MIDDLE EAST TECHNICAL UNIVERSITY

COMPUTER ENGINEERING DEPARTMENT

CENG491

Final Design Report

By

EsSoft

INDEX

1. INTRODUCTION

Network is the critical part of the computer systems. Especially, after the widely usage of internet, network becomes more important compared with the past. Every person, whether interested in computer systems or not, begins using network systems widely in daily life. Therefore, network programs, such as online chat, e-mail, are made more effective to attract users. These programs are designed by using different techniques, different algorithms, different protocols, if we look at the concept of network systems. However, these differences cause some problems. Since there are lots of differences, identification and classification phase for computer is a big problem.

1.1 PROJECT NAME and PROJECT TEAM

Our project is named as PROTOCAL.

Group Members are:

- Müjdat Bayar 1394725
- Akif Gencay Demirel 1394915
- Arda Güçlü 1395052
- Kerem Ozarkan 1395300

1.2 PROBLEM DEFINITION

Our Project, namely Protocal, will be used for analyzing, identifying, and classifying incoming network data in terms of their protocols. For this project, there is three steps in analyzing the protocols which are filtering, feature analyzing and classification of protocols. Filtering means throwing the unnecessary items from the information list .After this step, by using pattern classification, program identifies the possibilities which protocols can be. At the last step, namely classification, we determine the right protocol.

1.3 PROJECT SCOPE

Firstly, since our project basically concerns about protocols, we want to give brief explanation of which protocols will mainly be identified in our project:

Simple Mail Transfer Protocol (SMTP) is a relatively simple, text-based protocol, in which one or more recipients of a message are specified (and in most cases verified to exist) and then the message text is transferred.

- Hypertext Transfer Protocol (HTTP) is a communications protocol used to transfer or convey information on intranets and the World Wide Web.

- File Transfer Protocol (FTP) is used to transfer data from one computer to another over the Internet, or through a network.

- Post Office Protocol version 3 (POP3), an application-layer Internet standard protocol, to retrieve e-mail from a remote server over a TCP/IP connection.

- The Session Initiation Protocol (SIP) is an application-layer control (signaling) protocol for creating, modifying, and terminating sessions with one or more participants. It can be used to create two-party, multiparty, or multicast sessions that include Internet telephone calls, multimedia distribution, and multimedia conferences.

1.4 DESIGN GOALS AND OBJECTIVES

1.4.1 EFFECTIVENESS

Since our project is about identifying and classifying protocols, its main success depends on how many protocols it can identify. In other words, can our program

recognize new protocols without looking at its port number? For this reason, instead of analyzing lots of protocols and putting it in our database system, we try to develop our decoder phase such a way that when new protocol comes, our program can create this protocols keywords. As a result, with this feature, at the end of our project, there will be no need to put new protocols in database by hand. This feature increase effectiveness.

1.4.2 USABILITY

Our project is not a specific area project. For instance, one company which is not related with the computer systems may want to control its employers network traffic. Therefore, if this company wants to use our program, user should understand easily the syntax of program. For this necessity, our project's interface will be as simple as possible.

1.4.3 TIME

Since network traffic usually is not linear, time becomes critical issue that have to be fast in order to capture files and classifying it. It is directly related with the effectiveness of program. Because, time is the most important issue when it is compared with the other issues in terms of effectiveness. First step, to increase the time effectiveness, we choose our programming language as c++. After this step, we make our algorithms and tools that are not negatively affect our program.

2. DATA DESIGN

Database system is very important part of our project, because whole the special data are hold in there. Classification and identification is made according to the data that is searched in our project's database. In our database system, there will be two tables, namely user, and protocols.

2.1 USER

User table holds the information of the user that is not admin but using the project in the least security level compared with admin. Additionally, user can not start capturing the files from the network traffic.

Attributes are:

- Username
- Password
- User_secret_question
- User_secret_answer
- Name
- Surname
- E-mail

SQL code will be like that:

```
CREATE TABLE User(
    Username VARCHAR(20) NOT NULL,
    Password VARCHAR(15) NOT NULL,
```

User_Secret_Question VARCHAR(50) NOT NULL,
User_Secret_Answer TEXT NOT NULL,
Name VARCHAR(20) NOT NULL,
Surname VARCHAR(20) NOT NULL,
E-mail VARCHAR(30),
);

Username, Password, Use_Secret_Question, User_Secret_Answer, Name, Surname and E-mail is used for the data about user.

2.2 PROTOCOLS

Protocol table only holds the name of protocols, user can easily see which protocols can be recognized without additional recognition operation is being done. This table is directly related with the keyword table, because after making keyword analysis, output will be given from this table.

- ProtocolName

SQL code will be like that:

CREATE TABLE Protocols(
ProtocolName VARCHAR(15) NOT NULL,
FOREING KEY(ProtocolName) REFERENCES (Protocols (ProtocolName)
),
);

2.2.1 FTP (FILE TRANSFER PROTOCOL)

This protocol is used for transferring data. After identification of this protocol, our program should give output as which file is sent through the IP address. We read this file from filepath which is in our computer. As a result structure of table is:

- ProtocolName
- FileName
- Ipadress
- Date
- CaptureTime

SQL code will be like that:

```
CREATE TABLE FTP(
    ProtocolName VARCHAR(15) NOT NULL,
    FileName VARCHAR(20) NOT NULL,
    IPadress VARCHAR(30) NOT NULL,
    Date VARCHAR(20) NOT NULL,
    CaptureTime VARCHAR(20) NOT NULL,
    FOREING KEY(ProtocolName) REFERENCES ( Protocols (ProtocolName)
    );
```

2.2.2 SMTP (SIMPLE MAIL TRANSFER PROTOCOL)

This protocol is used for mail transferring. This table contains such as who sent mail is "from", who took mail is "to", and the content of mail is "MailContent".

Attributes are listed:

- ProtocolName

- From
- To
- MailContent
- Date
- CaptureTime
-CC
-BCC

SQL code will be like that:

```
CREATE TABLE SMTP(
    ProtocolName VARCHAR(15) NOT NULL,
    From VARCHAR(20) NOT NULL,
    To VARCHAR(30) NOT NULL,
    MailContent VARCHAR(20) NOT NULL,
    Date VARCHAR(20) NOT NULL,
    CaptureTime VARCHAR(20) NOT NULL,
    CC VARCHAR(20) NOT NULL,
    BCC VARCHAR(20) NOT NULL,
    FOREING KEY(ProtocolName) REFERENCES ( Protocols (ProtocolName)
    );
```

2.2.3 HTTP (HYPERTEXT TRANSFER PROTOCOL)

This protocol is a communications protocol used to transfer or convey information on intranets and the World Wide Web. Structure of this protocol looks like File Transfer Protocol. We read this file from filepath which is in our computer like FTP. Therefore,

Attributes are:

- ProtocolName
- FileName
- Ipadress
- Date
- CaptureTime

SQL code will be like that:

```
CREATE TABLE FTP(
        ProtocolName VARCHAR(15) NOT NULL,
        FileName VARCHAR(20) NOT NULL,
        IPadress VARCHAR(30) NOT NULL,
        Date VARCHAR(20) NOT NULL,
        CaptureTime VARCHAR(20) NOT NULL,
        FOREING KEY(ProtocolName) REFERENCES ( Protocols (ProtocolName)
);
```

Finally, these three protocols are the basic protocols, we firstly make our project according to their structures, after that we add new protocols time by time.

3 PROJECT REQUIREMENTS

The most important part of the project works is determining the requirements. The requirements analysis must be done carefully to get project maintenance. Therefore, during the development of the project, it must be guarantied that no unexpected events should occur. In order to avoid failure, requirements must cover all our needs. For our project, requirements are divided in three main issues.

3.1 System Requirements

3.1.1-Hardware Requirements

Minimal hardware requirements for our project are: A PC with the following configuration will be needed:

A minimum of 1 GB DDRAM
A minimum of 50 GB free space on hard disk, for huge database storage
A Pentium IV processor
Internet Connection
Local or Wide Area Network

3.1.2-Software Requirements

We will use several tools for different phases during development of the project. These development phases are;

 Documentation Part
- Analysis
- Design

 Development Part

- Implementation
- Testing

Documentation Tools

Microsoft Office 2003 Word

Adobe Acrobat Professional

SmartDraw

Development Tools

Windows XP

C++

WireShark (WireShark is a sniffer program as it mentioned before. Usage of wireshark's purpose is testing and also to create PCAP files)

3.2 Functional Requirements

- In our Project, required protocols that should be identified are:
  - HTTP
  - SIP
  - POP3
  - FTP
  - YMSG
- The data which is captured from network, which will be identified, is to be fed in the PCAP file format.
- Our identification process will also determine when the identified protocol is no longer available in the flow through the identified port.
- When we identify protocols our outputs will be like these:

- HTTP : If connected HHTP server is Yahoo! Mail and user downloads a mail, then RFC 822 complied e-mail messages(.eml).
- POP3 : Download mail messages(.eml).
- FTP : Transferred files.
- SIP : Voice files in Microsoft ASF format.
-YMSG: conversation text (txt). Audio(asf). Video(avi).

3.3 Nonfunctional Requirements

Usability:

As for all software, graphical user interface is very important for our project too since easy to use, easy to learn and adaptation is crucial for all software. Therefore, we will make the user interface clear and understandable. Moreover, graphical user interface will meet the user's needs as far as it is possible. Hence, while we were deciding our tool's features, we took into consideration both the inexperienced and professionals. As a conclusion, we considered the user satisfaction as the primary goal of our project.

Reliability:

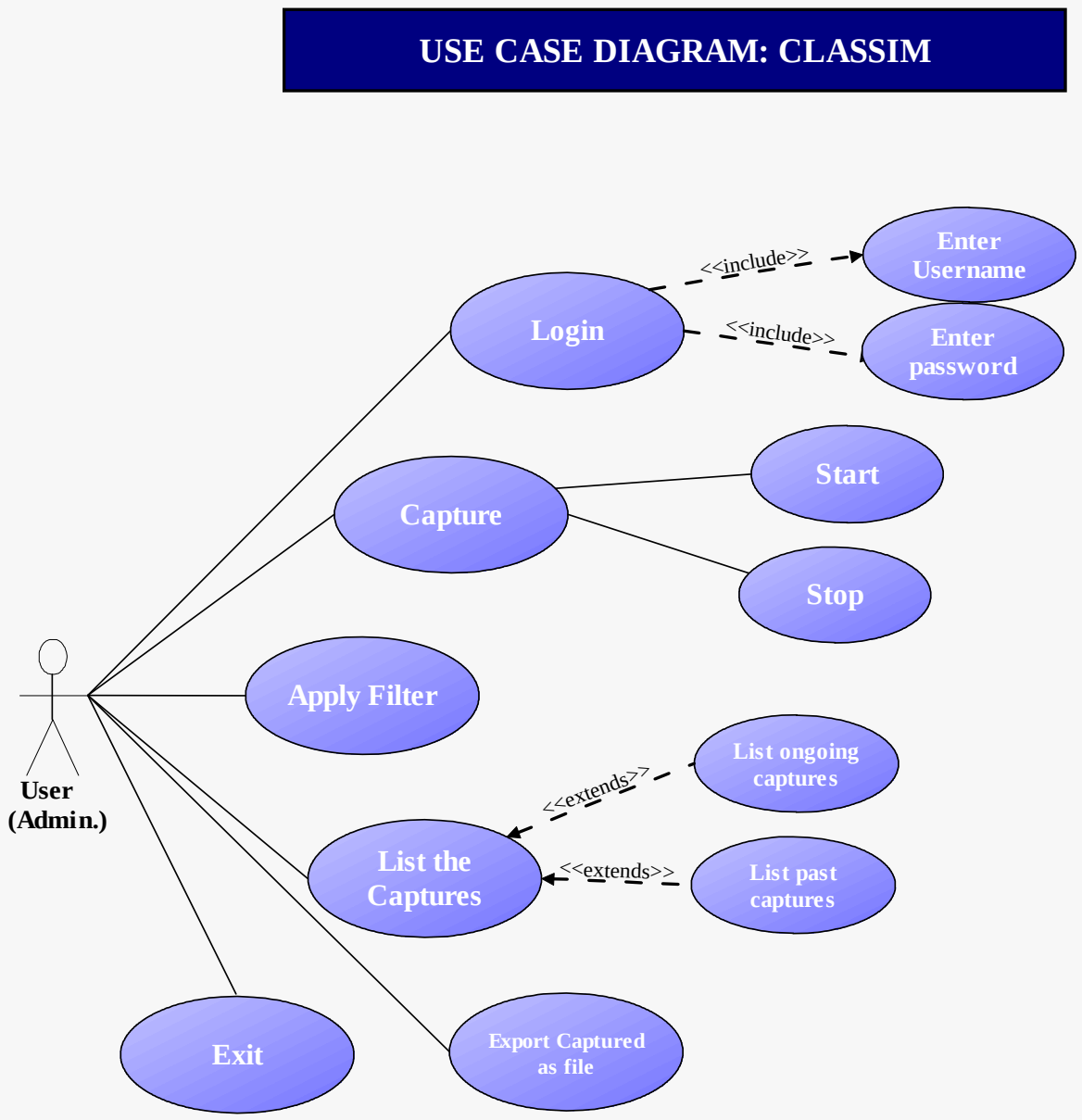
The system should be as bug free as possible. All sub components should work asynchronously, so that any delay caused by one of the components should not block other components work on its own. Moreover, we plan to do many tests after implementation to minimize the bugs on the program.

