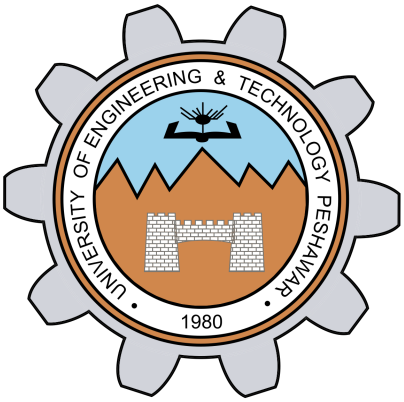
FYP PROPOSAL

Design and Analysis of An OMNeT++ based Simulation Framework for Optical Burst Switching



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"On my honor, as a student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work."

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Submission Date: September 20, 2025

Department of Computer Systems Engineering

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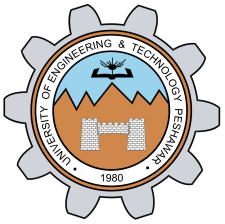

UNIVERSITY OF ENGINEERING AND TECHNOLOGY, PESHAWAR, PAKISTAN

B.Sc PROJECT PROPOSAL

Proposal Title	Design and Analysis of An OMNeT++-based Simulation Framework for Optical Burst Switching
Department	Computer Systems Engineering

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Mapping of the Project with Computer Systems Engineering Subjects

S.No	Course Code	Course Name	Possible linkage with the project (Justify)
1	CSE-102	Computer Programming	Computer programming enables OBS simulation in OMNeT++.
2	CSE-209	Probability Methods in Engineering	Probability methods will help to do statistical analysis.
3	CSE-302	Systems Programming	Systems programming is required to design and manage processes essential for OBS simulation.
4	CSE-303	Data Communication and Networks	Data Communication and Networks explains burst transmission across optical links in OBS.
6	CSE-309	Communication Systems	Provide the foundation for understanding signal transmission in OBS networks."

Contents

1 ABSTRACT:

Optical Burst Switching (OBS) has emerged as a promising paradigm for future high-speed IP networks, offering efficient utilization of optical bandwidth without requiring optical electronic conversions at intermediate nodes. Previous simulation study relied on older OMNeT++ versions (4.x),[1], which is no more available and not working on current operating system.

2 INTRODUCTION:

Optical Burst Switching (OBS) has been proposed as a future high speed switching technology for Internet Protocol (IP) networks that may be able to efficiently utilize extremely high capacity links without the need for data buffering or optical electronic conversions at intermediate nodes . Packets arriving at an OBS ingress node that are destined for the same egress OBS node are aggregated and sent in discrete bursts. At intermediate nodes, the data within the optical signal is not processed but instead, the whole burst is transparently switched according to directives contained within a control packet preceding the burst. At the egress node, the burst is subsequently de aggregated and forwarded electronically.
Optical Circuit Switching [2],[3] (OCS) establishes end-to-end lightpaths for the entire communication session, which guarantees reliability but wastes bandwidth when the circuit remains underutilized.Optical Packet Switching (OPS) [2],[3] on the other hand, transmits data at the packet level, offering fine-grained bandwidth utilization and scalability. However, the lack of buffering at optical nodes and high hardware cost make OPS less practical for large-scale deployment.

3 PROBLEM STATEMENT:

Previous study developed simulator using older versions of OMNeT++ (4.x),[1] which are now obsolete and incompatible with current operating systems. In contrast, our work employs the latest stable release, OMNeT++ 6.2.

4 METHODOLOGY:

4.1 LITERATURE REVIEW:

The project will begin with a detailed review of existing Optical Burst Switching (OBS) techniques and burst assembly algorithms (timer-based, threshold-based, and hybrid). This step will help identify performance gaps and select suitable strategies for implementation.

4.2 NETWORK ARCHITECTURE DESIGN:

Next, the OBS network architecture will be designed in OMNeT++ 6.2.
This design will ensure alignment with modern optical network models.

4.3 MODULE DEVELOPMENT:

We will develop simulation modules for key OBS processes:
Burst Transmission across optical links.

4.4 INTEGRATION IN OMNET++ (6.2):

All modules will be integrated into OMNeT++ 6.2.

4.5 ANALYSIS AND VALIDATION

Finally, the results will be analyzed and compared with previous simulations.

References

[1] A. L. Barradas, M. C. R. Medeiros, An omnet++ model for the evaluation of obs routing strategies, in: Proceedings of the 1st International Conference on Simulation Tools and Techniques for Communications, Networks and Systems {(OMNeT++ 2008)}, ACM, Marseille, France, 2008, pp. 1–8.

[2] S. Singh, S. Singh, B. Kaur, A. Singh, Contention avoidance scheme using machine learning inspired deflection routing approach in optical burst switched network, International Journal of Communication Systems 38 (1) (2025) e5352. doi:10.1002/dac.5352.
URL https://doi.org/10.1002/dac.5352

[3] R. Poorzare, S. Abedidarabad, A brief review on the methods that improve optical burst switching network performance, Journal of Optical Communications 40 (4) (2019) 507–514. doi:10.1515/joc-2019-0092.
URL https://doi.org/10.1515/joc-2019-0092