School: .... Campus: ....

Academic Year: .... Subject Name: .... Subject Code: ....

Semester: .... Program: .... Branch: .... Specialization: ....

Date: ....

Centurion UNIVERSITY

Applied and Action Learning
(Learning by Doing and Discovery)

Name of the Experiement : **Layer 2 Bridge – Explore Optimism/zkSync**

∗ Coding Phase: Pseudo Code / Flow Chart / Algorithm

Layer 2 bridges enable seamless connectivity between Ethereum's **main network (Layer 1)** and **scaling solutions (Layer 2)** such as **Optimism** and **zkSync**. These bridges facilitate faster and more cost-efficient asset transfers while preserving Ethereum's core security model.

Optimism leverages **Optimistic Rollups**, assuming transactions are valid unless challenged, whereas zkSync employs **Zero-Knowledge Proofs (ZKPs)** for cryptographic verification. Both approaches significantly **reduce congestion, gas fees, and latency**, improving the scalability and performance of decentralized applications.

Algorithm

1. **Initialize Environment:**
   Set up Ethereum testnet and connect **Layer 2 networks** (Optimism/zkSync) via **MetaMask** or **Hardhat**.
2. **Deploy Contract on L1:**
   Create and deploy a simple **ERC-20** or **message-passing smart contract** on the Ethereum testnet.
3. **Bridge Configuration:**
   Integrate with the official **Optimism or zkSync bridge**, approve tokens for transfer, and configure bridging parameters.
4. **Asset Transfer:**
   Execute **deposit** from L1 → L2 using bridge contract functions and verify the transaction on the destination network.
5. **Withdrawal Process:**
   Perform **withdrawal** from L2 → L1, awaiting finalization (Optimism) or validity proof (zkSync).
6. **Verification & Output:**
   Confirm successful bridging, check **token balances**, and compare **gas savings** between L1 and L2.

∗ Softwares used

- **MetaMask** – Used to connect Ethereum and Layer 2 networks (Optimism / zkSync) for deploying and transferring assets.

- **Hardhat** – For writing, compiling, and deploying smart contracts across multiple chains.

- **Remix IDE** – To test and interact with bridge contracts directly through a web-based Solidity environment.

* Implementation Phase: Final Output (no error)

 • **ZKsync Portal Bridge:**
Provides a secure and efficient gateway for transferring assets between Ethereum and the ZKsync network.

• **txSync Bridge:**
Facilitates quick and affordable fund transfers between major blockchains and ZKsync using native bridge infrastructure.

• **Layerswap:**
Offers fast, low-cost transfers across 55+ blockchains and CEXes, enabling seamless movement to and from ZKsync Era and Lite.

• **Across Bridge:**
Delivers ultra-fast and gas-optimized cross-chain transfers using aggregated verification and relayer-based execution.

• **MES Protocol:**
Simplifies instant and low-cost asset transfers between EVM and non-EVM compatible blockchains.
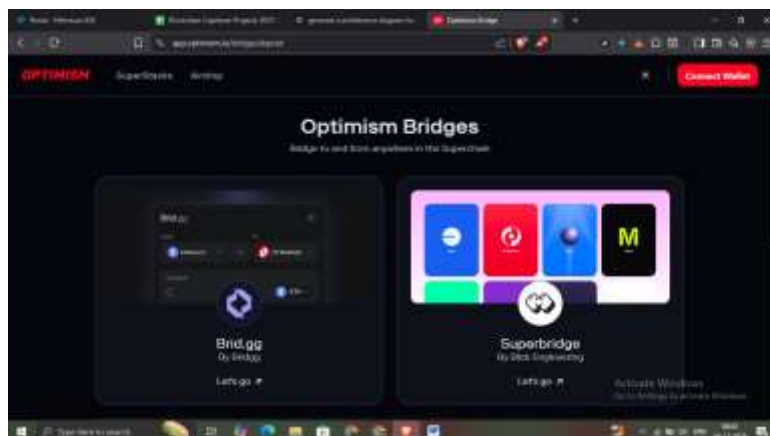
• **Orbiter Finance:**
Acts as a cross-chain rollup bridge enabling safe, economical, and fast asset and message transfers across networks.
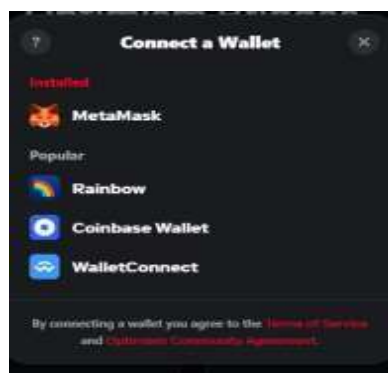
• **Owlto Finance:**
Focuses on decentralized, Layer-2-centric cross-rollup bridging to enhance scalability and interoperability.