Performance:

Speed of our product becomes an important issue in our design. In general, wrong programming methodologies that are used in the applications slow down the programs, not the complex algorithms used in the applications. Therefore, we will try not to do this mistake. The usage of system resources will be reduced as much as possible to increase the performance of our design.

4.SYSTEM DESIGN

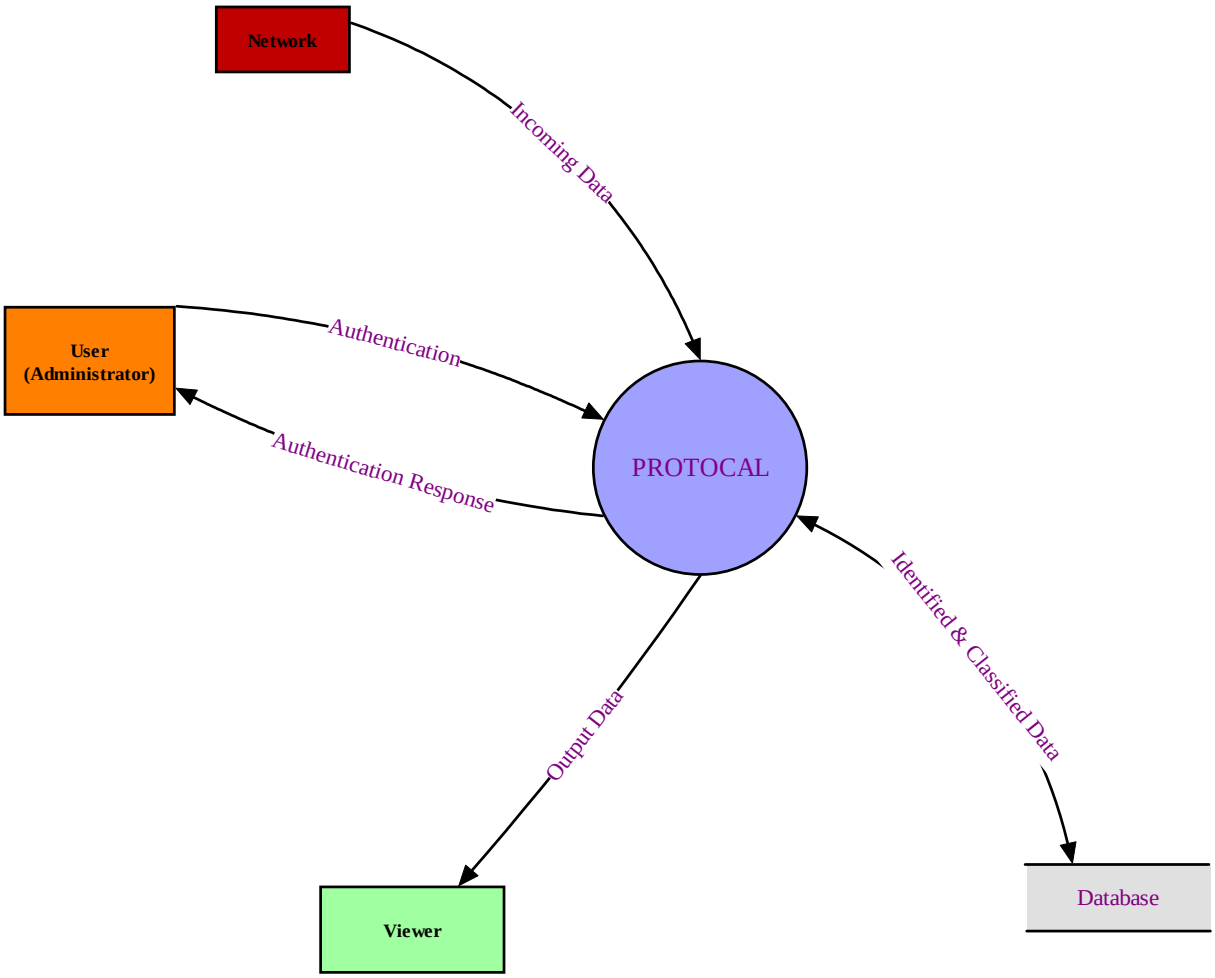
4.1 USE CASE DIAGRAMS



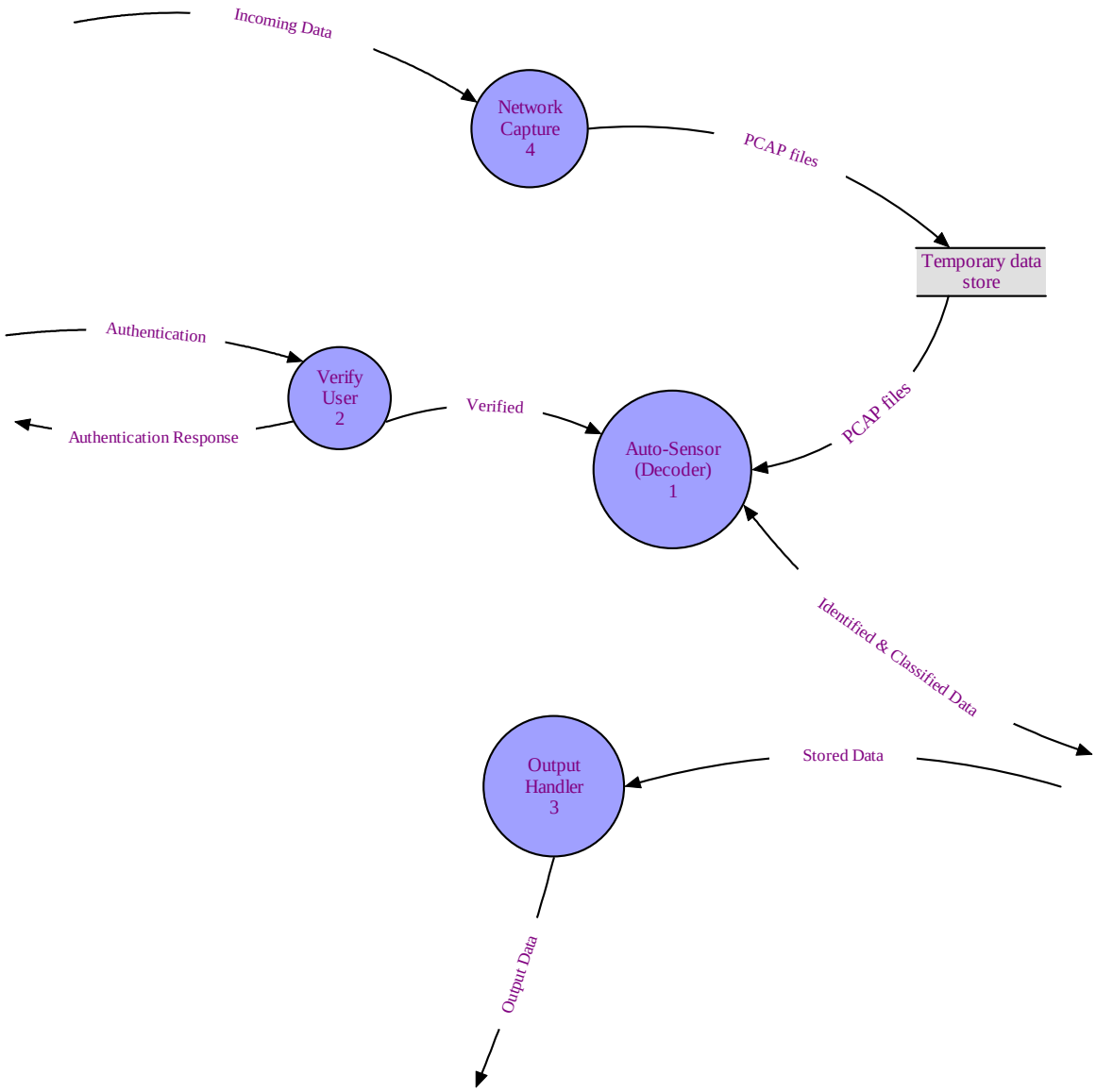
4.2 DFD DIAGRAMS

4.2.1 DIAGRAMS

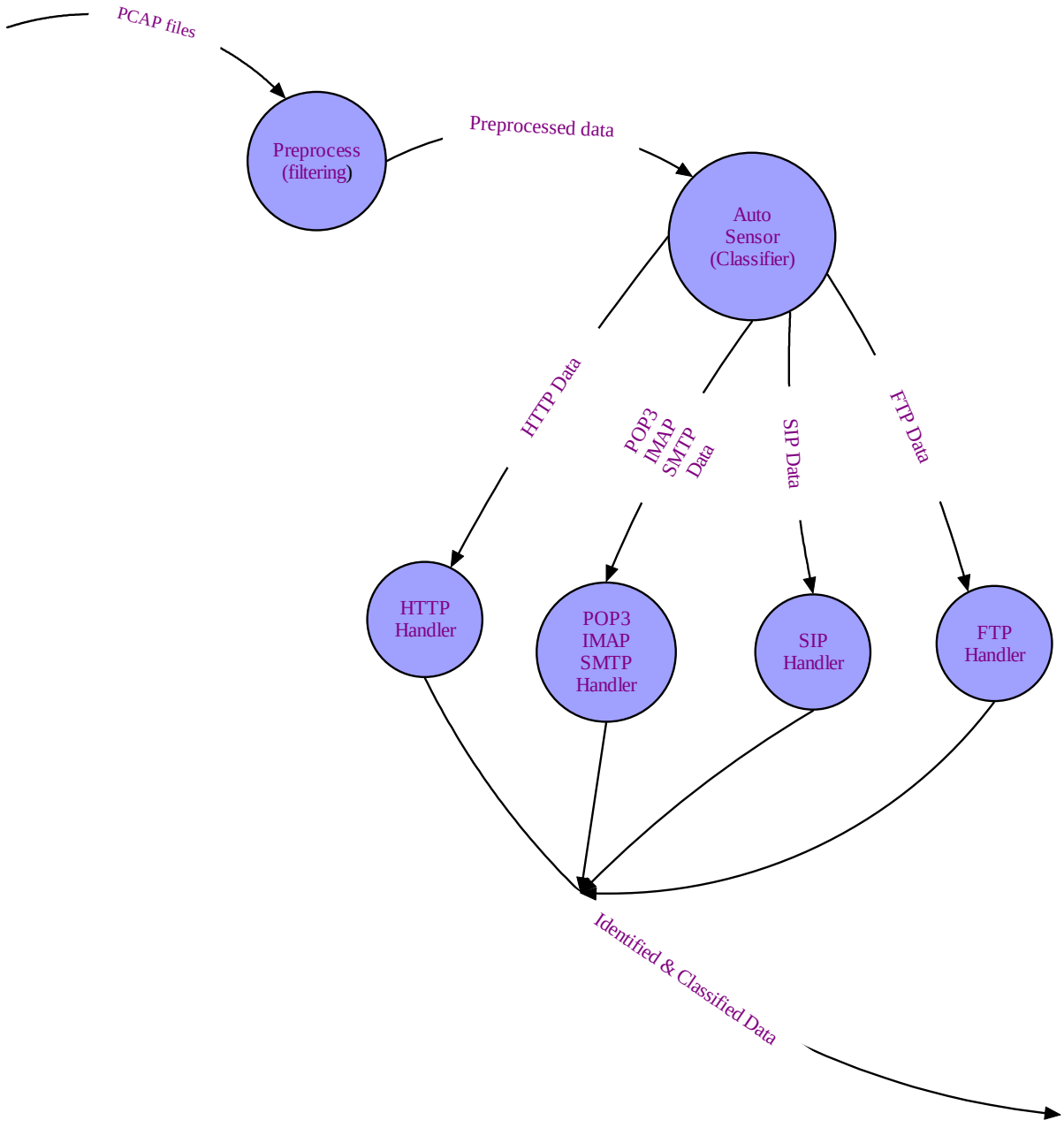
DFD0



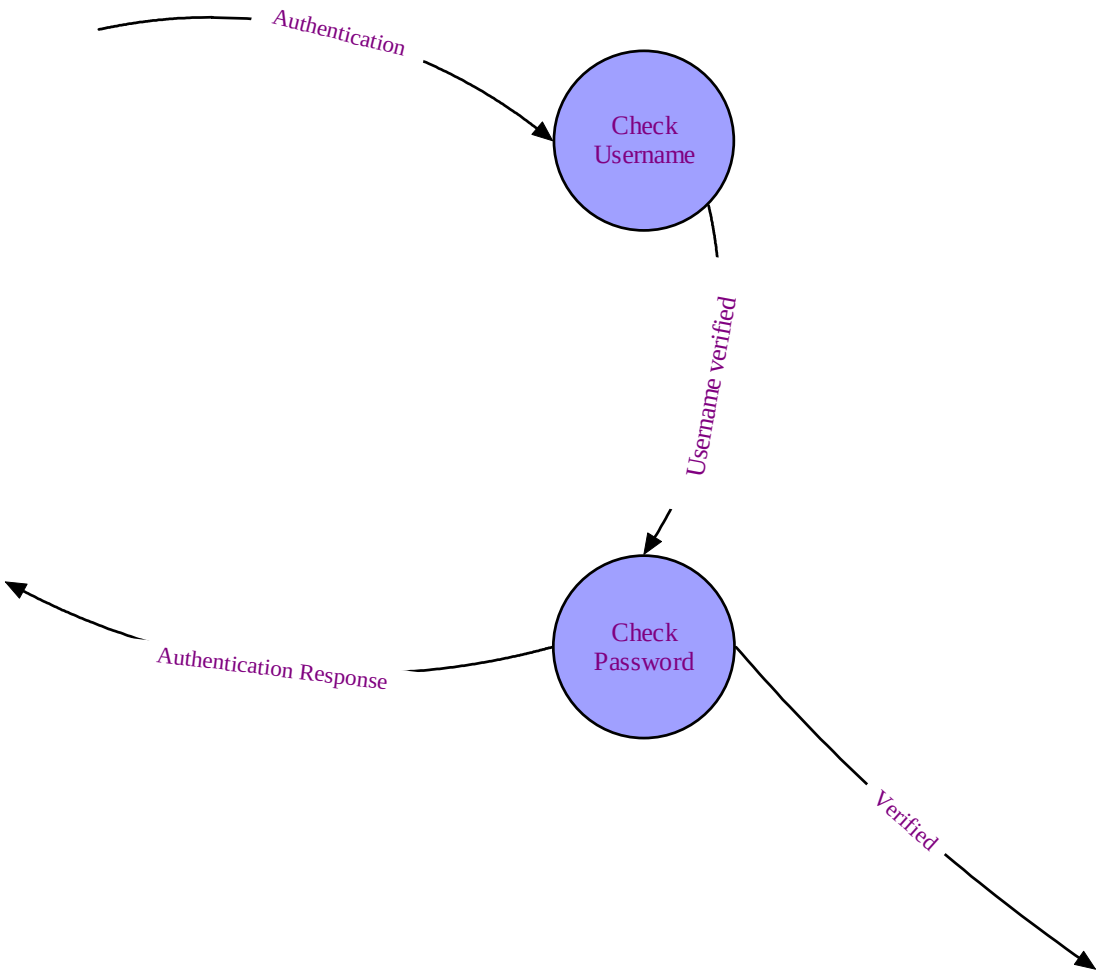
DFD1- PROTOCAL



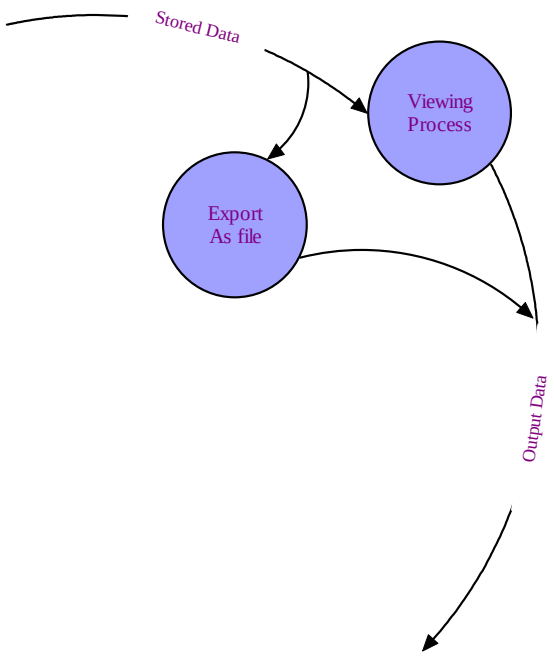
DFD2- Auto-Sensor(Classifier) and Handlers(Decoding)



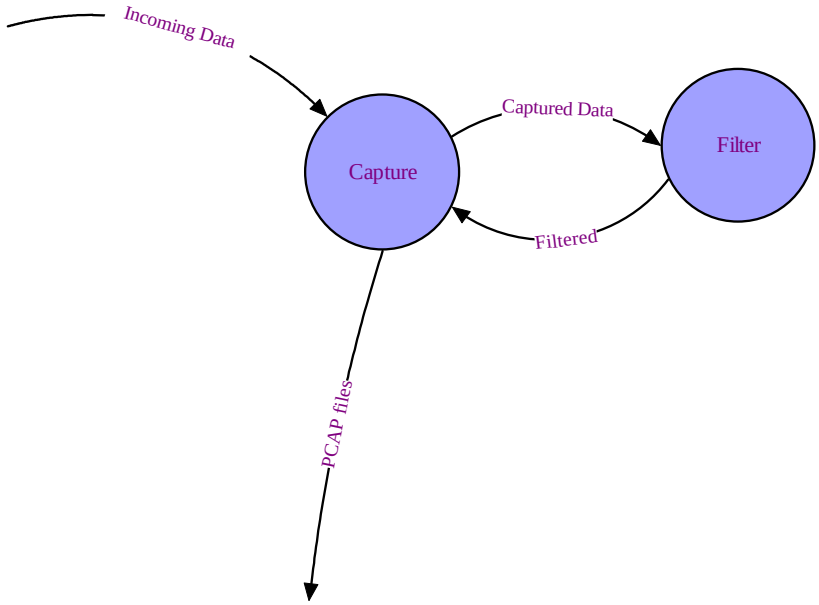
DFD2- Verify User



DFD2- Output Handler



DFD2- Network Capture



4.2.2 - DFD Data Dictionary

Name : Incoming Data

Input for: Network Capture

Output for : Network (external)

Description : The Data coming from Network that wil be captured as PCAP.

Name : PCAP files

Input for: Auto-Sensor , Temporary data store

Output for : Network Capture

Description : The file which has PCAP format that identifying will be done according.

Name : Identified & Classified Data
Input for: Database, output handler
Output for : Auto-Sensor , database
Description : Includes identified protocol type, source port, destination port, time info, transmitted data etc.

Name : Output Data
Input for: viewer
Output for : Output Handler
Description : data to be outputted in the format determined according to the identified protocol e.g. asf format for SIP protocol.

Name : HTTP Data
Input for: HTTP Handler
Output for : Auto-Sensor(Classifier)
Description : The identified data in the pattern classification part that is recognized as HTTP in the Auto-Sensor(Classifier).

Name : SMTP/POP3/IMAP Data
Input for: SMTP/POP3/IMAP Handler
Output for : Auto-Sensor(Classifier)
Description : The identified data in the pattern classification part that is recognized as SMTP/POP3/IMAP in the Auto-Sensor(Classifier).

Name : SIP Data
Input for: SIP Handler
Output for : Auto-Sensor(Classifier)
Description : The identified data in the pattern classification part that is recognized as SIP in the Auto-Sensor(Classifier).

Name : FTP Data
Input for: FTP Handler
Output for : Auto-Sensor(Classifier)
Description : The identified data in the pattern classification part that is recognized as FTP in the Auto-Sensor(Classifier).

Name : Authentication
Input for: User verify
Output for : User
Description : The information spesific to the User(Username and Password)

