stETH on Optimism parameters for Mainnet

Deployment scope

The full list of the contracts in scope is provided in the Lido Multichain section for [Optimism](#) .

note Levers and access control lists for L1 and L2 bridge endpoints stay the same and correspond to the [reference architecture and permissions setup](#) .

This document covers incremental changes proposed with the stETH on Optimism deployment.

Ethereum part

LidoLocator

info A new implementation containing the address of a newTokenRateNotifier instance for [postTokenRebaseReceiver](#)

TokenRateNotifier

info A standalone (non-proxy) contract proposed to plug to the protocol as a new [token rebase receiver](#) .

The contract maintains token rate observers that needs to be notified about token rate changes.

With the current setup the only single observer is connected upfront: theOpStackTokenRatePusher contract instance for pushing the token rate to Optimism.

Account that is allowed to add or remove pushers.

set to the be the Lido DAO Agent governance contract

owner=0x3e40D73EB977Dc6a537aF587D48316feE66E9C8c

Address of Lido Core protocol contract

corresponds to the stETH token address on Mainnet

LIDO=0xae7ab96520DE3A18E5e111B5EaAb095312D7fE84

Max amount of token rate observers that can be added inside this pusher

MAX_OBSERVERS_COUNT=32

Current length of observers

observersLength=1

The initially added OpStackTokenRatePusher observer for Optimism

see https://docs.lido.fi/deployed-contracts/#optimism

observers[0]=0xd54c1c6413caac3477AC14b2a80D5398E3c32FfE

OpStackTokenRatePusher

info A standalone (non-proxy) contract to be a receiver for theTokenRateNotifier contract above, and allowing to push an up-to-date wstETH/stETH [token rate](#) as a part of theAccountingOracle report [processing](#) .

The rate gets pushed to anTokenRateOracle instance on Optimism.

Address of the non-rebasable token (wstETH) on L1 to deploy the bridge/gateway for.

WSTETH=0x7f39C581F595B53c5cb19bD0b3f8dA6c935E2Ca0

Precision for sending stETH / wstETH token rate

i.e.: wsteth.getStETHByWstETH(10 ** TOKEN_RATE_DECIMALS)

TOKEN_RATE_DECIMALS=27

The address of the TokenRateOracle contract on Optimism

L2_TOKEN_RATE_ORACLE=0x294ED1f214F4e0ecAE31C3Eae4F04EBB3b36C9d0

Beacon Chain (Consensus Layer) genesis timestamp

GENESIS_TIME=1606824023

Seconds per a single slot according to the Ethereum CL spec

SECONDS_PER_SLOT=12

Address of the AccountingOracle of the Lido protocol.

ACCOUNTING_ORACLE=0x852deD011285fe67063a08005c71a85690503Cee

@notice Gas limit for L2 required to finish pushing token rate on L2 side.

Client pays for gas on L2 by burning it on L1.

Depends linearly on deposit data length and gas used for finalizing deposit on L2.

Formula to find value:

(gas cost of L2Bridge.finalizeDeposit() + OptimismPortal.minimumGasLimit(depositData.length)) * 1.5

L2_GAS_LIMIT_FOR_PUSHING_TOKEN_RATE=300000

L1LidoTokensBridge

info A new implementation for the previously deployedL1ERC20TokenBridge L1 endpoint proxy contract to be compatible with both wstETH and stETH tokens bridging flows, escrows wstETH on the Ethereum side.

Address of the L2 token bridge counterpart proxy endpoint for stETH and wstETH.

l2TokenBridge=0x8E01013243a96601a86eb3153F0d9Fa4fbFb6957

Address of the non-rebasable token (L1 wstETH) to deploy the bridge/gateway for.

L1_TOKEN_NON_REBASABLE=0x7f39C581F595B53c5cb19bD0b3f8dA6c935E2Ca0

Address of L1 wstETH (the same as L1_NON_REBASABLE_TOKEN)

WSTETH=0x7f39C581F595B53c5cb19bD0b3f8dA6c935E2Ca0

Address of the rebasable token (L1 stETH) to deploy the bridge/gateway for.

L1_TOKEN_REBASABLE=0xae7ab96520DE3A18E5e111B5EaAb095312D7fE84

Address of the L2 non-rebasable token (L2 wstETH) proxy on L2.

L2_TOKEN_NON_REBASABLE=0x1F32b1c2345538c0c6f582fCB022739c4A194Ebb

Address of the L2 rebasable token (L2 stETH) proxy on L2.

L2_TOKEN_REBASABLE=0x76A50b8c7349cCDDb7578c6627e79b5d99D24138

Optimism messenger contract L1CrossDomainMessengerProxy

https://docs.optimism.io/chain/addresses#ethereum-l1

MESSENGER=0x25ace71c97B33Cc4729CF772ae268934F7ab5fA1

Precision for sending stETH / wstETH token rate

i.e.: wsteth.getStETHByWstETH(10 ** TOKEN_RATE_DECIMALS)

TOKEN_RATE_DECIMALS=27

Beacon Chain (Consensus Layer) genesis timestamp

GENESIS_TIME=1606824023

Seconds per a single slot according to the Ethereum CL spec

SECONDS_PER_SLOT=12

Address of the AccountingOracle of Core Lido protocol.

ACCOUNTING_ORACLE=0x852deD011285fe67063a08005c71a85690503Cee

Optimism part

TokenRateOracle

info A source of truth contract (proxy and implementation) for wstETH/stETH token rate on the Optimism side. Used forwrap andunwrap on Optimism side, including wstETH internal bookkeeping when bridging stETH back and forth.

