**ABSTRACT**

In computer science, client-server is a software architecture model consisting of two parts, client systems and server systems, both communicating over a computer network or on the same computer. The client-server model is a distributed application structure that partitions tasks or workloads between the providers of a resource or service, called servers, and service requesters, called clients. Often clients and servers communicate over a computer network on separate hardware, but both client and server may reside in the same system. The client process always initiates a connection to the server, while the server process always waits for requests from any client. A server host runs one or more server programs which share their resources with clients. A client does not share any of its resources, but requests a server's content or service function. Clients therefore initiate communication sessions with servers which await incoming requests. The client and server communicate with each other through a well-known application protocol.

**Project to Program Outcomes (PO) Mapping**

**Project Name:** Client Server Simulation Using OpenGL

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| ✓ | ✓ | ✓ | ✓ | ✓ |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |

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| --- | --- |
| **Program outcomes (POs):** | |
| **PO1** | **Engineering knowledge:** Apply the knowledge of Mathematics, Science, Engineering fundamentals and an engineering specialization to the solution of complex engineering problems |
| **PO2** | **Problem analysis:** Identify, formulate, review research literature, and analyse complex Engineering problems reaching substantiated conclusions using first principles of mathematics, Natural sciences and engineering sciences |
| **PO3** | **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. |
| **PO4** | **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the Information to provide valid conclusions |
| **PO5** | **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations. |
| **PO6** | **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. |
| **PO7** | **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for Sustainable development |
| **PO8** | **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| **PO9** | **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings |
| **PO10** | **Communication:** Communicate effectively on complex engineering activities with the engineering Community and with society at large, such as, being able to comprehend and write effective reports And design documentation, make effective presentations, and give and receive clear instructions. |
| **PO11** | **Project management and finance:** Demonstrate knowledge and understanding of the Engineering and management principles and apply these to one’s own work, as a member and Leader in a team, to manage projects and in multidisciplinary environments. |
| **PO12** | **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |

**Project to Program Specific Outcomes (PSO) Mapping**

**Project Name:** Client Server Simulation Using OpenGL

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| --- | --- |
| **PSO1** | **PSO2** |
| ✓ | ✓ |

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| **Program Specific Outcomes (PSOs):** | |
| **PSO1** | Analyze the problem and identify computing requirements appropriate to its solution. |
| **PSO2** | Apply design and development principles in the construction of software systems of varying complexity. |

**CHAPTER 1**

* 1. **BRIEF INTRODUCTION :**

In today’s era of the internet majority of the communications happens through the client-server architecture model. All online transactions such as browsing the web, shopping on e-commerce portals, online banking transactions, etc are made possible through communication between the client i.e. the user of a service and the server. This process of communication is not as simple as explained above.

Clients and servers exchange messages in a request–response messaging pattern. The client initiates a request to the server and the server returns a response. This exchange of messages is an example of inter-process communication. To start the actual communication between the client and server, first a connection has to be established between the client and server through an interface called socket. Once the connection is set up, the client and server exchange messages through this socket.  To communicate, the computers must have a common language, and they must follow rules so that both the client and the server know what to expect. The language and rules of communication are defined in a communications protocol.

The exchange of messages between the client and server is in the form of data packets . Bytes are grouped together to form a data packet. Apart from the actual message the data packets also contain additional information such as source and destination address, protocol and its version, error control information, etc.

**1.2 MOTIVATION :**

Simulation of any process helps in better understanding of it. This project will demonstrate the internal working of a client-server architecture model. It would help in visualizing how connection between a client and server is established. This system can be used for educational purposes to teach and explain the working of client and server and network programming.

* 1. **SCOPE :**

Simulation of any process helps in better understanding of it. This project will demonstrate the internal working of a client-server architecture model. It would help in visualizing how connection between a client and server is established.

The existing system of displaying a simulated system of client server simulations has always been flawed because of its inability to display a simulated GUI. It has always been unable to convey a convincing display about the packet transfer and the receiving party and also to know where the packets and data is being sent to the server.

Our system covers the existing in the way that only the necessary and essential transfers are noted and also the actual details of the packets being sent are noted. The details about what is in the packets is not noted down and only the simulations of the working packets is clearly shown. This will help a person understand what is happening in a network without understanding the technical details in the network. This system can be used for educational purposes to teach and explain the working of client and server and network programming.

* 1. **STATEMENT OF PROBLEM:**

The aim of the simulation is to provide a graphical interface to a user to show how exactly client server simulation in a network happens. This should allow the user to understand how exactly communication happens between client server in a network. So the user should be able see how the commands are sent from client to server and how the responses happen. The user should understand how the packets in a network travel from the client to the server. The various functions such as retrieve, store and list should also be visualised in real time.

* 1. **LIMITATION OF PROBLEM:**

The existing system of displaying a simulated system of client server simulations has always been flawed because of its inability to display a simulated GUI. It has always been unable to convey a convincing display about the packet transfer and the receiving party and also to know where the packets and data is being sent to the server.

The insight into the data transfer has been missed out thus defeating the purpose of the protocol analyzer tools such as wireshark. A layman or a common person does not have the necessary knowledge to understand where all his packets are being transferred to and where exactly there is an issue.

Tools like ns2 cannot provide a very detailed and accurate analysis of the necessary data packets sent and received. The varied details and actions taking place in a simulated system are very limited.