Name : Authentication Response
Input for: User
Output for : User verify
Description : The response of verification as verified username and password or not.

4.2.3 – DFD Process Description

Name : Auto-Sensor
Input : PCAP files
Output : Identified & Classified Data
Description : This process takes PCAP files and decodes the information which is in PCAP format. According the decoding, incoming information sent to the protocol handlers. After protocol handlers, data becomes ready for storing and sending to output.

Name : Output Handler
Input : Identified & Classified Data
Output : Output Data
Description : This process gets the identified data. According to the protocol of data, process uses the required output format. Looking the protocol type, outputs the transmitted data in wanted format. For example in pop3 protocol outputs the mail message in ‘eml’ format. After all it sends the output data to viewer.

Name : Network Capture
Input : Incoming Data
Output : PCAP files
Description : This process gets the incoming data from network. After optional filtering process it generates PCAP files for our classifier to be used.

Name : User Verify
Input : Authentication
Output : Authentication Response
Description : This process gets the username and password of the User and gives permission to the User to pass through the program if he/she has the right to use the program.

Name : HTTP Handler
Input : HTTP Data
Output : Identified & Classified Data
Description : This process gets the data from Auto-Sensor(Classifier) that has been classified to be in HTTP protocol. Process analyzes coming data according to RFC document of HTTP and decomposes the data.

Name : FTP Handler

Input : FTP Data

Output : Identified & Classified Data

Description : This process gets the data from Auto-Sensor(Classifier) that has been classified to be in FTP protocol. Process analyzes coming data according to RFC document of FTP and decomposes the data.

Name : SMTP/POP3/IMAP Handler

Input : SMTP/POP3/IMAP Data

Output : Identified & Classified Data

Description : This process gets the data from Auto-Sensor(Classifier) that has been classified to be in SMTP/POP3/IMAP protocol. Process analyzes coming data according to RFC document of SMTP/POP3/IMAP and decomposes the data.

Name : SIP Handler

Input : SIP Data

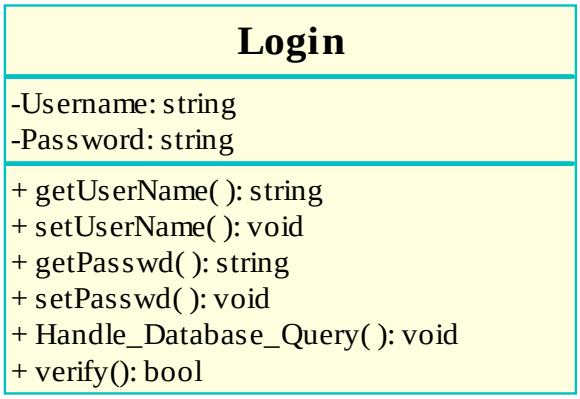
Output : Identified & Classified Data

Description : This process gets the data from Auto-Sensor(Classifier) that has been classified to be in SIP protocol. Process analyzes coming data according to RFC document of SIP and decomposes the data.

