CSCI-5448 SPRING 2016
OBJECT ORIENTED ANALYSIS AND DESIGN
PROJECT REPORT - PACKET SNIFFER

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Description: A packet sniffer application using Java and having a GUI that can capture and analyze packets being transmitted and received over a network. The captured packets can be used to gain information about the type and content of messages being transmitted over the network.

1. What features were implemented?

The features of the packet analyzer are implemented from the user requirements are as follows:

User Requirements

ID	Requirement	Topic Area	User	Priority
UR-001	User should be able to launch application.	Interaction	Any	High
UR-002	User should be able to close the application	Freedom	Any	Medium
UR-003	User should be able to start capturing packets by selecting network interface		Any	High
UR-004	User should be able to stop capturing packets		Any	High
UR-007	User should be able to import/export the saved Packets.		Any	High
UR-010	User should be able to filter packets according to detected protocols.		Any	Medium
UR-011	User should be able to inspect the packet information for a selected packet		Any	Medium
UR-012	User should be able to view only packet header.		Any	Medium
UR-013	User should have the option to view real time network statistics	Stats	Any	High

2. Which features were not implemented from Part 2?

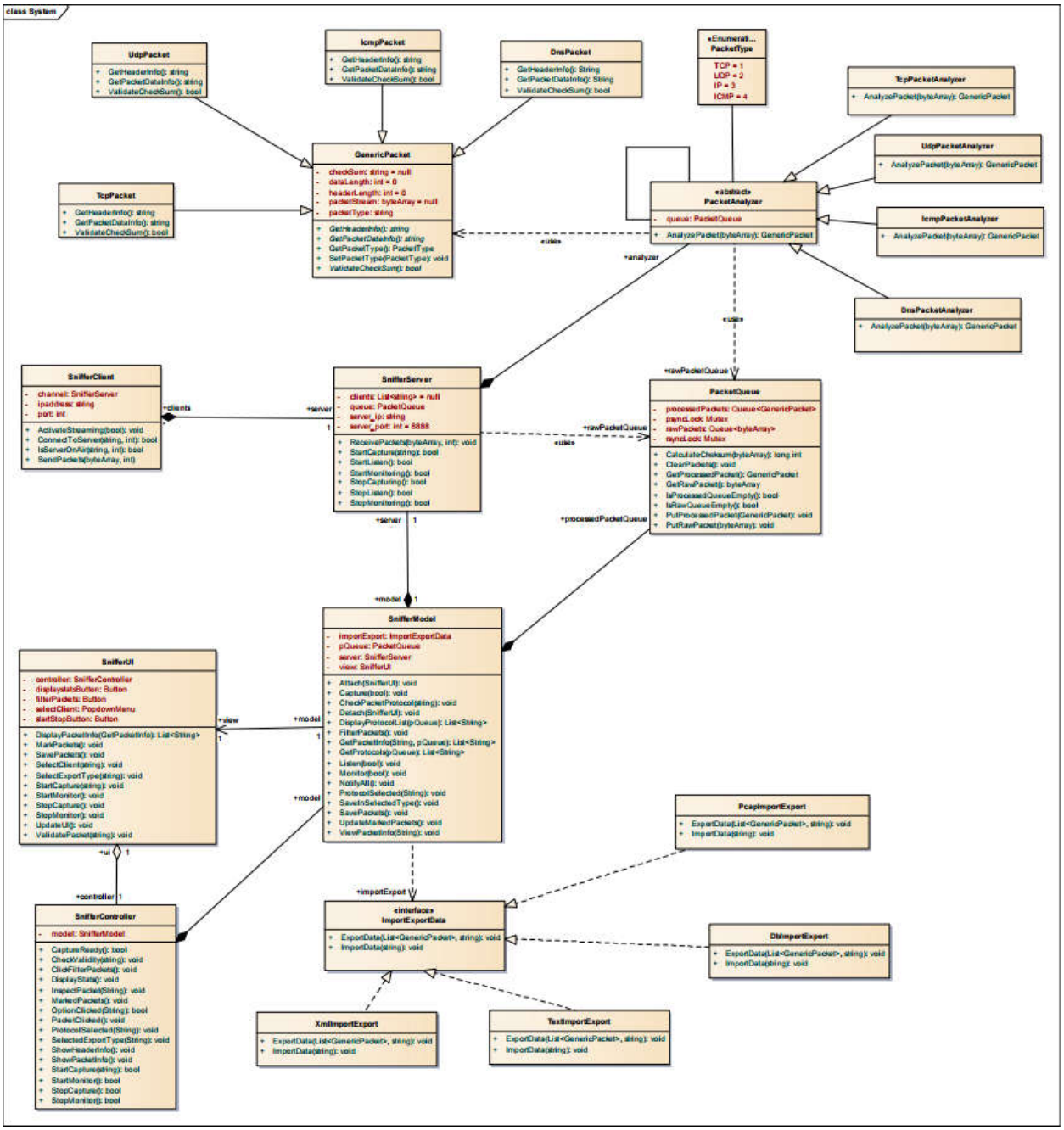
The features that we were unable to implement (due to complexity and time constraints) are:

