FireFly Updates

Community Call

Date: Wednesday 14th Dec 2022

HYPERLEDGER FIREFLY

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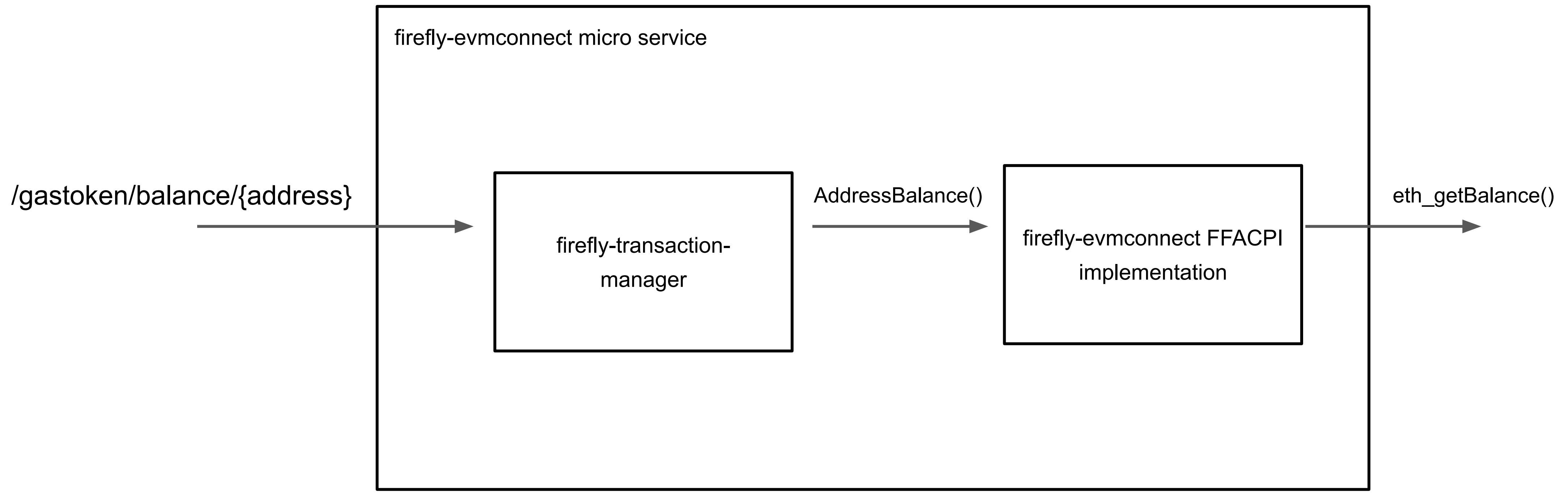
Agenda

1. New FFCAPI for querying blockchain balances
2. Improving efficiency of blockchain receipt handling
3. Proposal for Policy Engine changes

1. FFCAPI - New **AddressBalance()** function


firefly-evmconnect micro service
/gastoken/balance/{address}
firefly-transaction-manager
AddressBalance()
firefly-evmconnect FFACPI implementation
eth_getBalance()

1. FFCAPI - New **AddressBalance()** function

FFCAPI Interface (pkg/ffcapi/api.go in hyperledger/firefly-transaction-manager)

```
type API interface {

       // AddressBalance gets the balance of the specified address
       AddressBalance(ctx context.Context, req *AddressBalanceRequest) (*AddressBalanceResponse, ErrorReason, error)

       // BlockInfoByHash gets block information using the hash of the block
       BlockInfoByHash(ctx context.Context, req *BlockInfoByHashRequest) (*BlockInfoByHashResponse, ErrorReason, error)

       // BlockInfoByNumber gets block information from the specified position (block number/index) in the canonical chain currently known to the local node
       BlockInfoByNumber(ctx context.Context, req *BlockInfoByNumberRequest) (*BlockInfoByNumberResponse, ErrorReason, error)

       // NextNonceForSigner is used when there are no outstanding transactions for a given signing identity, to determine the next nonce to use
       NextNonceForSigner(ctx context.Context, req *NextNonceForSignerRequest) (*NextNonceForSignerResponse, ErrorReason, error)

       ...
}
```

