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

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

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

Date: .....

Applied and Action Learning

(Learning by Doing and Discovery)

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

Objective/Aim:

Explore Layer-2 networks by bridging testnet ETH from Ethereum Sepolia to Optimism and zkSync.
Perform basic bridge transactions and record observations.

Apparatus/Software Used

1. MetaMask Wallet
2. Brave Web Browser
3. Optimism Bridge – https://app.optimism.io/bridge
4. zkSync Bridge – https://portal.zksync.io/
5. Ethereum Sepolia Testnet

Theory/Concept:

Layer-2 Networks (L2):

Layer-2 solutions such as Optimism (Optimistic Rollups) and zkSync (Zero-Knowledge Rollups) scale Ethereum by moving transactions off-chain while still inheriting Ethereum's security.

Bridging:

A bridge locks tokens on the Layer-1 network (Ethereum) and releases/mints the equivalent amount on the Layer-2 chain.
Users typically bridge test ETH when interacting with L2 testnets.

Optimism (Optimistic Rollup):

Bundles many transactions and submits them to Ethereum with a fraud-proof window.

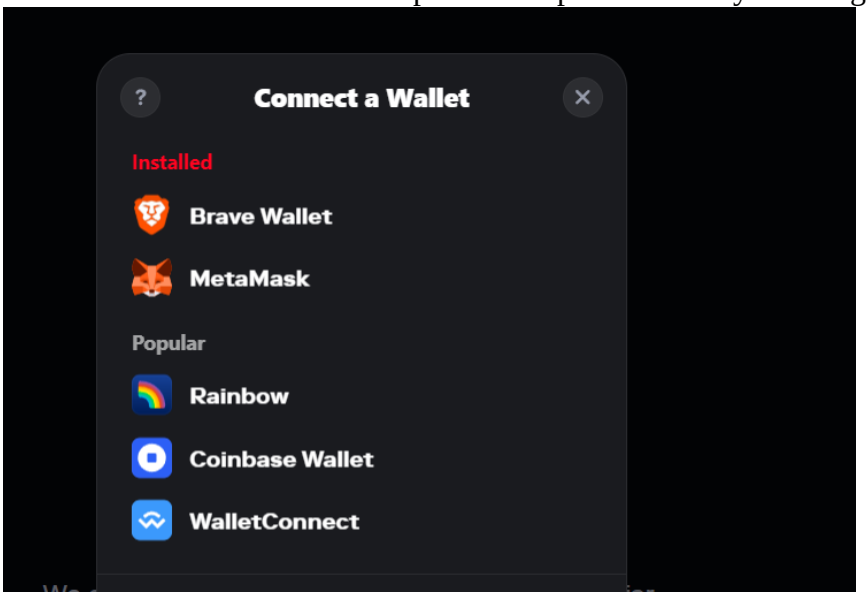
zkSync (ZK-Rollup):

Uses validity proofs (zero-knowledge proofs) to instantly confirm correctness of off-chain transactions.

Procedure:

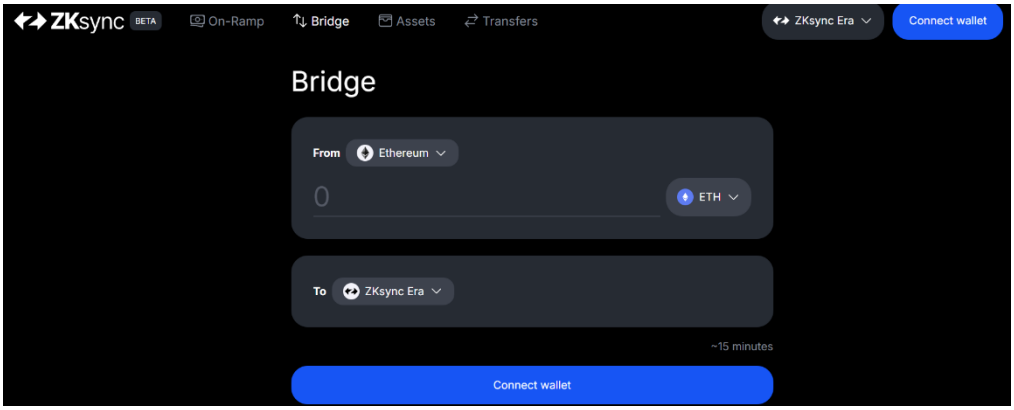
A. Bridging to Optimism (Layer-2)

1. Open MetaMask and switch to the Sepolia testnet.
2. Visit the Optimism bridge: app.optimism.io/bridge.
3. Click Connect Wallet and connect using MetaMask.
4. Confirm the bridge is set from Ethereum (Sepolia) → Optimism (Sepolia).
5. Enter an amount of test ETH to bridge (e.g., 0.01).
6. Click Deposit.
7. Review the transaction details in MetaMask (gas fee, bridge amount).
8. Confirm the transaction.
9. Wait for confirmation — bridging typically takes a few minutes.
10. Switch MetaMask network to Optimism Sepolia to view your bridged ETH.



B. Bridging to zkSync (Layer-2)

1. Open MetaMask and remain on Ethereum Sepolia.
2. Visit the zkSync portal: portal.zksync.io.
3. Click Connect Wallet and connect through MetaMask.
4. Navigate to the Bridge section.
5. Ensure the direction is Ethereum (Sepolia) → zkSync Sepolia.
6. Enter the amount of test ETH to bridge.
7. Click Deposit to zkSync.
8. Confirm the transaction in MetaMask.
9. View the bridging progress — zkSync deposits typically complete quicker due to ZK-proof finality.
10. Switch MetaMask network to zkSync Sepolia to verify the received ETH



Observation

1. MetaMask successfully connects to both Optimism and zkSync testnets without issues.
2. Test ETH bridging works smoothly using official L2 bridges.
3. zkSync bridging typically finalizes faster because ZK-Rollups provide validity proofs immediately.
4. Bridging requires Sepolia test ETH to pay gas fees on Layer-1.
5. After completion, bridged ETH becomes visible when MetaMask is switched to the corresponding L2 testnet.

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 Faculty:

Signature of the Student:

Name :