

# IntraPing: A Secure, Anonymous, and Private Communication Framework for Authenticated University Environments

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**Abstract**—The digital transformation of university campuses has created a growing tension between institutional accountability and student privacy. IntraPing is a MERN-stack platform designed to provide verified anonymity within authenticated university environments. The system enables students to communicate freely while maintaining institutional trust and technical security. It introduces Enrollment ID- based verification, OTP-enabled authentication, state-aware JWT enforcement, and server-side identity stripping to ensure that users remain anonymous at the database level. The architecture separates user credentials from post content to eliminate traceable metadata linkage. IntraPing demonstrates that institutional verification and user anonymity can coexist in a secure academic communication ecosystem.

**Index Terms**—Anonymity, Authentication, JSON Web Token (JWT), MERN Stack, Privacy-Preserving Systems.

## I. INTRODUCTION

As universities adopt integrated digital platforms, the need for secure and privacy-preserving communication tools has increased significantly. Most institutional platforms link communication to verified identities, discouraging students from discussing sensitive topics openly. IntraPing addresses this identity paradox by combining institutional verification with backend anonymity.

## II. PROBLEM STATEMENT

Current academic communication systems face a Privacy–Authenticity Paradox. Identity-linked systems create a chilling effect on student discourse, while fully anonymous platforms often lack accountability.

IntraPing mitigates these concerns through structured, verifiable anonymity.

## III. PROPOSED SOLUTION

IntraPing introduces Enrollment-Based Gatekeeping, OTP- Based Verification, and State-Aware JWT Security. A middleware mechanism performs Server-Side Identity Stripping before storing posts, ensuring no direct linkage between identity and content.

In addition, the framework incorporates role-based moderation controls, rate limiting, encrypted session handling, and structured audit monitoring to maintain institutional integrity while preserving anonymity.

## IV. TECHNICAL IMPLEMENTATION

### MERN Stack Architecture

The system utilizes MongoDB, Express.js, React, and Node.js to ensure scalability and performance. Authentication logs are isolated from message storage to maintain strict privacy boundaries.

### Authentication Workflow

1. Enrollment ID and temporary password entry.
2. OTP verification via registered university email.
3. JWT generation with a “mustChangePassword” flag.
4. Mandatory password update before full platform access.

## V. CONCLUSION

IntraPing demonstrates that institutional security and individual privacy can coexist effectively. The framework provides a scalable and privacy-preserving

communication ecosystem suitable for authenticated academic environments.

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