4.3. CLASS DIAGRAMS

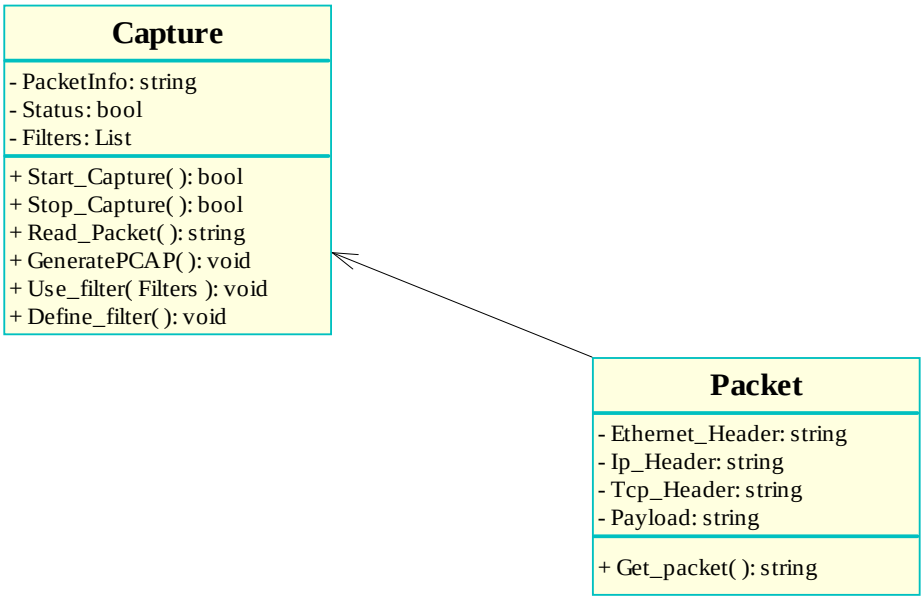
4.3.1-User Verification

User verification part of our project will only allow the users that are registered to the system by admin. Login class will have a method to get the username and password. Another method that reach the database and handle the requested query will be implemented. We will also implement a method to verify that entered username and password belongs to an existing user. Our class will look like this:



4.3.2 Network Capture

‘Network capture’ will be pcap provider of our Auto-Sensor(Classifier). We will have methods to start and stop capturing. Since packets will be taken in order, we do not need reordering phase. This class will read incoming packets and generate us the pcap files that we will use in classification part.
Classes will look like this:



4.3.3 Auto-Sensor (Classification)

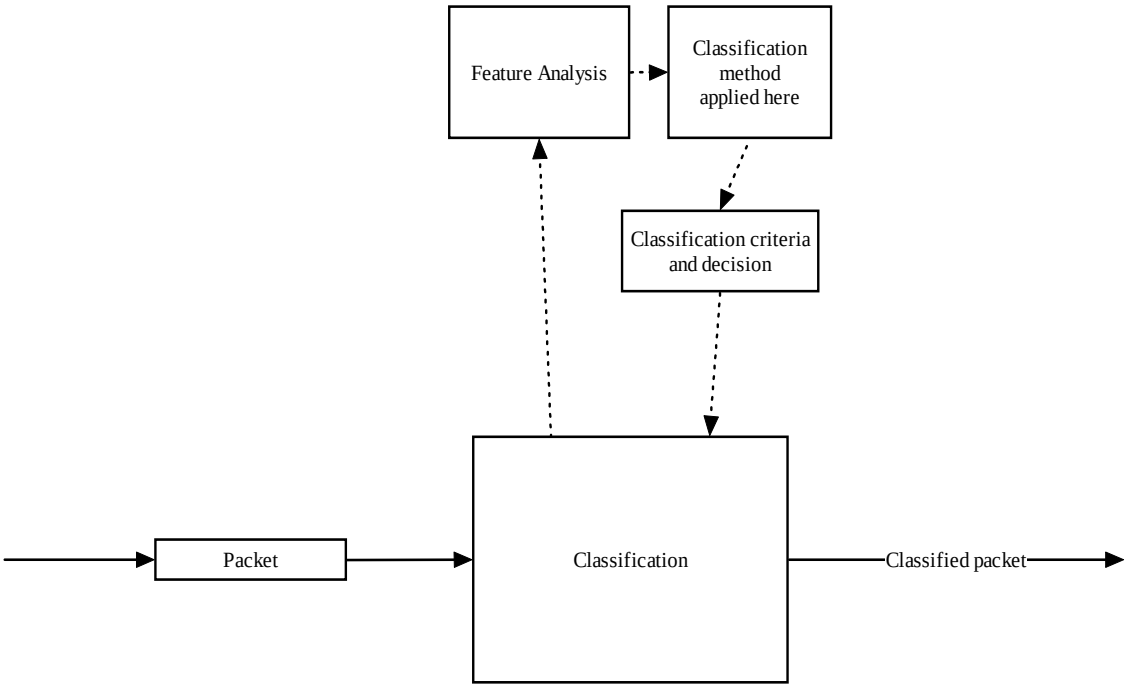
Auto-Sensor is the main part of the project. Classification without having port info will be done in this phase. This part includes Preprocessing, Feature analysis and Pattern classification.

- ***Feature Analysis***

The human mind categorizes information in memory so it can be retrieved easily. As a result we have to categorize our data in order to classify it easily for our project. In order to make feature analysis, we have to use one of the machine learning methods like support vector machine, hidden markov model, neural network. We will use Support Vector Machine because SVMs have recently attracted a great deal of attention in the machine
learning literature due to their strong performance on classification and regression problems. Additionally, in our opinion, Support Vector Machine is more suitable with our project.

Support Vector Machine (SVM) are a set of related supervised learning methods used for classification and regression. They belong to a family of generalized linear classifiers. A special property of SVMs is that they simultaneously minimize the empirical classification error and maximize the geometric margin; hence they are also known as maximum margin classifiers.

- ***Design Structure***



First of all, to group packets, we should anlayze tha packets in terms of their flow and content. We decided to examine packets in two aspect.

Flow analysis:

The flow info of the packets can give us some clues about their protocol. We plan to use the statistics about the flow.

The packet size is one of them. For each protocol, packet size will differ. Looking packet size, a prediction can be done. We will collect size statistics of each protocol and evaluate new packet according to these statistics.

A second flow analysis will be dependent on recent packet flow. Recent packet flow will be analyzed and used to categorize new packet.

Content Analysis:

In content analysis, we will examine the payload of the packet that protocol dependent data is carried. Of course, this part is more important than flow analysis. This analysis will depend on the inner structure of the protocol.

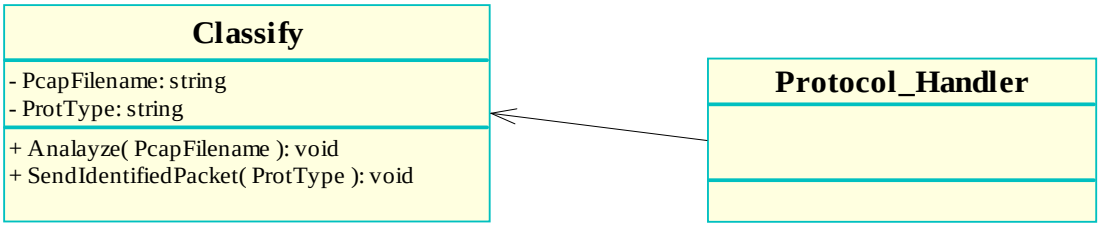
All protocols are not text-based so we should also examine the structure of the packet. The packet is structured based on the protocol. For instance, it will be divided into meaningful parts such as first 4 bytes represent a meaningful info and next 4 bytes represent a different info.

Because of this, the new packet will be divided into segments according to each protocol and will be examined through this segmentation.

Additionally, the content is important. If carried data is text-based, it is possible to use keyword matching. This is what we plan to do. To combine structural analysis with keyword matching will enable us to detect text-based protocols. This will also prevent us to make a mistake in tricky packets like a mail including the keywords of mail protocol. In binary protocols, we will analyze the packets according to their structure.

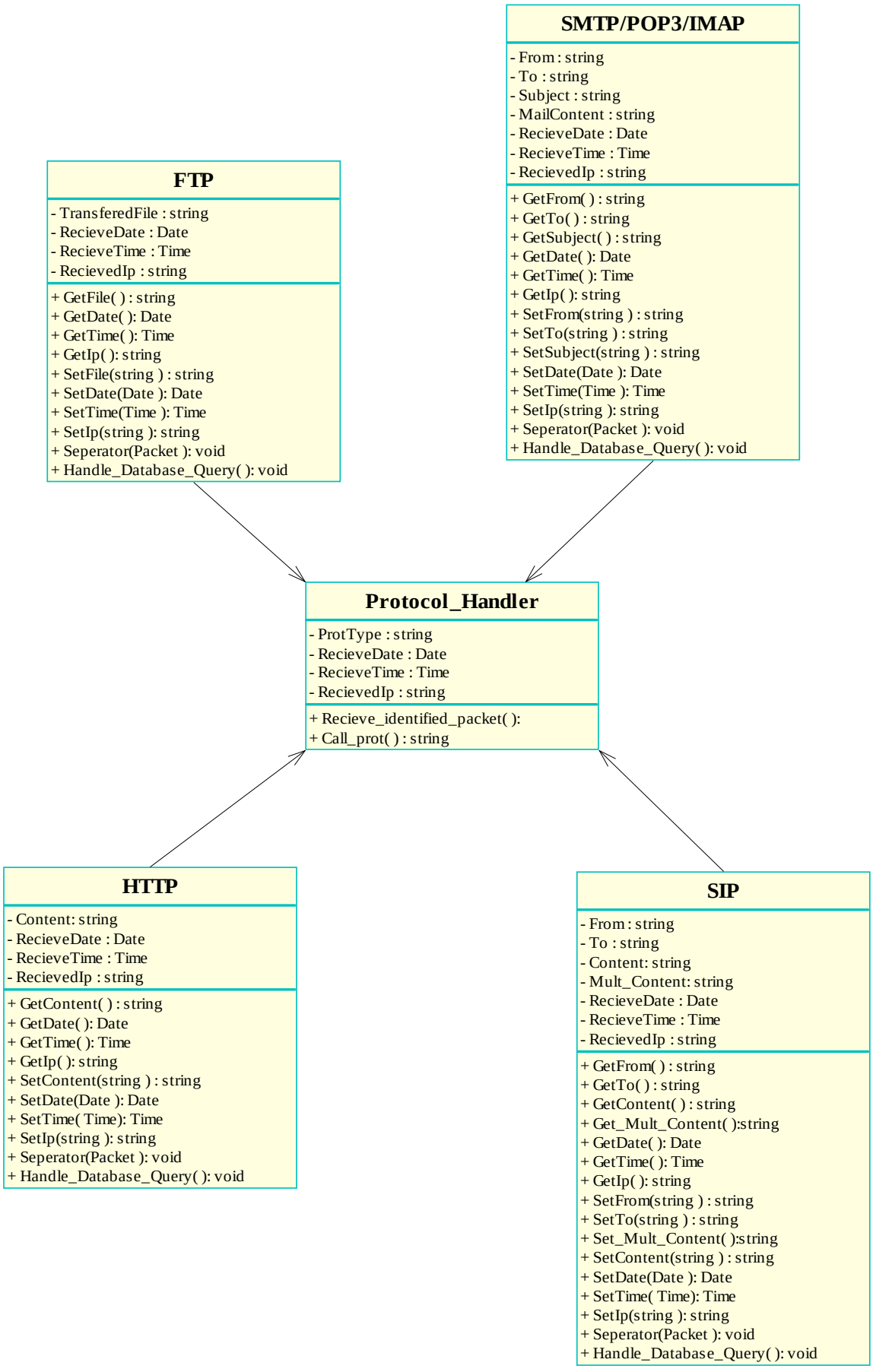
Classification:

In this phase, the data collected above will be evaluated according to classification constraints and the decision will be done.

