harder than usual . Also to overcome this problem every team member give detailed information about their own work to other team mates.

Development Environment:

In our project we will use some programs to communicate with AP-400 and write firmware to take needed information. Due to the lack of experience of team members on using these programs we would make a lot of mistake and it will be time consuming. Also while connecting LCD display to AP400 we will use some hardware. Again our team members do not have any experience on this hardware. To overcome these

problems we decide to make a huge research on these tools before using them. Also if we encountered a problem while using these tools, we will take help of an experienced computer engineer who work on this area.

Project Scope:

Before starting to project determining project scope is very important issue. Changes in the scope of project will affect us very badly. Because we will make our plans according to this scope and any change in this scope will change our plans. For example, if we decided to use normal LCD display and after some time change our minds to use graphic LCD display it will be very costly to us. Our budget will be changed, tools will be changed etc. To overcome this problem we decided to make researches as much as we can. Also we will make changes which will affect some part of project not other parts of it.

Technology to be built:

In our project in addition to AP40 we will use a lot of component. Therefore connecting them to each other will be a big problem. Protocols that we will use to connect components to each other may not be suitable. To avoid this problem we will make a big research on protocols and find most suitable protocols to our project.

5.3 Risk Table

Risk table provide information about probabilities, categories and impact of the risk. Our risk table is:

RISK	CATEGORY	PROBABILITY	IMPACT
Late answers to our questions	CL	30%	3
Giving damage to AP400	CL	15%	4
Dropping course	SZ	5%	2
Lack of experience	DE	30%	3
Change in the scope of project	PS	15%	3
Inconvinient protocols	TB	10%	3
Timing mistakes	PSC	40%	2
Helath problems of team members	SZ	60%	1
Problems with AP400 structure	TB	30%	2