User Requirements				
ID	**Requirement**	**Topic Area**	**User**	**Priority**
UR-005	User should be able to mark packets for saving packet information.		Any	Medium
UR-006	User should be able to save either all the captured packets or marked captured packets		Any	High
UR-008	User should be able to view types of protocols used in captured packets.		Any	High
UR-009	Users should have the option of choosing the client machine to monitor packets from.	Freedom	Any	High
UR-014	User should be able to validate a selected packet for its integrity and authenticity	Validity	Any	High

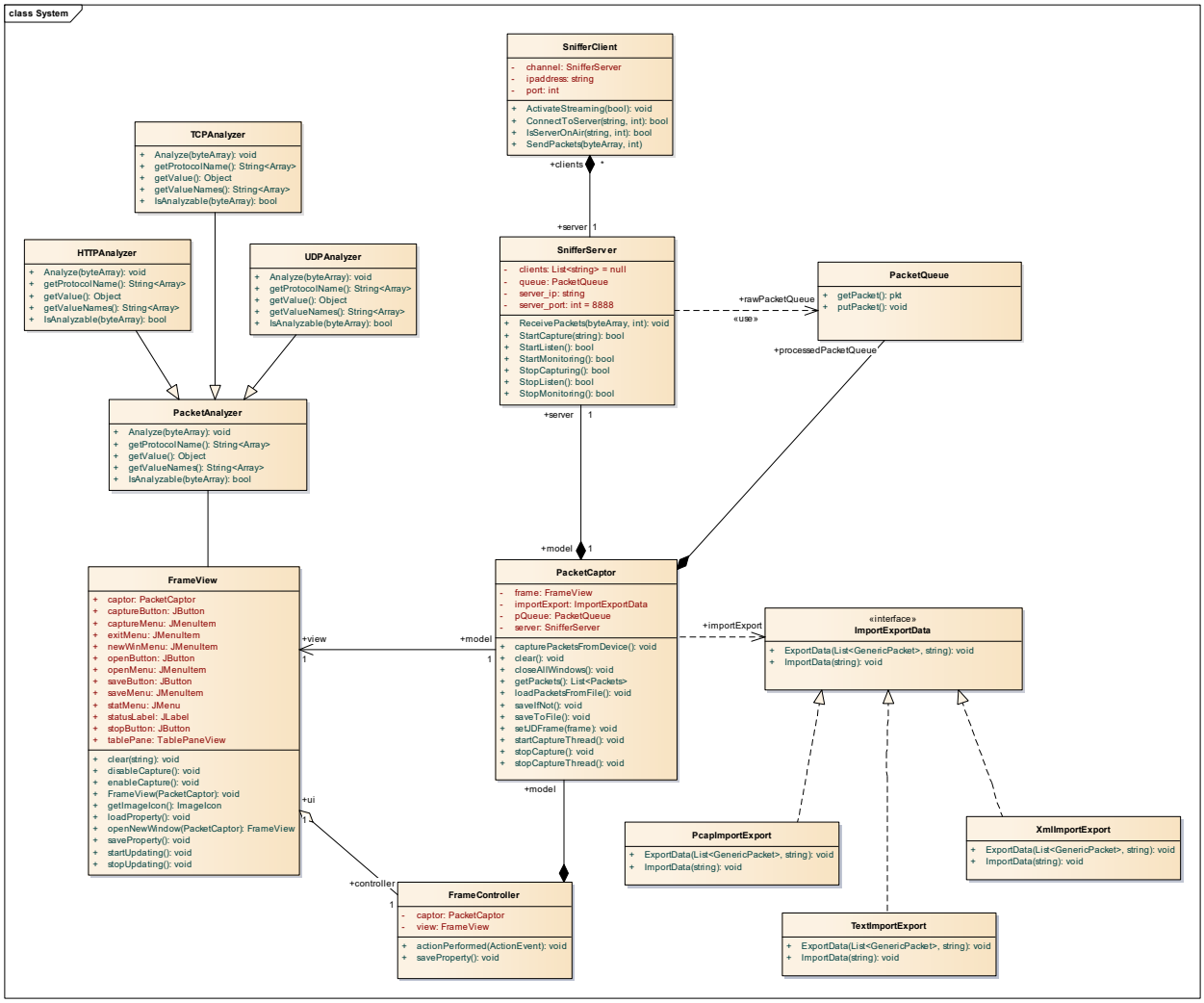
Also, the above features are not essential to the functioning of a vanilla packet sniffer and the core functionality has been implemented.