Precision for receiving and storing stETH / wstETH token rate

DECIMALS=27

Address of the L1 token rate pusher (OpStackTokenRatePusher) instance

L1_TOKEN_RATE_PUSHER=0xd54c1c6413caac3477AC14b2a80D5398E3c32FfE

Address of L2 token bridge proxy.

L2_ERC20_TOKEN_BRIDGE=0x8E01013243a96601a86eb3153F0d9Fa4fbFb6957

Optimism messenger contract L2CrossDomainMessenger

https://docs.optimism.io/chain/addresses#op-mainnet-l2

MESSENGER=0x4200000000000000000000000000000000000007

A time period when token rate can be considered outdated.

TOKEN_RATE_OUTDATED_DELAY=86400 # 1 day due to the regular stETH token rebase cadence

A time difference between received l1Timestamp and L2 block.timestamp when token rate can be considered outdated.

MAX_ALLOWED_L2_TO_L1_CLOCK_LAG=86400 # 1 day

Allowed token rate deviation per day in basis points.

MAX_ALLOWED_TOKEN_RATE_DEVIATION_PER_DAY_BP=500 # 500 BP = 5%

The maximum allowed time difference between the current time and the last received

token rate update that can be set during a pause. This is required to limit the pause role

and mitigate potential economic attacks.

OLDEST_RATE_ALLOWED_IN_PAUSE_TIME_SPAN=86400 # 1 day

The maximum delta time that is allowed between two L1 timestamps of token rate updates.

MIN_TIME_BETWEEN_TOKEN_RATE_UPDATES=3600 # 1 hour

Minimal sane token rate to accept (sanity check)

MIN_SANE_TOKEN_RATE=10000000000000000000000000 # 0.01 * 10^27

Maximal sane token rate to accept (sanity check)

MAX_SANE_TOKEN_RATE=100000000000000000000000000000 # 100 * 10^27

Enable token rate oracle updates

TOKEN_RATE_UPDATE_ENABLED=true

Roles granting the permission to resume updating rate.

Optimism Governance Bridge Executor

TOKEN_RATE_UPDATE_ENABLERS=["0xefa0db536d2c8089685630fafe88cf7805966fc3"]

Roles granting the permission to pause updating rate.

Optimism Governance Bridge Executor

Emergency brakes committee

TOKEN_RATE_UPDATE_DISABLERS=["0xefa0db536d2c8089685630fafe88cf7805966fc3",
"0x4Cf8fE0A4c2539F7EFDD2047d8A5D46F14613088"]

Address of the account to grant the DEFAULT_ADMIN_ROLE

Optimism Governance Bridge Executor

TOKEN_RATE_ORACLE_ADMIN=0xefa0db536d2c8089685630fafe88cf7805966fc3

ERC20BridgedPermit for wstETH

info A new implementation for the wstETH (non-rebasable) token deployed on Optimism.

Provides a way to seamlessly wrap/unwrap to stETH and implements new permit signature standards (ERC-2612 and ERC-1271).

Bridge address that can mint/burn wstETH on L2

bridge=0x8E01013243a96601a86eb3153F0d9Fa4fbFb6957

Token name for wstETH on Optimism

name="Wrapped liquid staked Ether 2.0"

Token symbol for wstETH on Optimism

symbol="wstETH"

Token decimals

decimals=18

ERC20RebasableBridgedPermit for stETH

info An ERC-20 compatible contract (proxy and implementation) for the rebasable stETH token deployed on Optimism.

Provides a way to seamlessly wrap/unwrap from wstETH and implements permit signature standards (ERC-2612 and ERC-1271).

Bridge address that can mint/burn wstETH on L2

L2_ERC20_TOKEN_BRIDGE=0x8E01013243a96601a86eb3153F0d9Fa4fbFb6957

Token rate oracle on Optimism for wstETH/stETH token rate retrieval upon wrap and unwrap

TOKEN_RATE_ORACLE=0x294ED1f214F4e0ecAE31C3Eae4F04EBB3b36C9d0

Token rate decimals precision used by the token rate oracle on Optimism

TOKEN_RATE_ORACLE_DECIMALS=27

wstETH on Optimism address

stETH on Optimism is 'wrapped' wstETH technically

TOKEN_TO_WRAP_FROM=0x1F32b1c2345538c0c6f582fCB022739c4A194Ebb

Token name for stETH on Optimism

name="Liquid staked Ether 2.0"

Token symbol for stETH on Optimism

symbol="stETH"

Token decimals

decimals=18

L2ERC20ExtendedTokensBridge

info A new implementation for the previously deployedL2ERC20TokenBridge L2 endpoint proxy contract to be compatible with both wstETH and stETH tokens bridging flows, mints and burns wstETH on the Optimism side.

Address of L1 token bridge proxy.

l1TokenBridge=0x76943C0D61395d8F2edF9060e1533529cAe05dE6

Address of the non-rebasable token (L1 wstETH) to deploy the bridge/gateway for.

L1_TOKEN_NON_REBASABLE=0x7f39C581F595B53c5cb19bD0b3f8dA6c935E2Ca0

Address of the rebasable token (L1 stETH) to deploy the bridge/gateway for.

L1_TOKEN_REBASABLE=0xae7ab96520DE3A18E5e111B5EaAb095312D7fE84

Address of the L2 non-rebasable token (L2 wstETH) proxy on L2.

L2_TOKEN_NON_REBASABLE=0x1F32b1c2345538c0c6f582fCB022739c4A194Ebb

Address of the L2 rebasable token (L2 stETH) proxy on L2.

L2_TOKEN_REBASABLE=0x76A50b8c7349cCDDb7578c6627e79b5d99D24138

Optimism messenger contract L2CrossDomainMessenger

https://docs.optimism.io/chain/addresses#op-mainnet-l2

MESSENGER=0x4200000000000000000000000000000000000007