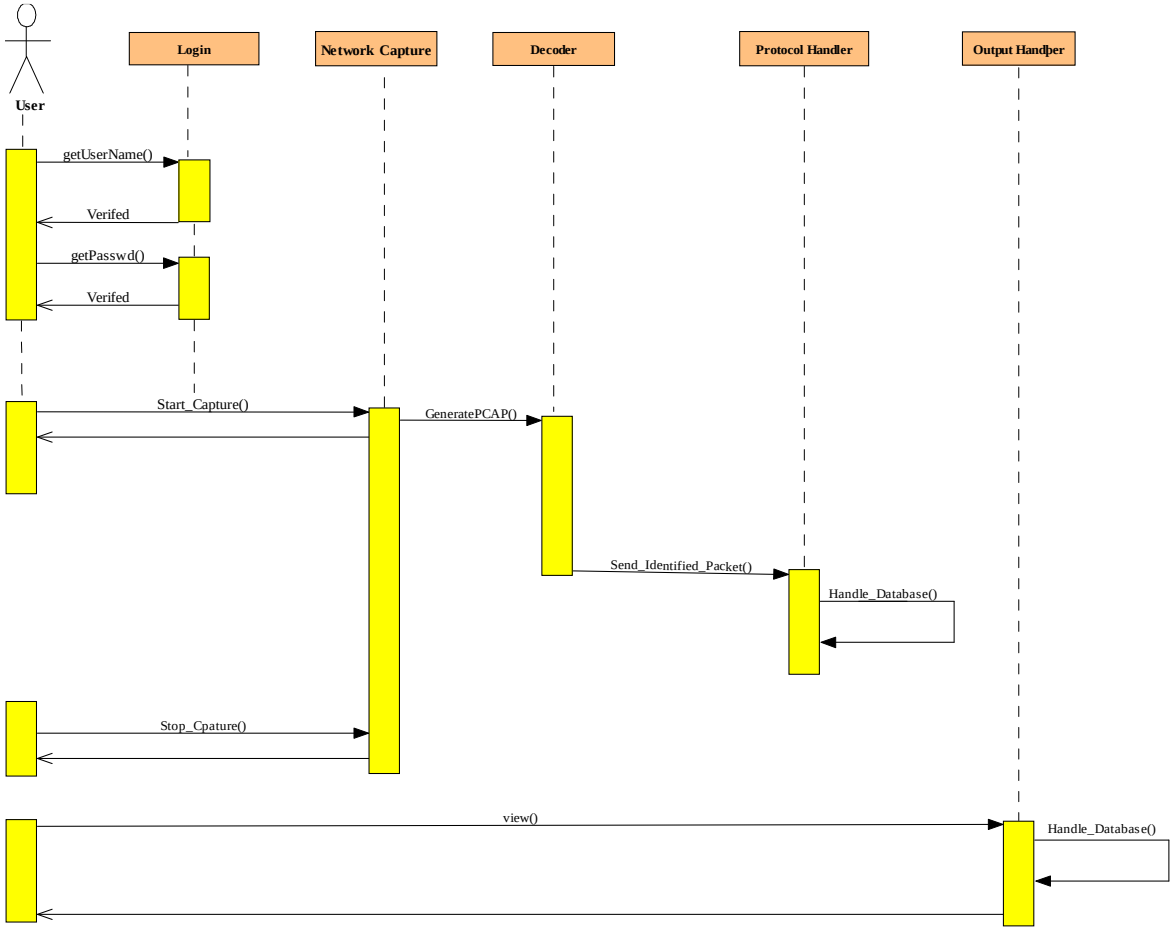


4.3.4 Protocol Handlers

Classified packets will be sent to the related Protocol Handler and will be analyzed according the RFC of this protocol if it is available. These packets will be decoded in the related handler. Each protocol handler will use a method to analyze the packet and get the necessary information. And each protocol will have a method to reach the database and perform requested query.

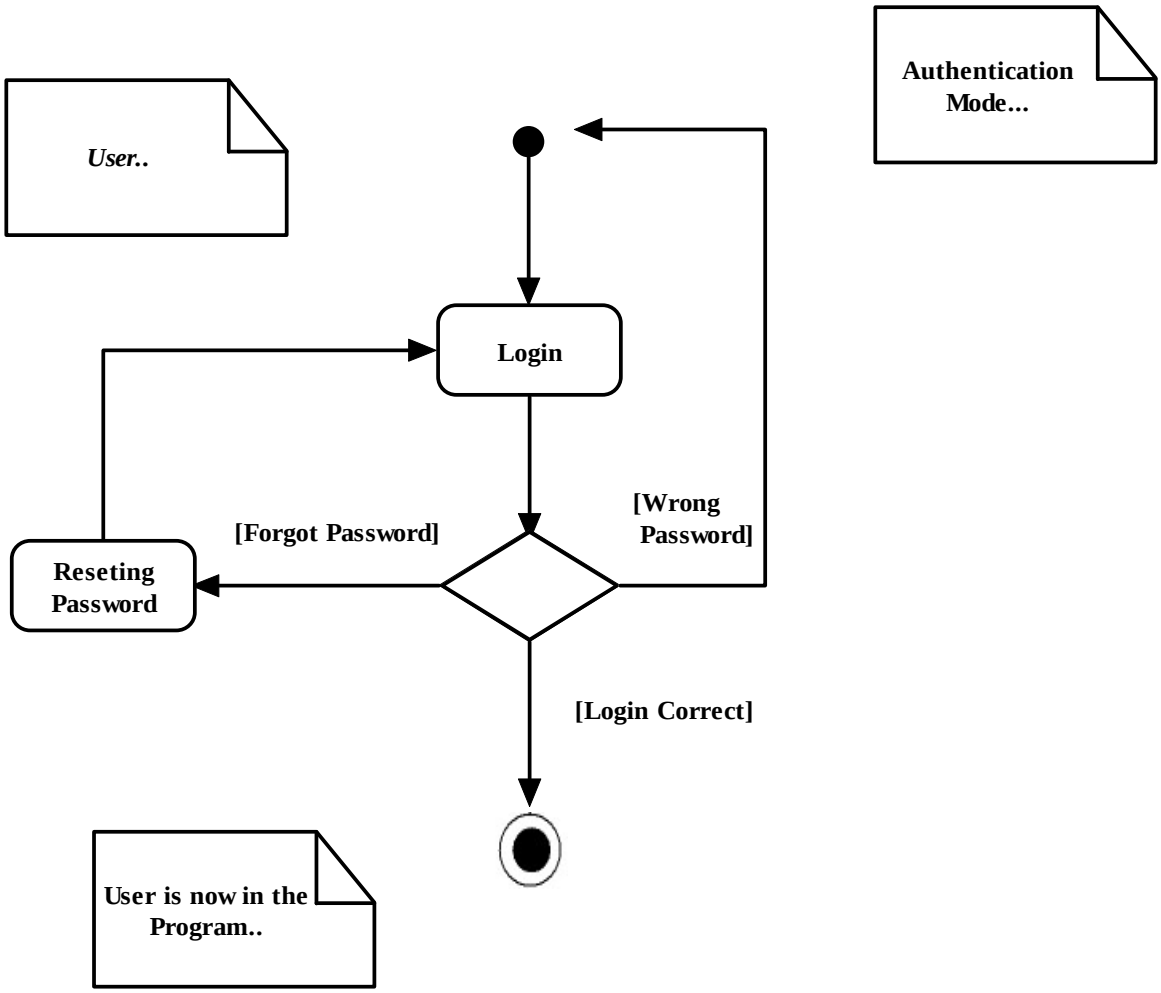

SMTP/POP3/IMAP
- From : string
- To : string
- Subject : string
- MailContent : string
- RecieveDate : Date
- RecieveTime : Time
- RecievedIp : string
+ GetFrom( ) : string
+ GetTo( ) : string
+ GetSubject( ) : string
+ GetDate( ): Date
+ GetTime( ): Time
+ GetIp( ): string
+ SetFrom(string) : string
+ SetTo(string) : string
+ SetSubject(string) : string
+ SetDate(Date): Date
+ SetTime(Time): Time
+ SetIp(string): string
+ Seperator(Packet): void
+ Handle_Database_Query( ): void
FTP
- TransferedFile : string
- RecieveDate : Date
- RecieveTime : Time
- RecievedIp : string
+ GetFile( ) : string
+ GetDate( ): Date
+ GetTime( ): Time
+ GetIp( ): string
+ SetFile(string) : string
+ SetDate(Date): Date
+ SetTime(Time): Time
+ SetIp(string): string
+ Seperator(Packet): void
+ Handle_Database_Query( ): void
Protocol_Handler
- ProtType : string
- RecieveDate : Date
- RecieveTime : Time
- RecievedIp : string
+ Recieve_identified_packet( ):
+ Call_prot( ) : string
HTTP
- Content: string
- RecieveDate : Date
- RecieveTime : Time
- RecievedIp : string
+ GetContent( ) : string
+ GetDate( ): Date
+ GetTime( ): Time
+ GetIp( ): string
+ SetContent(string) : string
+ SetDate(Date): Date
+ SetTime(Time): Time
+ SetIp(string): string
+ Seperator(Packet): void
+ Handle_Database_Query( ): void
SIP
- From : string
- To : string
- Content: string
- Mult_Content: string
- RecieveDate : Date
- RecieveTime : Time
- RecievedIp : string
+ GetFrom( ) : string
+ GetTo( ) : string
+ GetContent( ) : string
+ Get_Mult_Content( ):string
+ GetDate( ): Date
+ GetTime( ): Time
+ GetIp( ): string
+ SetFrom(string) : string
+ SetTo(string) : string
+ Set_Mult_Content( ):string
+ SetContent(string) : string
+ SetDate(Date): Date
+ SetTime(Time): Time
+ SetIp(string): string
+ Seperator(Packet): void
+ Handle_Database_Query( ): void

