**PiyuTalk: A Web-Based LSPU Interactive Chat System for Communication Using WebSockets**

**Proponents:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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****INTRODUCTION****

**Effective communication is important in academic institutions, and Laguna State Polytechnic University (LSPU) is no exception. The idea for PiyuTalk was suggested by Sir Dan Azriel N. San Agustin, Chairperson of the Research and Development Office (ITSO), who experienced an overwhelming number of student messages on his personal Messenger account. This made it difficult to manage and respond to important inquiries, highlighting the need for a dedicated university chat system. Studies show that message overload is a common issue in academic settings, with 68% of university faculty struggling to manage fragmented communications across multiple platforms, leading to inefficiencies (TandfOnline, 2024). Additionally, a study at Pag-asa National High School found that excessive use of social messaging platforms was linked to a 15% decline in academic performance (Academia.edu, 2019). These findings support the need for an organized, institution-specific communication solution like PiyuTalk.**

**Current communication methods at LSPU, primarily relying on personal messaging apps and email, prove inadequate for academic needs. Research on educational communication systems reveals that structured, role-based chat platforms can reduce irrelevant messages by 40% and improve information retrieval efficiency by 60% (Academia.edu, 2020). The XMPP protocol study demonstrates how dedicated communication systems facilitate better message organization through features like group channels and priority tagging (Academia.edu, 2020). PiyuTalk addresses these needs by implementing four distinct communication channels: university-wide announcements, department-specific discussions, year-level groups, and private messaging—a structure proven effective in educational settings (DigitalLearningEdge, n.d.).**

**For real-time functionality, PiyuTalk employs WebSocket technology, which offers significant advantages over traditional HTTP communication. Studies show WebSockets maintain persistent connections that reduce latency to under 100ms, compared to HTTP's typical 500-1000ms delay (ResearchGate, 2015). Recent implementations in academic environments demonstrate WebSocket's ability to support over 5,000 concurrent users with minimal resource consumption (UBT Kosovo Conference, n.d.). This technology is particularly valuable for LSPU's needs, enabling instant notifications and seamless collaboration while being compatible with the Philippines' varied internet infrastructure.**

**Security remains a paramount concern for academic communication systems. Analysis of educational technologies reveals that nearly 30% of school communication platforms have vulnerabilities that could expose sensitive data (Polakis et al., 2022). The Cavite State University study on encrypted chat systems demonstrates that end-to-end encryption effectively protects message content while maintaining system performance (Studocu, n.d.). PiyuTalk incorporates these security measures while complying with the Philippines' Data Privacy Act of 2012, ensuring protection for all university communications.**

**This study aims to develop PiyuTalk as a comprehensive solution to LSPU's communication challenges. By combining role-based organization, WebSocket technology, and robust security measures, the system addresses the key issues of message overload, disorganization, and privacy concerns prevalent in Philippine higher education. The project not only serves LSPU's immediate needs but also establishes a model for other academic institutions transitioning to digital communication platforms. Through careful implementation and continuous evaluation, PiyuTalk has the potential to significantly improve communication efficiency and academic collaboration at LSPU.**

****General Objectives****

**This study aims to develop a web-based platform entitled “PiyuTalk: An LSPU Interactive Chat System for Structured University Communication Using WebSockets”.**

****Specific Objectives****

**1.To develop a secure, real-time chat system for Laguna State Polytechnic University (LSPU) with the following features:**

**1.1 Global Chat for university-wide announcements and discussions.**

**1.2 Departmental Chat for faculty and students within specific academic departments.**

**1.3 Year-Level Chat to facilitate communication among students of the same academic year.**

**1.4 Private Messaging for one-on-one conversations between users.**

1. **To implement role-based access control (RBAC) to ensure only authorized users can participate in designated chats.**
2. **To integrate WebSocket technology for low-latency, high-concurrency messaging, ensuring smooth performance even with LSPU’s internet infrastructure.**
3. **To enforce security measures, including end-to-end encryption for private messages.**
4. **To test and evaluate the system’s usability, performance, and effectiveness in reducing reliance on personal messaging apps (e.g., Messenger) through user feedback and technical benchmarks.**

****Scope and Limitation of the Study** This study focuses on developing PiyuTalk, a real-time chat system designed to improve communication at Laguna State Polytechnic University (LSPU). The web-based platform will feature organized chat channels including university-wide announcements, department-specific discussions, year-level groups, and private messaging. Using WebSocket technology, the system ensures instant message delivery while maintaining security through end-to-end encryption for private conversations. The project includes testing with actual users to evaluate the platform's effectiveness in streamlining campus communications.**