3. Show your Part 2 class diagram and your final class diagram. What changed? Why? If it did not change much, then discuss how doing the design up front helped in the development.

Part 2 Class Diagram



Final Class Diagram



- A lot of classes in the Part 2 version of the class diagram didn't end up making it to the final version.

- The class GenericPacket was removed and everything is handled by the PacketAnalyzer class

- Also, the client server is yet to be implemented and hence those classes did not make it to the final version. The program currently captures all incoming and outgoing data from the network interfaces of the host machine.

- Also, the PacketQueue class does not currently perform any function since it is meant to queue incoming packets when a client server architecture is implemented. For now, the packets are handled by the in-built queue of the JPCAP Java network library that allows to handling of packets.

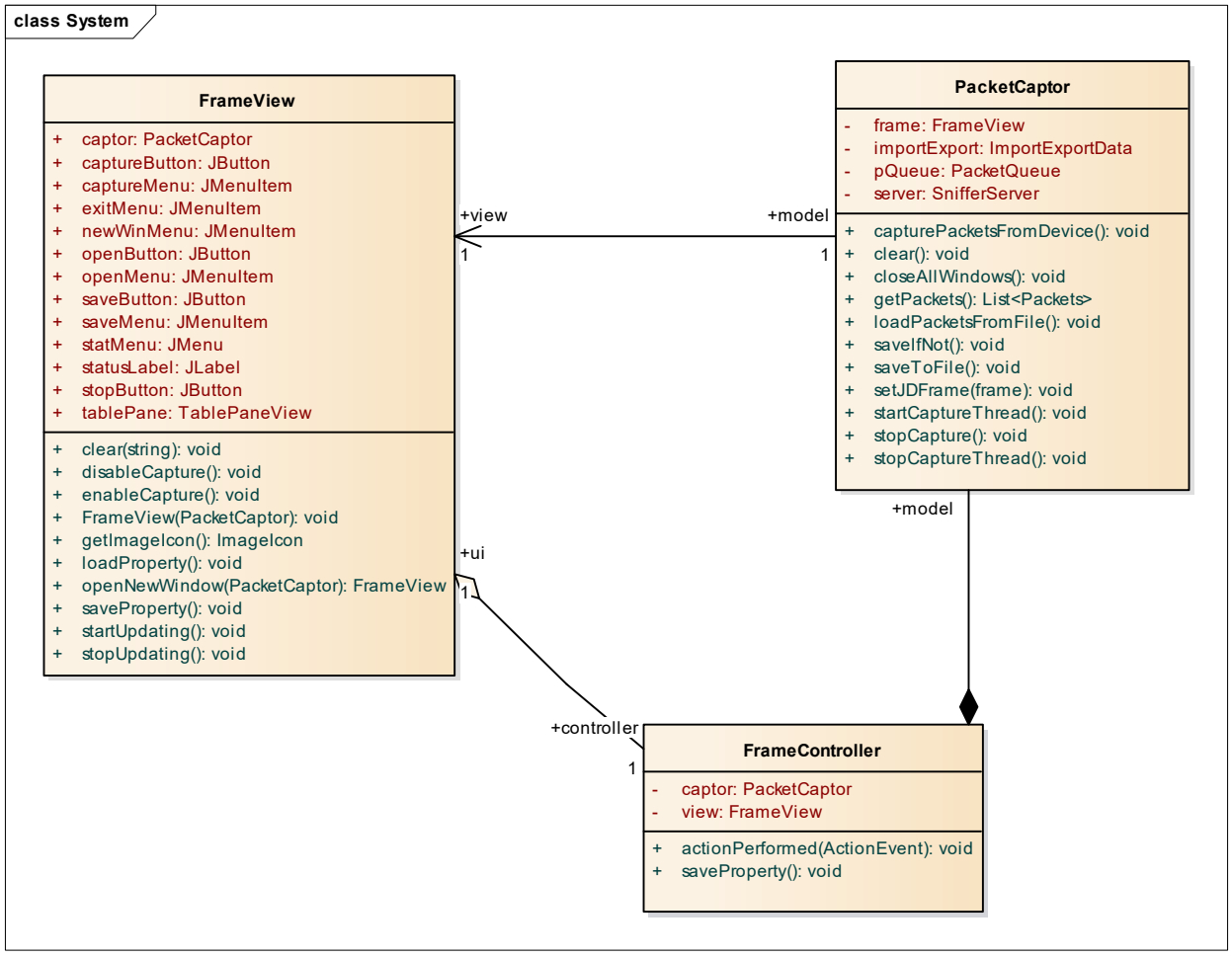
- However, our implementation of the project follows an MVC design pattern which was also proposed in the initial class diagram. Designing the class diagram up-front helped us to at least know what sort of framework we'd want to follow and we could thus program our implementation around that framework.