4.4. SEQUENCE DIAGRAM

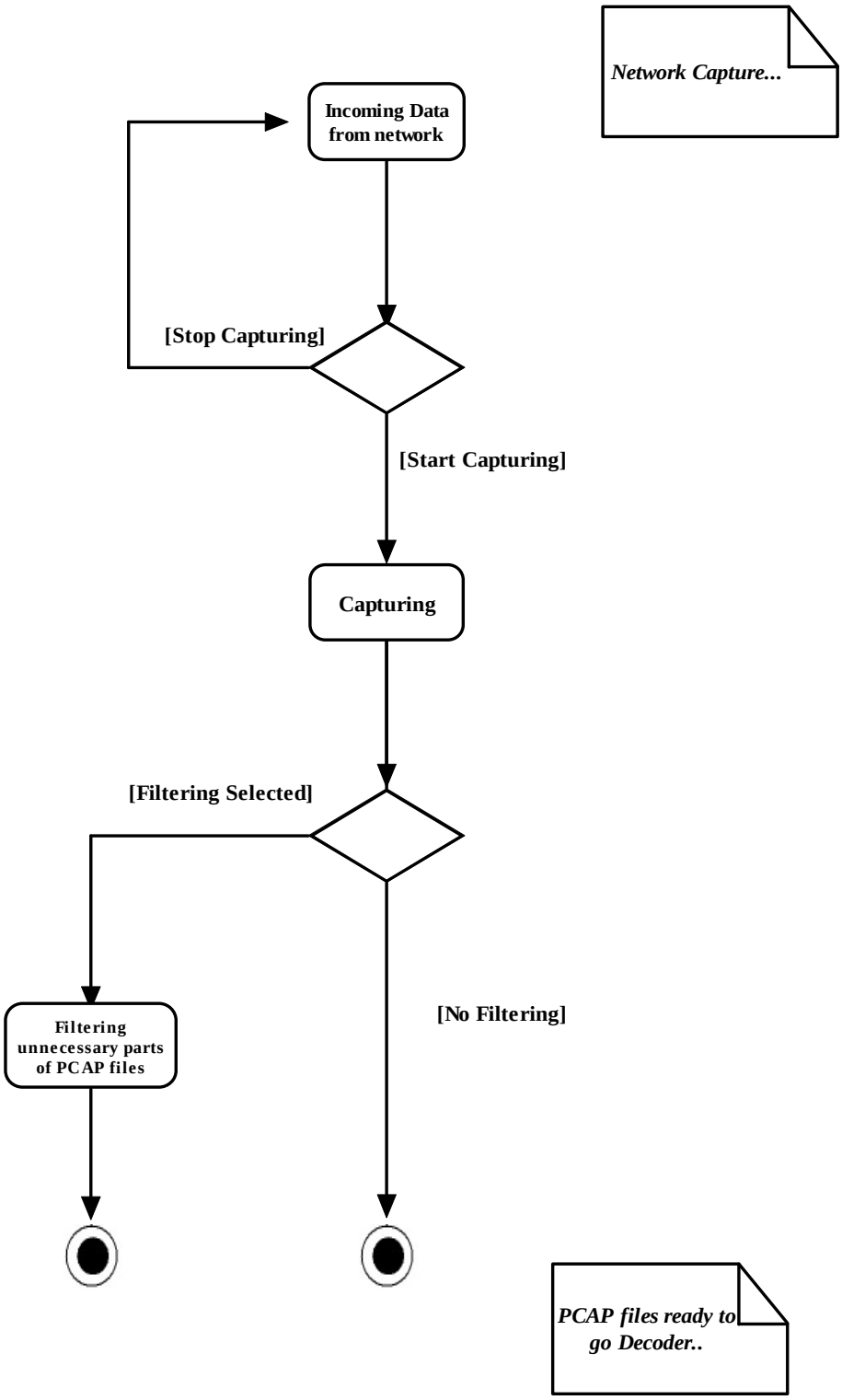


4.5.ACTIVITY DIAGRAMS

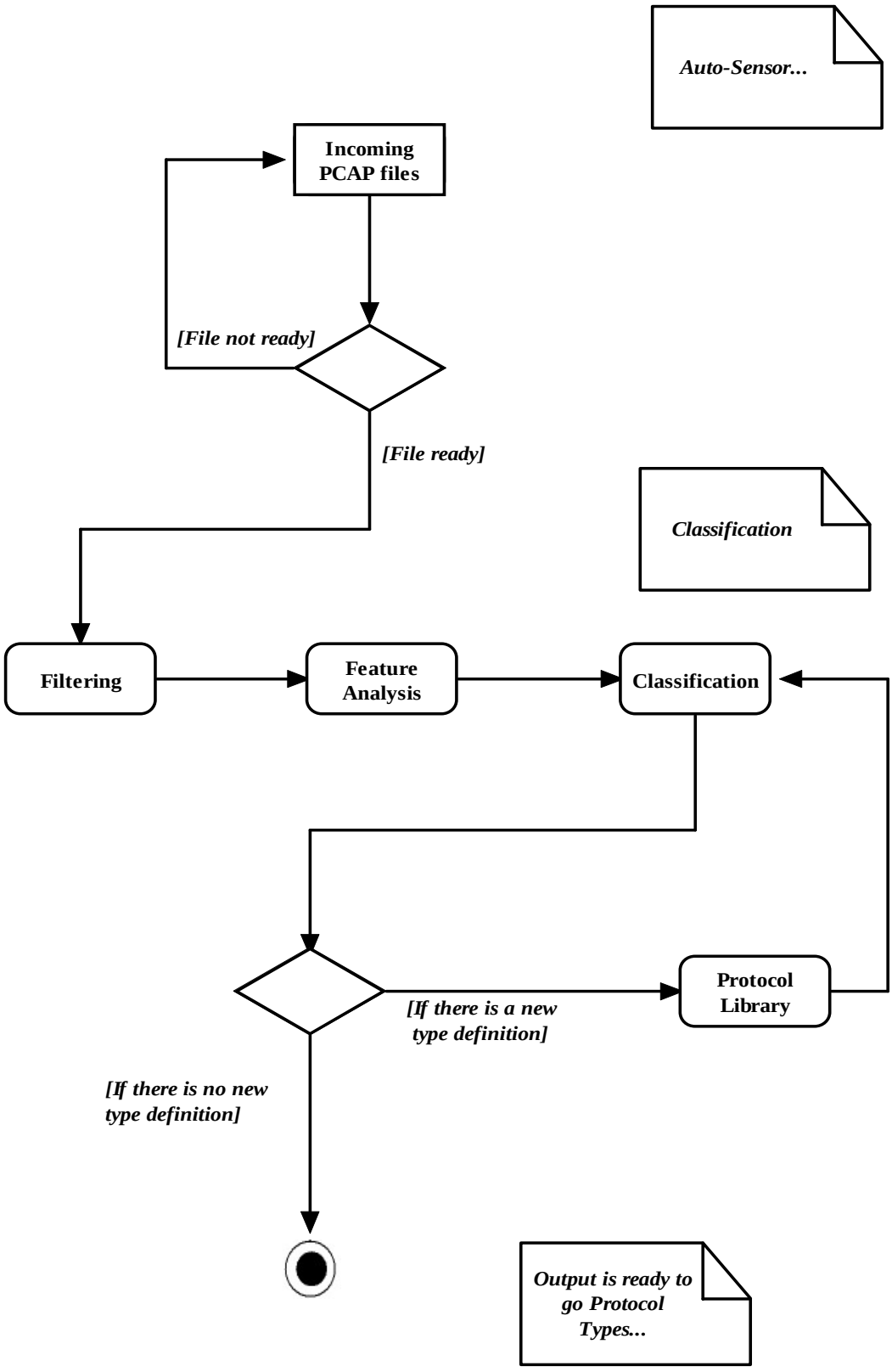
4.5.1 Login



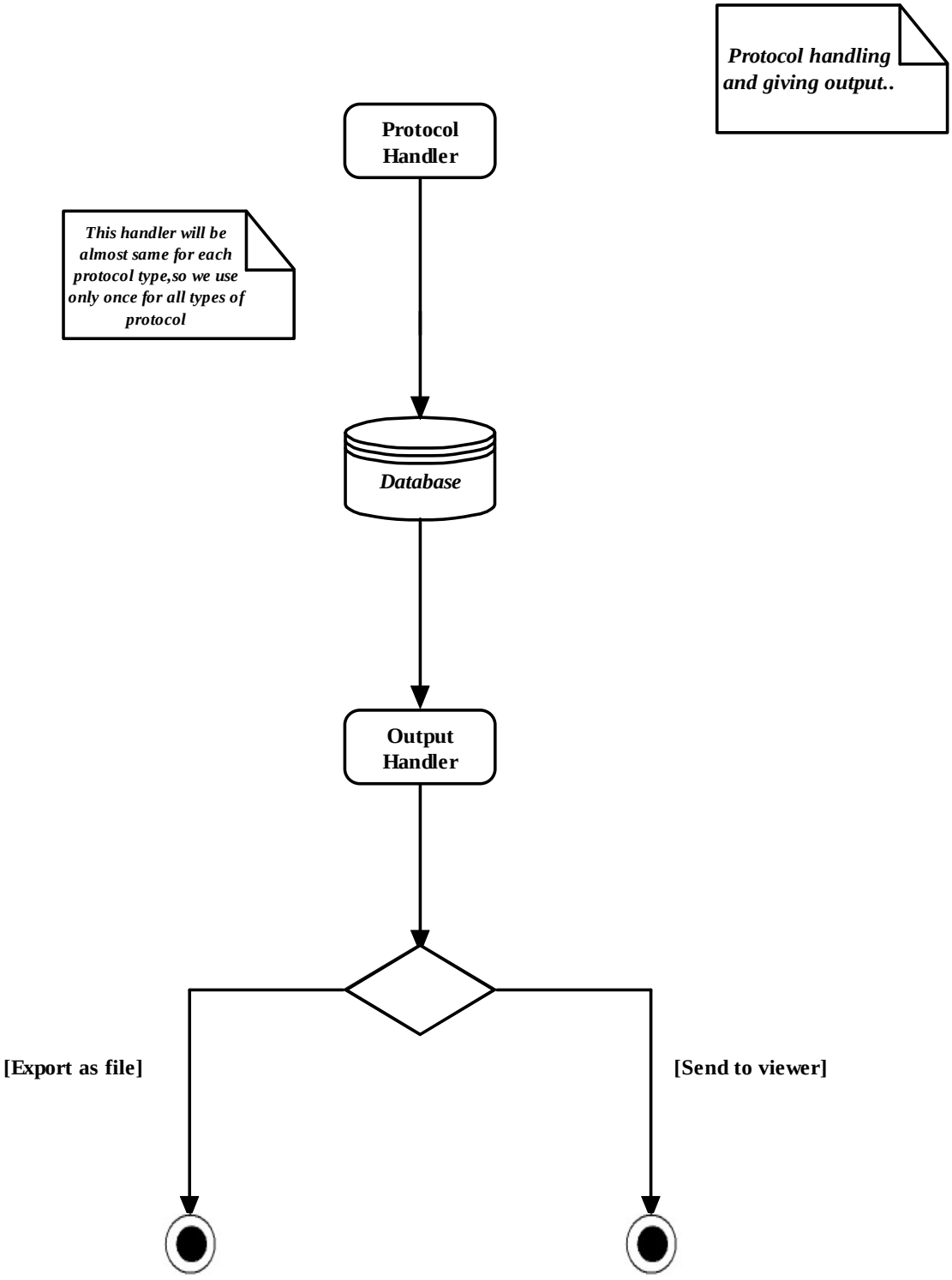
4.5.2 Capturing Data



4.5.3 Auto-Sensor



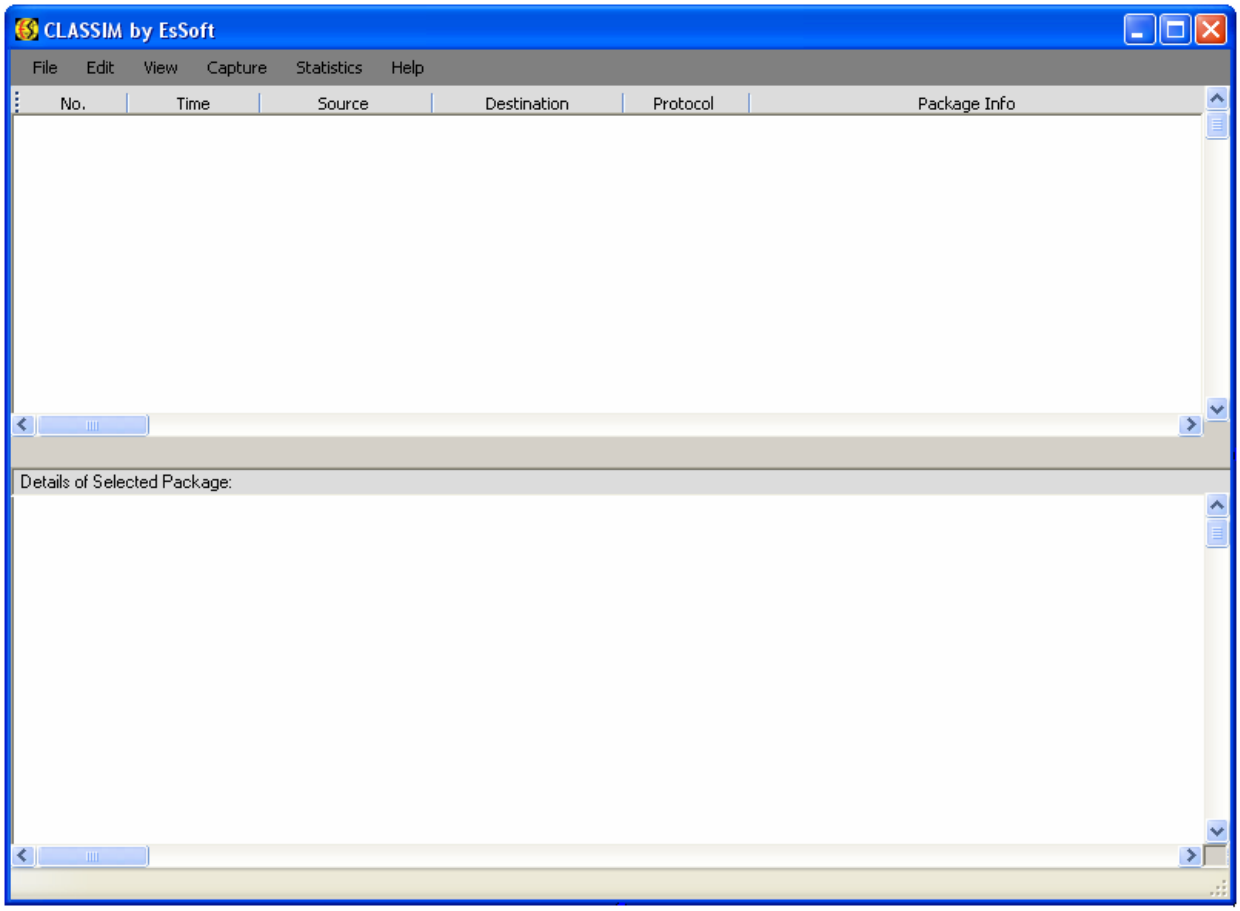
4.5.4 Protocol Handling and Giving Output



