

Execution

Notation : `execution`

Description : The execution of a transaction defines the state transition function: `stf`. However, before any transaction can be executed it needs to go through the initial tests of intrinsic validity.

1 Intrinsic Validity

The criteria for intrinsic validity are as follows:

- The transaction follows the rules for *well-formed RLPs* (recursive length prefixes.)
- The *signature* on the transaction is valid.
- The *nonce* on the transaction is valid, i.e. it is equivalent to the sender account's current nonce.
- The `gas_limit` is greater than or equal to the `intrinsic_gas` used by the transaction.
- The sender's account balance contains the cost required in up-front payment.

Accordingly, the post-transactional state of Ethereum is expressed thus:

```
transaction(post.state) = stf(present.state, transaction)
```

While the amount of gas used in the execution is expressed: `stf(gas.used)` and the accrued log items belonging to the transaction are expressed: `stf(logsbloom, content)(logsbloom, set)` Information concerning the result of a transaction's execution is stored in the transaction receipt `tx_receipt`. The set of log events which are created through the execution of the transaction, `logs_set` in addition to the bloom filter which contains the actual information from those log events `logs_bloom` are located in the transaction receipt. In addition, the post-transaction state `post_transaction(state)` and the amount of gas used in the block containing the transaction receipt `post(gas.used)` are stored in the transaction receipt. Thusly the transaction receipt is a record of any given `execution`.

2 Substate

A smaller, temporary state `transaction.substate` is generated during transaction execution. It's contains three sets of data:

- The accounts tagged for self-destruction following the transaction's completion.
`self_destruct(accounts)`
- The `logs_series`, which creates checkpoints in EVM code execution for frontend applications to explore, and is made up of the `logs_set` and `logs_bloom` from the `tx.receipt`.
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