4. Did you make use of any design patterns in the implementation of your final prototype? If so, how? If not, where could you make use of design patterns in your system?

The following design patterns were used in implementation of the final prototype:

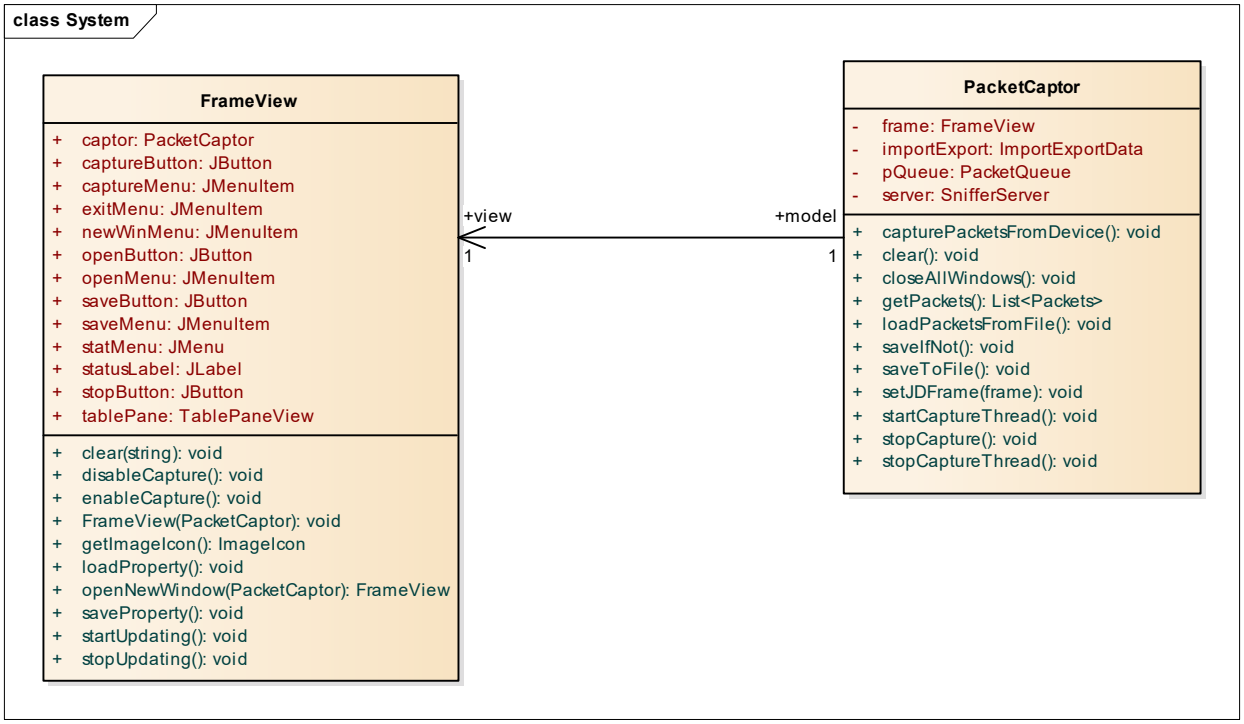
1. Model View Controller
2. Observer Pattern
3. Strategy Pattern

A. Model-View-Controller



- The PacketCaptor class, FrameView class and FrameController class form a model-view-controller architecture.
- The PacketCaptor class is the model which contains the basic data obtained from the calling of function and has all the necessary functions that are required to be called according to a user's requirements.
- The FrameView class serves as the View component that helps to render the window or frame of the window of the graphical user interface that the user will interact with (interaction such as inputting text, selecting options, etc.)
- The FrameController class serves as the controller component of the MVC, that helps to bind the data flow between the view and the model and to help keep the implementation of the 2 classes independent of each other.
- The FrameController class relays a user action or input in the view to the model and the model calls a function on that action. The result is replicated in the view and any modifications made to the view are replicated in the model, through the controller class.