5. User Interface

5.1 General Overview

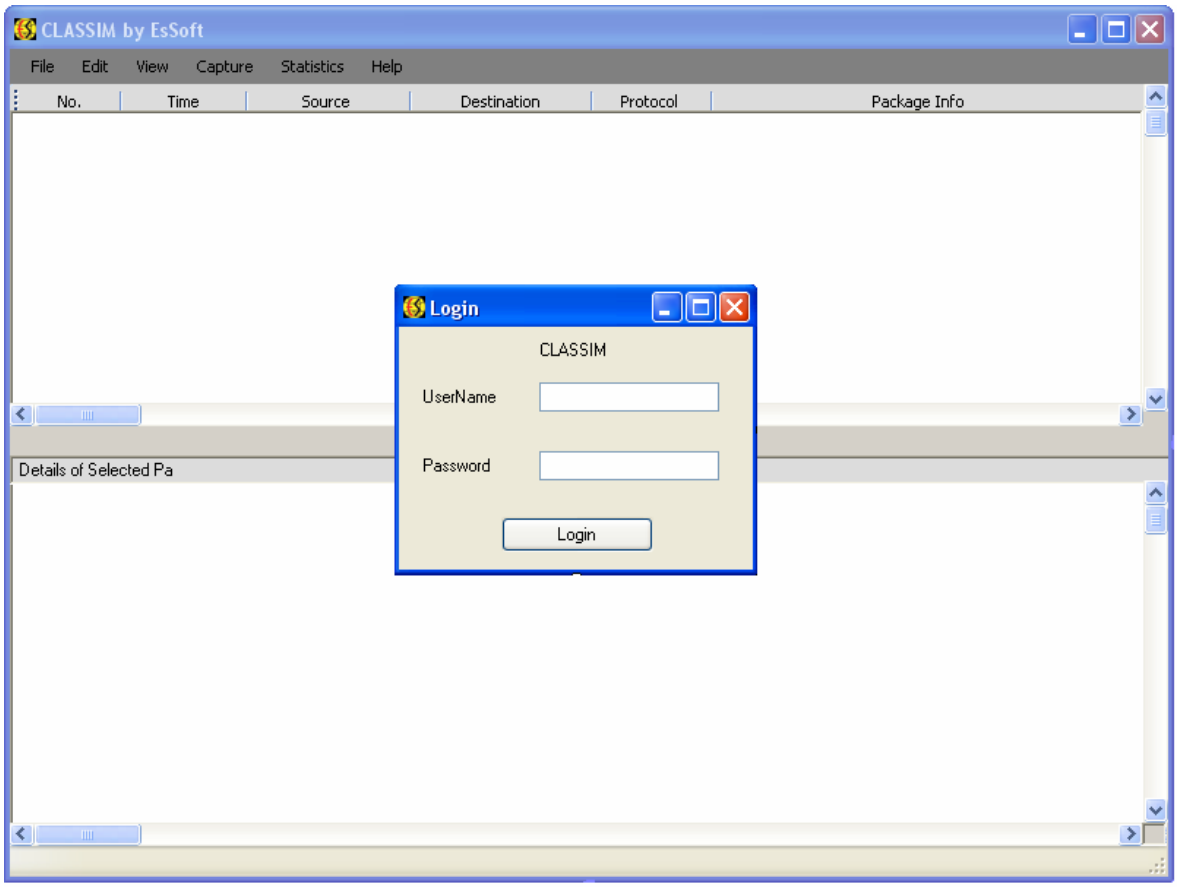
The Prototype of PROTOCAL's MAIN GUI will be look as below:



As seen from this screenshot, GUI includes two panel. One of the panel is captured packages panel and the other panel is details of the selected captured

packages. Also there is a menu bar that provide user to view other informations about selected captured packages. All these part of the GUI mentioned on 5.2 Menu Bar part, 5.2 and 5.4 Panels.

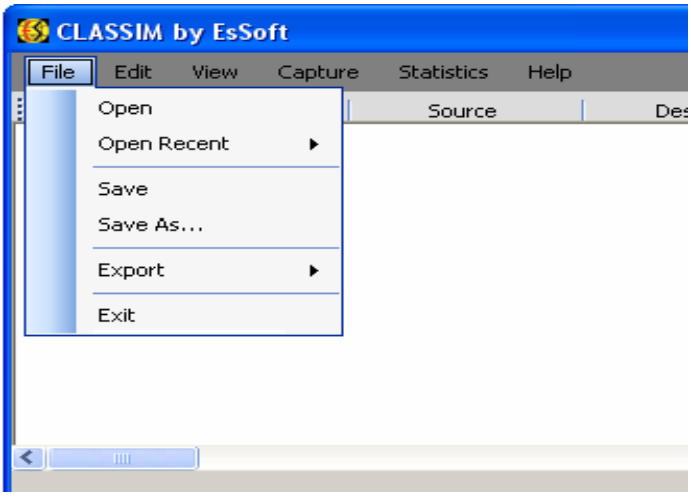
5.2 LOGIN



When program starts Login Window will appear in the first coming screen. User have to enter the correct username and password to log in.

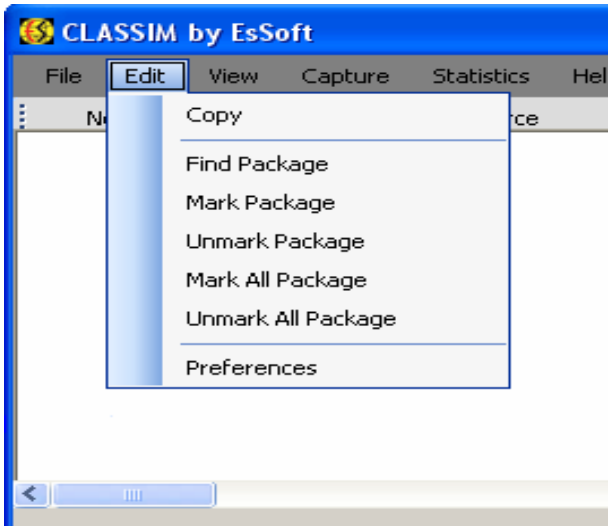
5.3 MENUBAR

5.3.1 FILE MENU



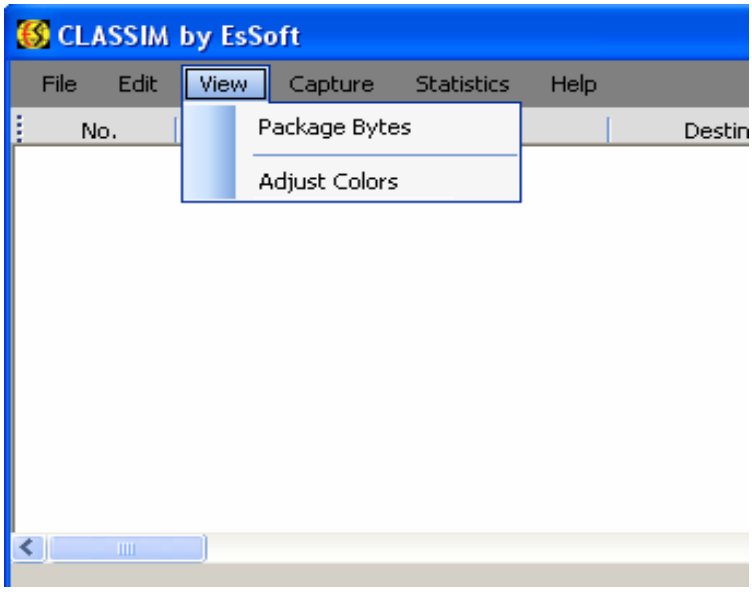
By this menu user can open an existing files by “Open”. User can open recent saved files by using “Open Recent”. User can save captured file list by “Save” or “Save As”. By “Export” user can save selected package’s .eml,.asf,.avi vs. files if selected package contents these type of files . User exits the program with “Exit”.

5.3.2 EDIT MENU



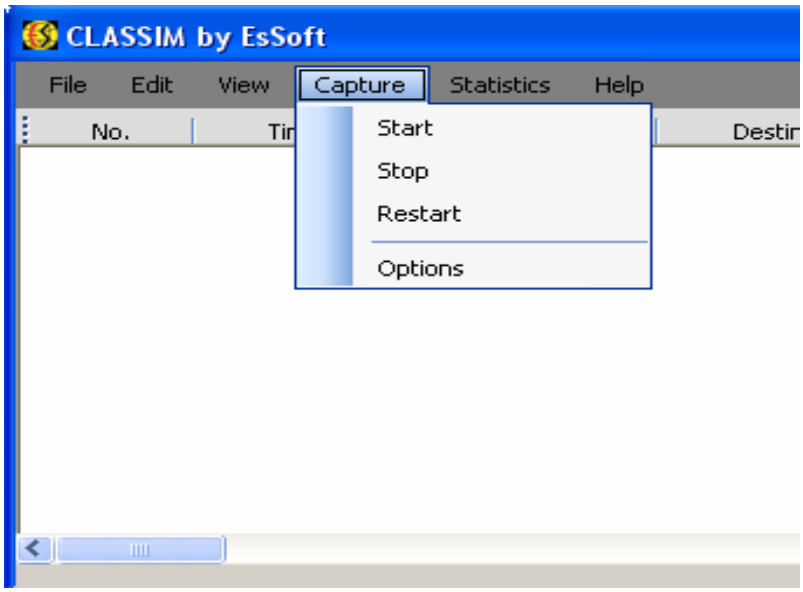
In edit menu user can copy the information of the captured files or details of the selected file. User can find a package with specifying its protocol or capture date or its package content by “Find Package”. Mark, unmark a package or mark, unmark all packages by “Mark Package”, “Unmark Package”, “Mark All Packages”, “Unmark All Packages”. By marking packages you can save them and adjust their viewing properties. And by “Preferences” user can change the preferences of the user interface.

5.3.3 VIEW MENU



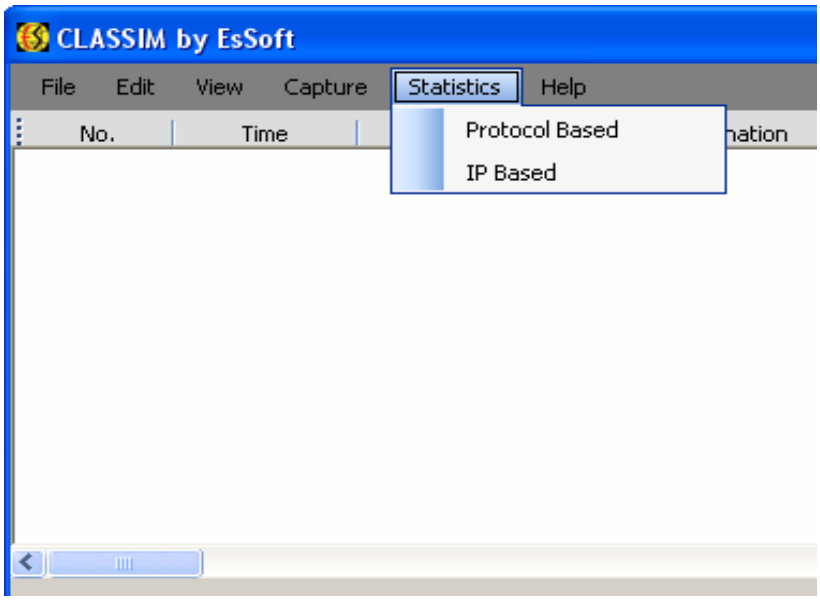
User can view the package content in hexadecimal form by “Package Bytes”. And by “Adjust Colors” user can change the color of the view of the captured packages.(for example : can assign different color to captured packages according to captured packages’ protocols.)

