Collaborative White Board Synchronization in Networks

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Abstract: *The rapid growth of remote learning, distributed teams, and online collaboration has created a strong demand for interactive tools that allow multiple users to work together in real time. Traditional collaborative whiteboard platforms are primarily web-based and often on complex backend infrastructure, which can introduce latency, require constant connectivity and provide limited control over the underlying communication processes. These limitations highlight the need for a lightweight, secure, and efficient system that supports seamless cooperation over computer networks. The proposed project, Collaborative Whiteboard Synchronization Using Computer Networks, addresses this need by designing and implementing a real-time, secure, synchronized whiteboard application using socket programming enhanced with SSL/TLS encryption. The system is based on a client– server architecture where the server acts as a central communication hub, responsible for managing multiple client connections and broadcasting drawing updates to all participants. Communication between clients and server takes place over TCP sockets wrapped with SSL/TLS certificates to ensure confidentiality, integrity and authenticated data exchange. This secure channel prevents unauthorized access, guarantees data protection and makes the system suitable for academic, professional and organizational environments where sensitive information may be shared. Each client application features a Tkinterbased graphical user interface that provides an intuitive whiteboard where users can draw, annotate, and interact using different colours and brush thicknesses. When a user draws on the white board, the system captures the corresponding mouse events and converts them into drawing commands comprising coordinates, colour information and stroke style. These commands are transmitted to the server, which instantly distributes them to all other clients connected to the session. This broadcast mechanism ensures that every participant views a consistent and synchronized canvas, regardless of the number of users or the order in which drawing actions occur. The design also supports collaborative editing features such as UNDO, REDO, and CLEAR, allowing users to modifier reset the canvas collectively. These commands are shared with the same level of synchronizations normal drawing actions, ensuring uniformity across all whiteboard instances..*

Keywords*: SSL/TLS encryption*