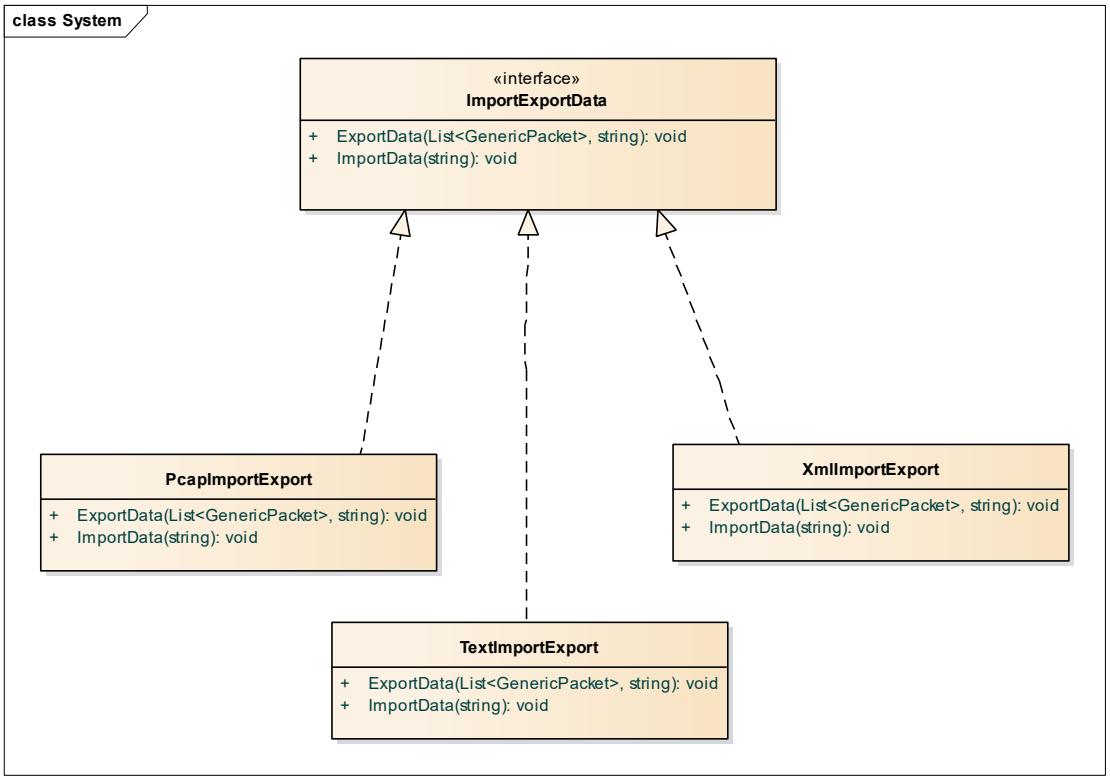
B. Observer Pattern



- The Observer pattern is basically a pattern that signifies one class observing the behavior of another and reacting to some stimuli that the observed class has to offer.
- The PacketCaptor class observes the FrameView class for any action that the user performs (interaction) with the view and takes corresponding action.

- The FrameView class observes the value of the variable or return value of a function in the PacketCaptor class corresponding to the user action and takes on a value according to what the PacketCaptor has for that entity.
- Basically, both classes monitor each other and keep their connected data in sync (not through direct connection but with the help of a connector)

C. Strategy Pattern



- The ImportExportData class helps to save information of the packets in the session to a log in the following 3 formats: Pcap, txt or XML.
- The strategy pattern comes into play when loading a log of packet information having any of the 3 given extension choices into the the program. The strategy pattern helps the function to resolve the extension properly and load the data in human-readable form.

5. What have you learned about the process of analysis and design now that you have stepped through the process to create, design and implement a system?

1. Analysis of a system in terms of its requirements and proposed design is extremely crucial at the beginning of any of any software design process as it helps us draft a rough sketch of what the system could look like and what features are important for the essential requirements of the system to function properly.

2. The nature and requirements of the system will change as the development progresses and so sufficient provision to accommodate this change dynamically should be programmed into the system's architecture.
3. It is important for all the team members to understand what each one is doing so as to work on his/her own part of the system keeping in mind the overall structure of how the system is being built, i.e., compatibility between modules
4. Implementation of a system is not a trivial task and implementing all of the use cases and requirements by a given deadline is an extremely difficult task keeping in mind the dynamic nature of the requirements and the process of development.
5. The architecture of the system reflects the designers' mindset and approach to the given system. Making use of Object-Oriented concepts in the design shows that the developers are interested in making a system keeping in mind the pitfalls of development but at the same time keeping it open for expansion or modification at later stages during the development.