5.3.4 CAPTURE MENU



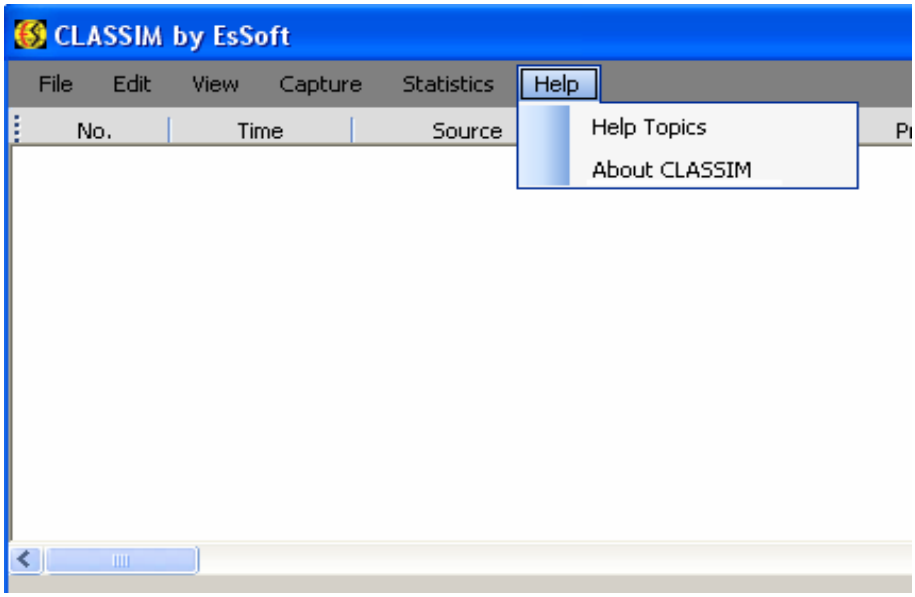
User can start capturing by “Start”. User can stop or restart the capturing by “Stop”, “Restart”. And also user can change capturing options by “Options” (for example : user can filter the protocols, IP’s, etc..)

5.3.5 STATISTIC MENU



By statistic menu user can view the statistic based on protolocols or IP's. Protocol based statistics can be viewed by "Protocols Based". IP based statistics can be viewed by "IP Based".

5.3.6 HELP MENU



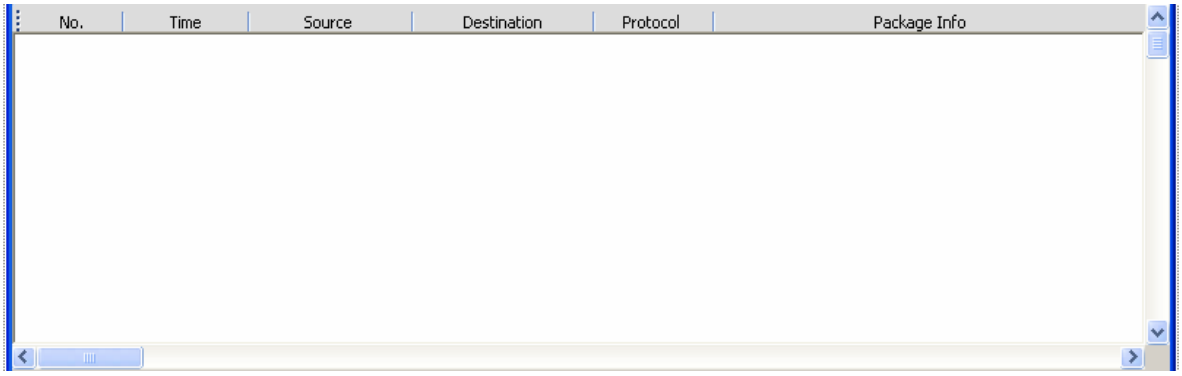
User can view "Help Topics" or "About CLASSIM".

5.4 TOOLBAR

Tool Bar will be implemented in the Final Design Report. Use will be able to select the tools he/she wants to use.

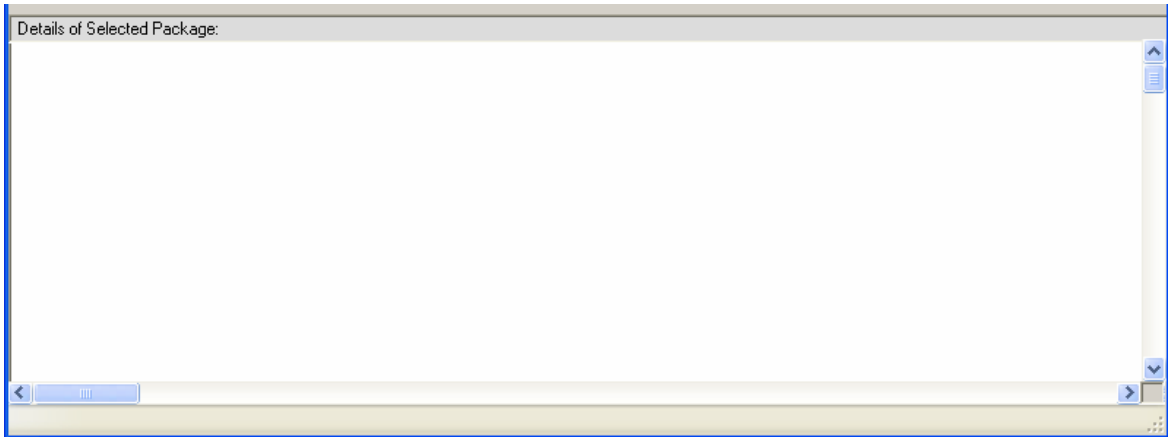
5.5 PANELS

5.5.1 CAPTURED PACKAGES PANEL



In Captured Packages Panel, packages which are captured according to filter is viewed. Captured packages' package info, protocol, destination etc. are also viewed in this panel.

5.5.2 DETAILS of CAPTURED PACKAGE



In Details of Captured Package, the selected package's content is viewed.

6. PROJECT SCHEDULE

Gantt chart is provided in Appendix A.

7. TESTING STRATEGIES

This initial design plan will be improve in next design phases.

Parts of the project will be tested for functionality and performance before integration.

Tests:

- Can User log in to the system securely?

We try to get information about user's data, such as password, username from another computer. If we are unsuccessful, test is done.

- Are the packages decoded correctly?

We will have database that is hold protocol structures, we will compare result of decoded file with this database. If return value is true, test is done.

- Does Auto-Sensor perform pattern recognition and classification well? (most important)

We will use PCAP files whose protocol is known. We will compare result of our pattern recognition with this PCAP files protocol. If the success percentage of this comparison is more than 90%, test is done

- Is the package information output correctly?

We will open this package with other network analyzer, and compare its result with ours. If they match, test is done.

- Does the interface work correctly?

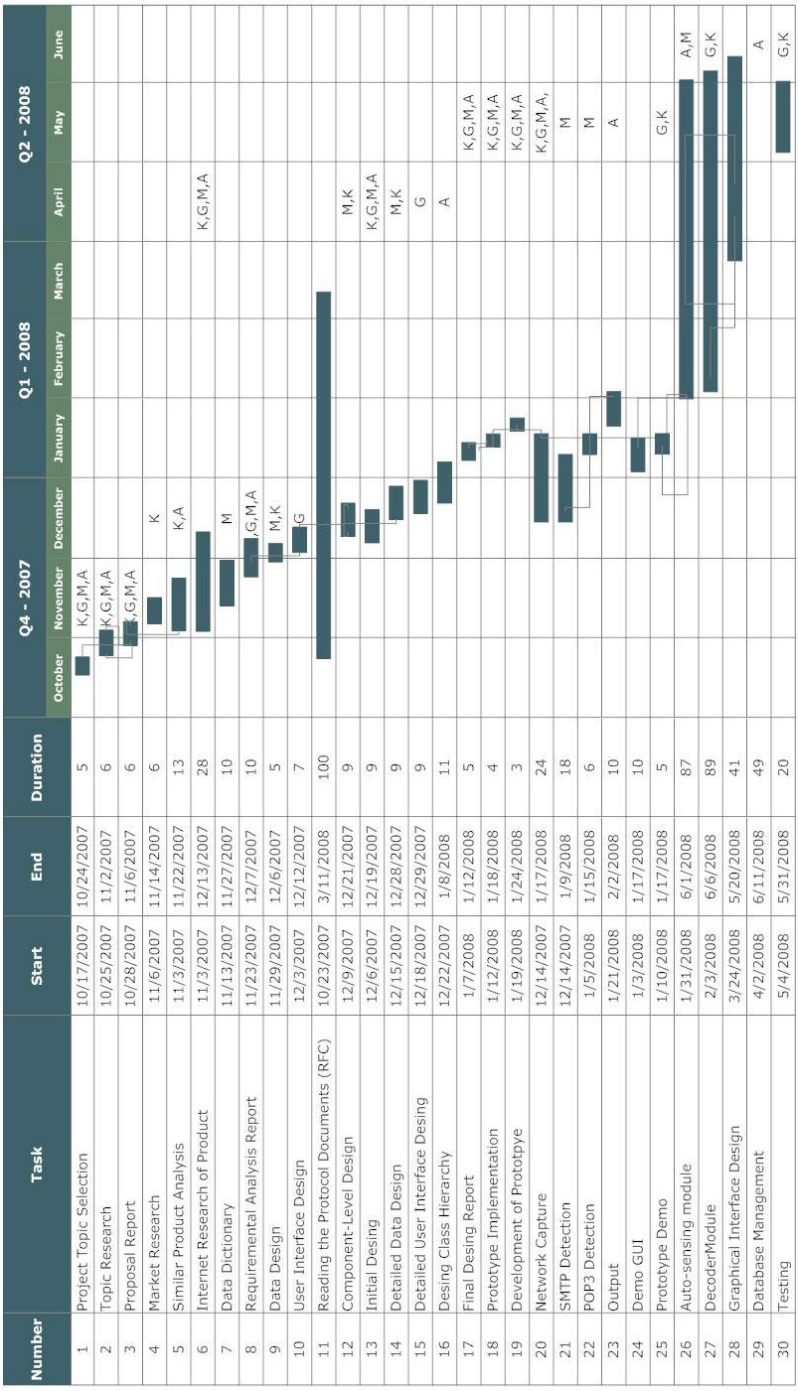
All buttons and controls will be checked, if there will be no failure, test is done.

8. CONCLUSION

Thanks to development of computer technology, network systems become complex and sometimes make problems for users that have to be dealed. For instance, increase of usage of internet in the world, control of network systems is a critical issue. Hardware and software to connect one computer to the other have to do identification and classification of programs in terms of protocols.

Through the whole process, we appreciate needs about network systems. We put different features to our project in order to make it more efficient in terms of time and easibility.

APPENDIX A



Number	Task	Start	End	Duration
1	Project Topic Selection	10/17/2007	10/24/2007	5
2	Topic Research	10/25/2007	11/2/2007	6
3	Proposal Report	10/28/2007	11/6/2007	6
4	Market Research	11/6/2007	11/14/2007	6
5	Similar Product Analysis	11/3/2007	11/22/2007	13
6	Internet Research of Product	11/3/2007	12/13/2007	28
7	Data Dictionary	11/13/2007	11/27/2007	10
8	Requiremental Analysis Report	11/23/2007	12/7/2007	10
9	Data Design	11/29/2007	12/6/2007	5
10	User Interface Design	12/3/2007	12/12/2007	7
11	Reading the Protocol Documents (RFC)	10/23/2007	3/11/2008	100
12	Component-Level Design	12/9/2007	12/21/2007	9
13	Initial Desing	12/6/2007	12/19/2007	9
14	Detailed Data Design	12/15/2007	12/28/2007	9
15	Detailed User Interface Desing	12/18/2007	12/29/2007	9
16	Desing Class Hierarchy	12/22/2007	1/8/2008	11
17	Final Desing Report	1/7/2008	1/12/2008	5
18	Prototype Implementation	1/12/2008	1/18/2008	4
19	Development of Prototpye	1/19/2008	1/24/2008	3
20	Network Capture	12/14/2007	1/17/2008	24
21	SMTP Detection	12/14/2007	1/9/2008	18
22	POP3 Detection	1/5/2008	1/15/2008	6
23	Output	1/21/2008	2/2/2008	10
24	Demo GUI	1/3/2008	1/17/2008	10
25	Prototype Demo	1/10/2008	1/17/2008	5
26	Auto-sensing module	1/31/2008	6/1/2008	87
27	DecoderModule	2/3/2008	6/6/2008	89
28	Graphical Interface Design	3/24/2008	5/20/2008	41
29	Database Management	4/2/2008	6/11/2008	49
30	Testing	5/4/2008	5/31/2008	20

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