CL = Company Location

SZ = Staff Size

DE = Development Environment

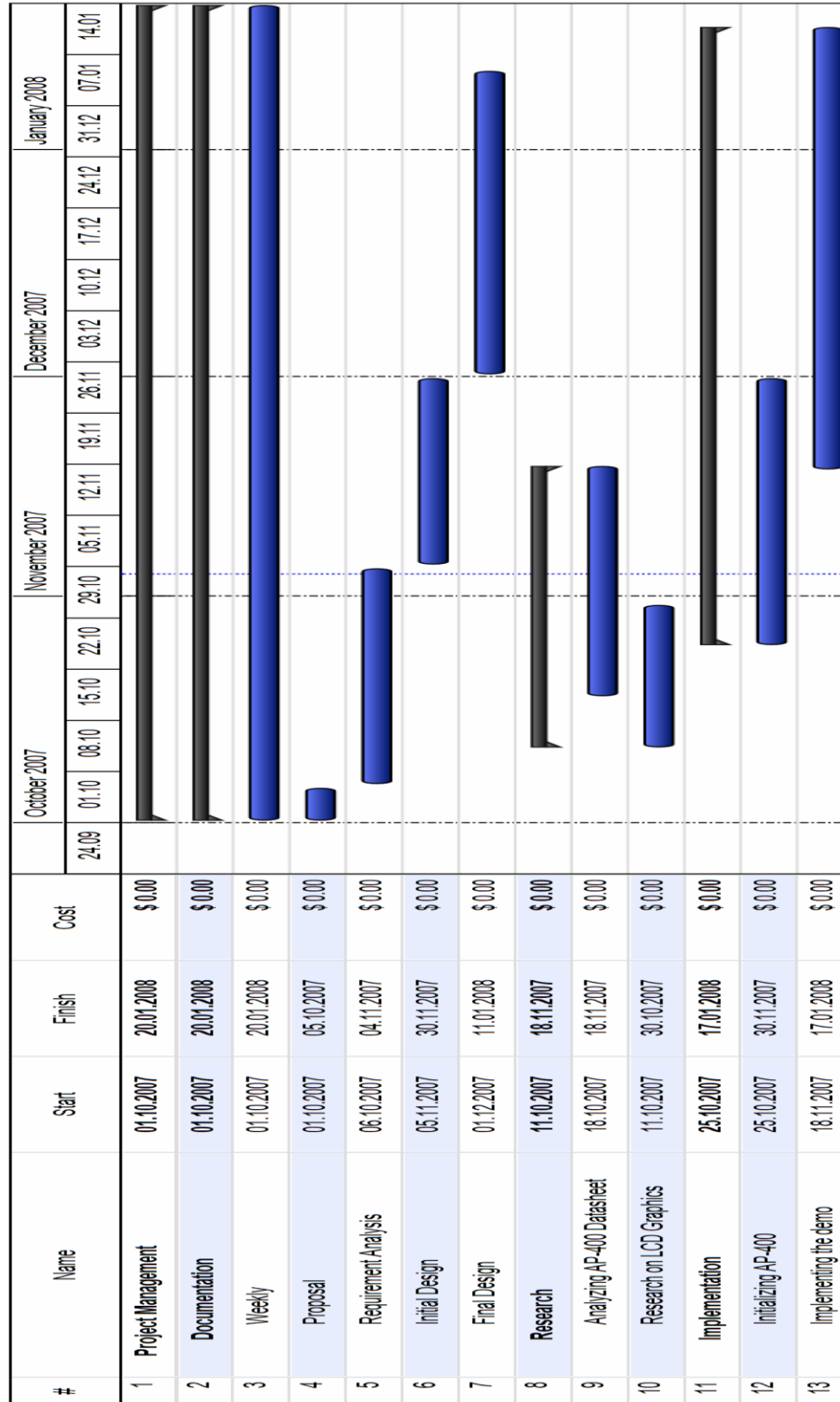
PS = Project Scope

TB = Technology to be Built

PSC = Project Scheduling

6. SCHEDULING-GANTT CHART

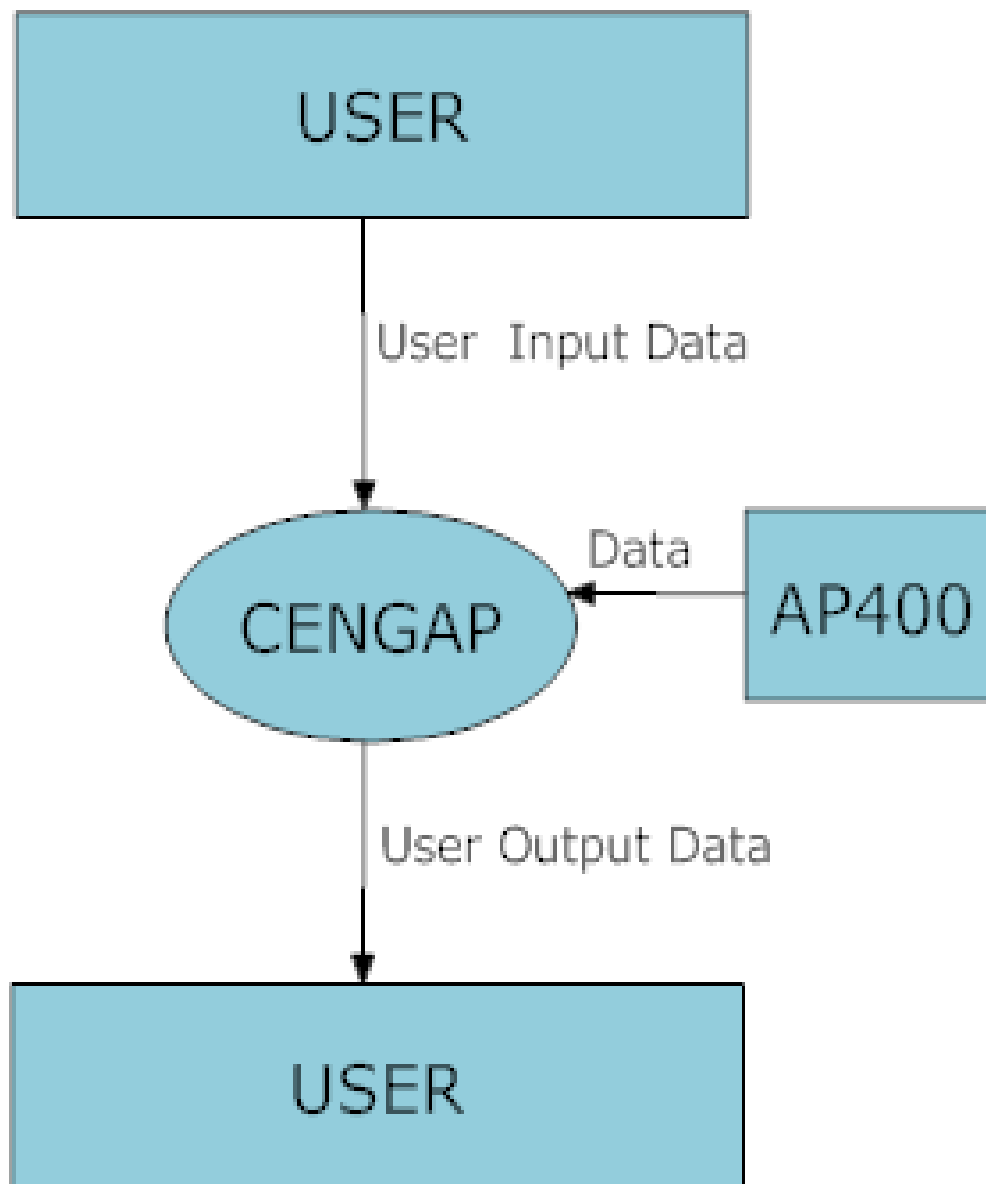
gantt : Gantt Chart : Project



7. MODELLING

7.1 Data Flow Diagrams

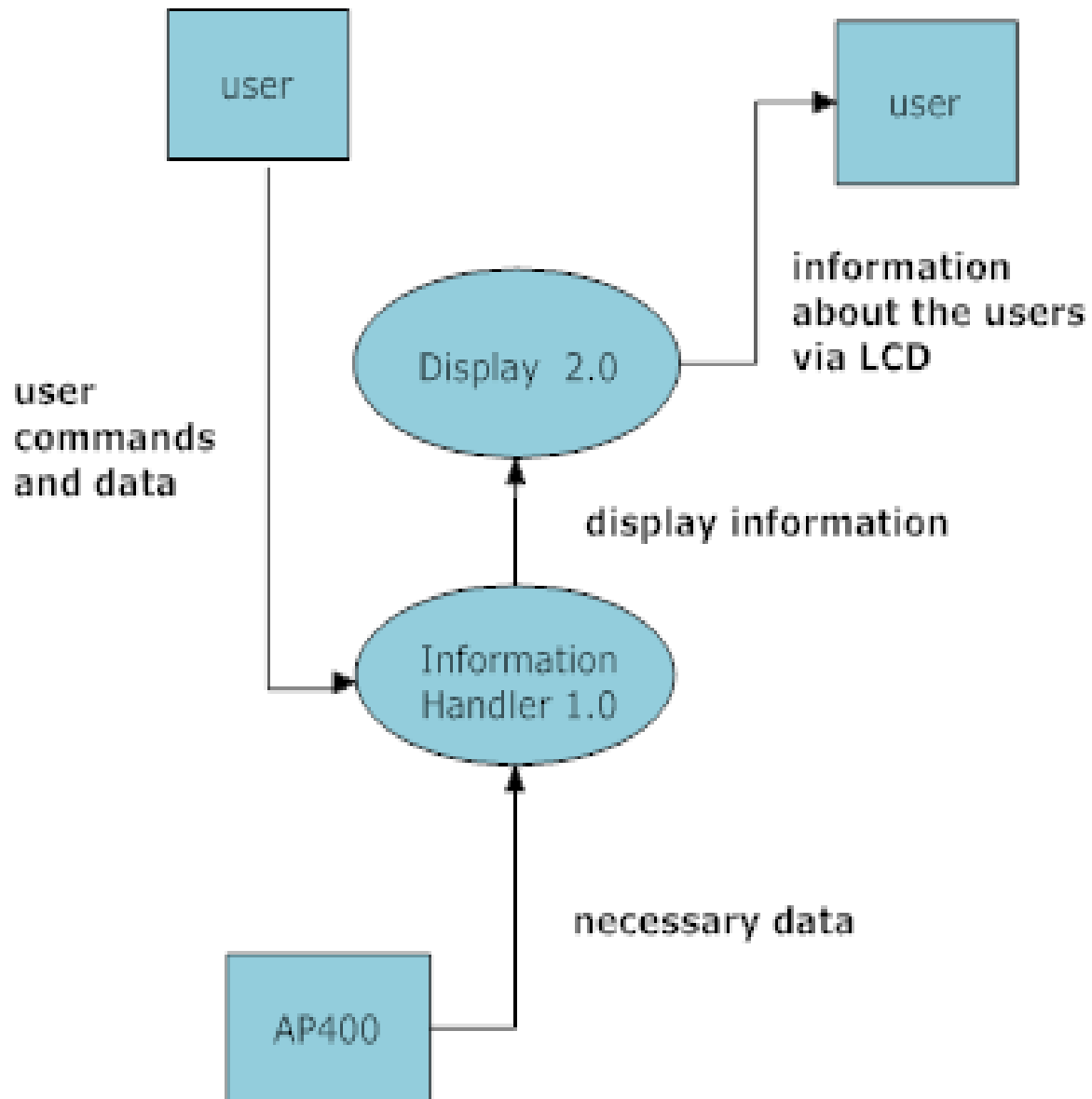
DFD Level 0 - Top View of the Project



In the topmost level of the data flow diagram, the interaction of the software with the environment is shown.

DFD Level 1 – CENGAP 0.0

If the top view of the DFD is expanded, the major components of the system are revealed.



Those sub-processes are:

Information Handler 1.0: Necessary information will be received from AP400 by this process.

Display 2.0: The desired information will be displayed via LCD to the user by this process.

7.2 Use Case Diagram

