CESS

Cumulus Encrypted Storage System

CESS Course Week 3 - Episode 5

dApp Development #2

CESS Official Website

Table of Content

Smart Contract Development: Solidity

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- Developer Familiarity
- Widely Supported Toolchains
- Direct Code Migration

Ink! vs. Solidity Development

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	ink!	Solidity
Virtual Machine	Any Wasm VM	EVM
Encoding	Wasm	EVM bytecode
Language	Rust	Solidity
Tooling	Rust toolings	Solidity toolings
Overflow Protection	Enabled by default	Yes
Storage Entries	Variable	256 bits (**2^{256}** entries)
Has Metadata?	Yes	Yes

src: https://use.ink/ink-vs-solidity/

Other Commonly Used Libraries

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Name	Type	Description
Polkadot SDK	Substrate	An umbrella project encompassing three sub-projects: Substrate, Cumulus, and Polkadot.
Polkadot-js API	Substrate	Javascript/Typescript library to interact with Substrate-based blockchains, with utility libs on cryptographic functions.
ether.js	EVM Smart Contract	Library to interact with EVM-compatible smart contracts.
wagmi	EVM Smart Contract / React hook	React hook for EVM-compatible smart contract.

Substrate and EVM Addresses

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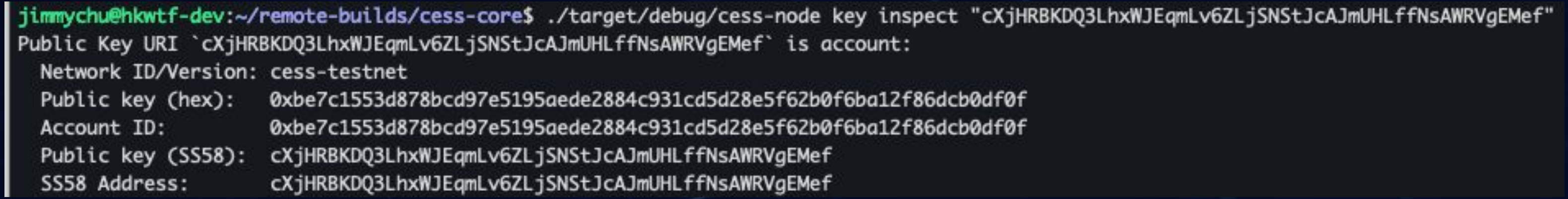
CESS Address:

- SS58 address: cXjHRBKDQ3LhxWJEqmLv6ZLjSNStJcAJmUHLffNsAWRVgEMef
- Decoded using Base58 encoder/decoder (36 bytes):

Base58 encoding

50acbe7c1553d878bcd97e5195aede2884c931cd5d28e5f62b0f6ba12f86dcb0df0f85d0

- Pub. key (32 bytes): **be7c1553d878bcd97e5195aede2884c931cd5d28e5f62b0f6ba12f86dcb0df0f**



```
jimmychu@hkwtf-dev:~/remote-builds/cess-core$ ./target/debug/cess-node key inspect "cXjHRBKDQ3LhxWJEqmLv6ZLjSNStJcAJmUHLffNsAWRVgEMef"
Public Key URI `cXjHRBKDQ3LhxWJEqmLv6ZLjSNStJcAJmUHLffNsAWRVgEMef` is account:
  Network ID/Version: cess-testnet
  Public key (hex):   0xbe7c1553d878bcd97e5195aede2884c931cd5d28e5f62b0f6ba12f86dcb0df0f
  Account ID:         0xbe7c1553d878bcd97e5195aede2884c931cd5d28e5f62b0f6ba12f86dcb0df0f
  Public key (SS58):  cXjHRBKDQ3LhxWJEqmLv6ZLjSNStJcAJmUHLffNsAWRVgEMef
  SS58 Address:       cXjHRBKDQ3LhxWJEqmLv6ZLjSNStJcAJmUHLffNsAWRVgEMef
```

- SS58 address: **base58-encode(network prefix, public key, checksum)**
- Network prefix: **0x50ac** (decimal: 11330, due to additional conversion)
- Checksum: **0x85d0**