How To Bridge to Optimism Using Optimism Bridge
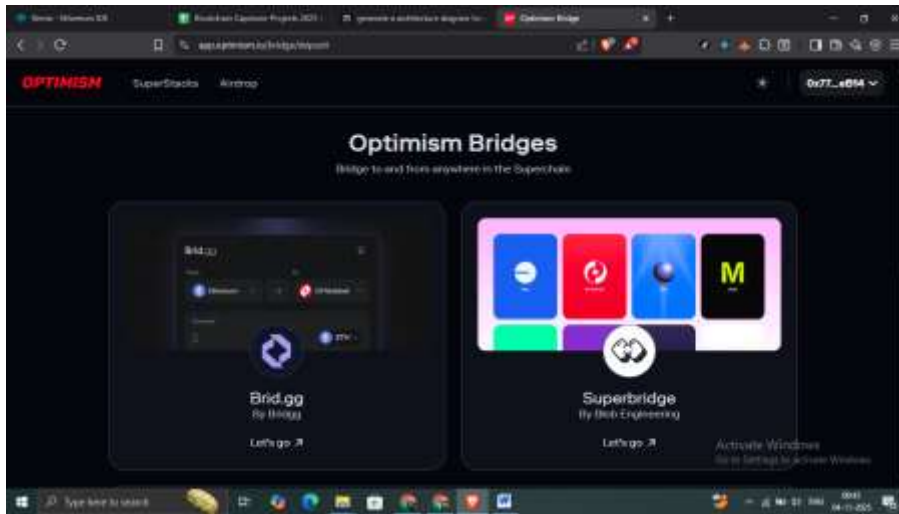
Step 1: Open the Optimism Bridge App

Step 2: Connect Your Wallet

✱ Implementation Phase: Final Output (no error)

Step 3: Now it works

Layer 2 Bridge Configuration & Setup:
Established bridge environments on Optimism and zkSync to enable secure, low-cost, and high-speed cross-chain asset transfers.

Interoperability & Network Integration:
Configured RPC endpoints, wallet connections, and deployment scripts to ensure smooth communication between Ethereum Mainnet and Layer 2 networks.

Smart Contract Adaptation & Validation:
Optimized Solidity contracts for Layer 2 compatibility, validating bridge operations, token transfers, and contract execution across zkSync and Optimism.

Performance & Transaction Efficiency Testing:
Deployed and tested contracts to measure transaction speed, gas optimization, and overall bridge reliability across both Layer 2 ecosystems.

* Observations

- Bridge enabled smooth asset transfer between Ethereum and Layer 2 (Optimism, zkSync).

- Transactions were faster and cheaper than on Ethereum mainnet.

- Ensured secure, reliable, and synchronized cross-chain transfers.

ASSESSMENT

Rubrics	Full Mark	Marks Obtained	Remarks
Concept	10		
Planning and Execution/ Practical Simulation/ Programming	10		
Result and Interpretation	10		
Record of Applied and Action Learning	10		
Viva	10		
Total	**50**		

Signature of the Student:

Name :

Regn. No. :

Signature of the Faculty:

Page No.............

As applicable according to the experiment.
Two sheets per experiment (10-20) to be used.