**The research has several defined boundaries. The system is exclusively for current LSPU students, faculty, and staff, with no provisions for external users. While optimized for web browsers on both computers and mobile devices, it won't include standalone mobile applications in this initial version. Group chats will use standard encryption rather than end-to-end protection due to technical constraints. The study acknowledges potential performance variations based on local internet conditions and doesn't include integration with other university systems at this stage.**

****Literature Review****

****Communication****

**Modern academic institutions face significant challenges with communication overload, particularly through the misuse of personal messaging platforms. A study by TandfOnline (2024) revealed that 68% of university faculty struggle with fragmented communications across multiple apps, leading to inefficiencies in responding to critical academic inquiries. This aligns with findings from Pag-asa National High School, where excessive use of social messaging platforms correlated with a 15% decline in student academic performance due to constant distractions (Academia.edu, 2019). The proliferation of informal channels like Messenger has created an urgent need for centralized systems that can filter and prioritize institutional communications.**

**The Philippine educational context presents unique challenges where students and faculty often default to personal social media for official communications. Research indicates that this practice not only blurs professional boundaries but also exposes sensitive academic data to security risks (TandfOnline, 2024). At LSPU, the problem is exemplified by faculty members like Sir Dan Azriel N. San Agustin, who receive hundreds of student messages daily on personal accounts, making it difficult to manage urgent requests. These findings underscore the necessity for dedicated university chat systems like PiyuTalk that can reduce noise while maintaining accessibility (Academia.edu, 2019).**

****Role-Based Chat Systems in Education****

**Structured communication systems have proven effective in reducing irrelevant messages by 40% in educational settings through role-based segmentation (Academia.edu, 2020). Studies on XMPP protocol implementations demonstrate how features like departmental channels and priority tagging can improve information retrieval efficiency by 60% compared to unstructured platforms. DigitalLearningEdge (n.d.) further emphasizes that tiered chat systems (university/department/year-level) mirror academic hierarchies, enabling more focused discussions among relevant stakeholders.**

**The success of role-based access control in educational chat systems lies in its ability to maintain organizational boundaries while facilitating collaboration. For instance, research shows that separating communications by year-level prevents information overload for students, allowing them to focus on cohort-specific announcements (Academia.edu, 2020). PiyuTalk adopts this model through its four-channel structure (global, departmental, year-level, private), which DigitalLearningEdge (n.d.) identifies as a best practice for academic institutions. This approach ensures that messages reach only intended recipients, reducing the cognitive load on users.**

****WebSocket Technology for Real-Time Chats****

**Traditional HTTP protocols introduce significant latency (500-1000ms), creating bottlenecks in academic collaboration (ResearchGate, 2015). WebSocket technology addresses this by maintaining persistent connections that reduce latency to under 100ms, enabling truly real-time interactions. A case study from UBT Kosovo Conference (n.d.) demonstrated WebSocket's ability to support over 5,000 concurrent users with minimal server load, making it ideal for university-scale deployments.**

**The advantages of WebSockets are particularly relevant in the Philippine context, where inconsistent internet infrastructure demands lightweight solutions. ResearchGate (2015) highlights how WebSocket's efficient bandwidth usage ensures stable performance even on low-speed connections. For LSPU, this technology enables features like instant notifications and seamless file sharing without the delays characteristic of polling-based HTTP systems. The UBT Kosovo study (n.d.) further confirms that WebSocket implementations in academic environments have significantly improved response times for time-sensitive communications like exam announcements.**

****Security & Privacy for Academic Chats****

**Academic communication platforms are frequent targets for data breaches, with 30% exhibiting vulnerabilities that expose sensitive information (Polakis et al., 2022). A Cavite State University study on encrypted chat systems found that end-to-end encryption effectively protects message content without compromising system performance (Studocu, n.d.). These security measures are critical for maintaining trust in institutional communication tools, particularly when handling grades or personal student data.**

**The implementation of E2EE in PiyuTalk's private messaging aligns with global best practices for educational technologies. Polakis et al. (2022) emphasize that encryption must extend beyond transport-layer security (TLS) to protect against insider threats and server compromises. However, as noted in the Cavite State study, there are technical trade-offs; while E2EE secures private chats, group channels require alternative encryption methods to maintain usability (Studocu, n.d.). These findings informed PiyuTalk's security design, which prioritizes E2EE for one-on-one conversations while using TLS for group spaces.**