Substrate and EVM Addresses

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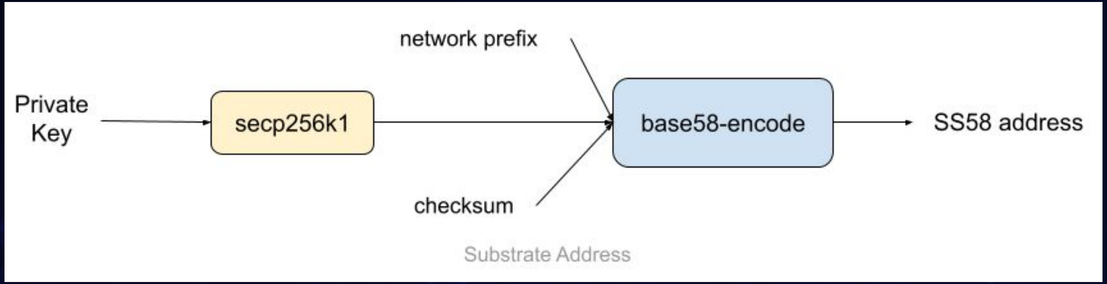
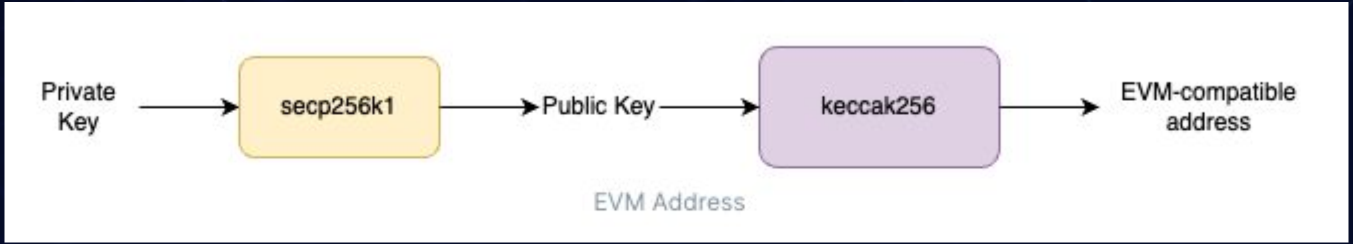
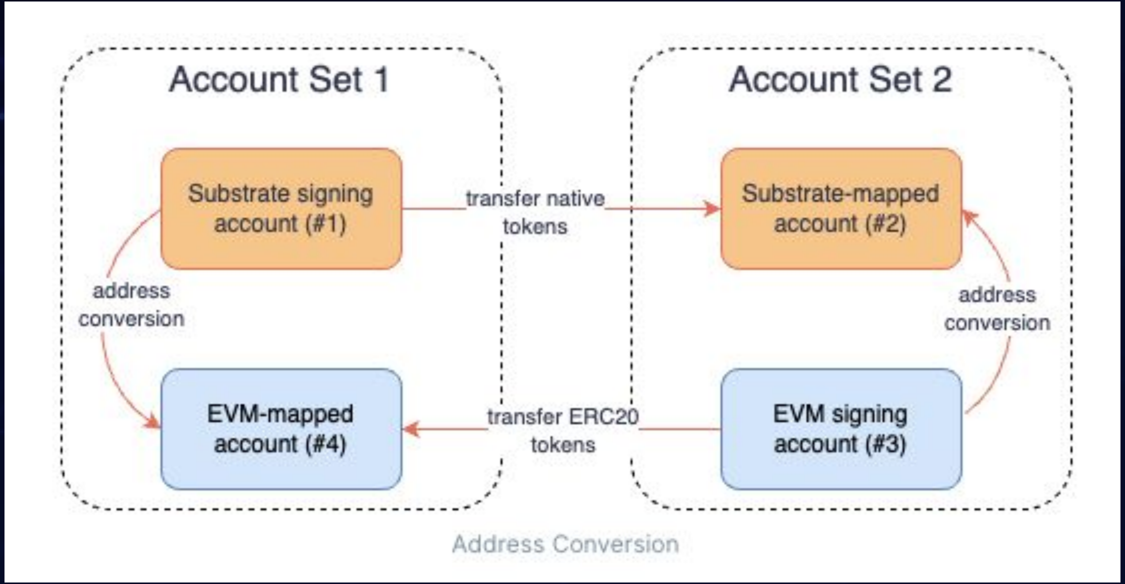


EVM address (H160 addr): `0x9440Abf16a3319E633DA6835d90470ed029D7c0B (20 bytes)`



Substrate and EVM Addresses

We need **TWO** account sets & an address conversion tool:



Demo: Transfer from Substrate Signing Acct to EVM Signing Acct

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- Polkadot Portal & Metamask installation
- The address conversion tool
- Convert EVM signing addr. to Substrate-mapped addr.
- Transfer from Substrate signing addr to Substrate-mapped addr
- Check acct balance in Metamask

Demo: Transfer from EVM Signing Acct to Substrate Signing Acct

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- The address conversion tool
- Convert Substrate signing addr to EVM-mapped addr
- Transfer from EVM signing addr to EVM-mapped addr
- Withdraw in Substrate signing addr with an on-chain transaction
- Check acct balance in Polkadot Portal

Demo: Deploy a Contract on CESS Testnet

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- Flipper.sol in CESS example
- Configure **`hardhat.config.ts`** for CESS Testnet deployment
- Deploy with **`hardhat deploy`**
- Interact with the contract using Remix

Demo: Proof of Existence (PoE) Tutorial

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- src: contract, front end
- PoE: what it does
- Demo: PoE interaction
- PoE: smart contract side (Solidity)
- PoE: front end with wagmi
- ref: CESS documentation

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End