1. FFCAPI - New **/gastoken/balances/{address}** route

FFTM Route (pkg/fftm/route_get_address_balance.go in hyperledger/firefly-transaction-manager)

```
return &ffapi.Route{
        Name:    "getBalance",
        Path:    "/gastoken/balances/{address}",
        Method: http.MethodGet,
        PathParams: []*ffapi.PathParam{
                {Name: "address", Description: tmmsgs.APIParamSignerAddress},
        },
        ...
        JSONHandler: func(r *ffapi.APIRequest) (output interface{}, err error) {
                return m.getLiveBalance(r.Req.Context(), r.PP["address"])
        },
}
```

API path calls out that the balance is related to the gas currency for the chain, nothing to do with tokens/contracts

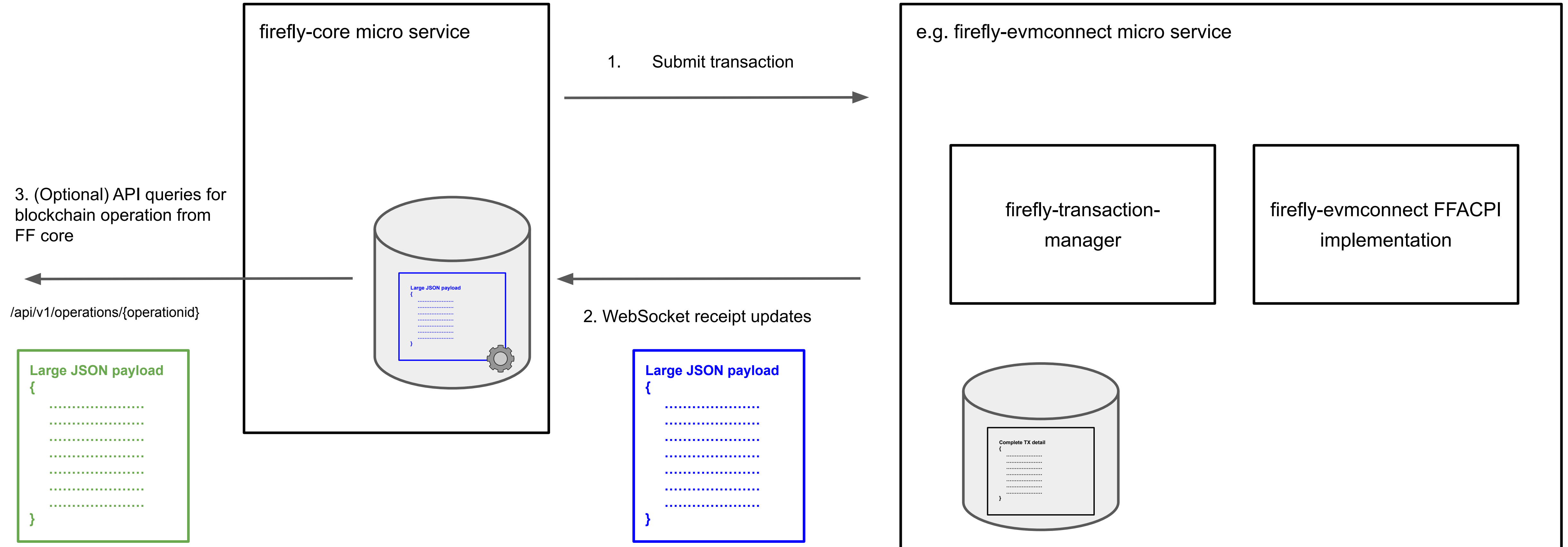
1. FFCAPI - **AddressBalance()** implementation

evmconnect implementation (internal/get_address_balance.go in hyperledger/firefly-evmconnect)

```go
func (c *ethConnector) AddressBalance(ctx context.Context, req *ffcapi.AddressBalanceRequest) (*ffcapi.AddressBalanceResponse, ffcapi.ErrorReason, error) {

	var addressBalance ethtypes.HexInteger
	var blockTag = req.BlockTag
	if blockTag == "" {
		blockTag = "latest"
	}
	err := c.backend.CallRPC(ctx, &addressBalance, "eth_getBalance", req.Address, blockTag)
	if err != nil {
		return nil, "", err.Error()
	}

	return &ffcapi.AddressBalanceResponse{
		Balance: (*fftypes.FFBigInt)(&addressBalance),
	}, "", nil

}
```

2. Blockchain connector receipt handling improvements

Current behaviour

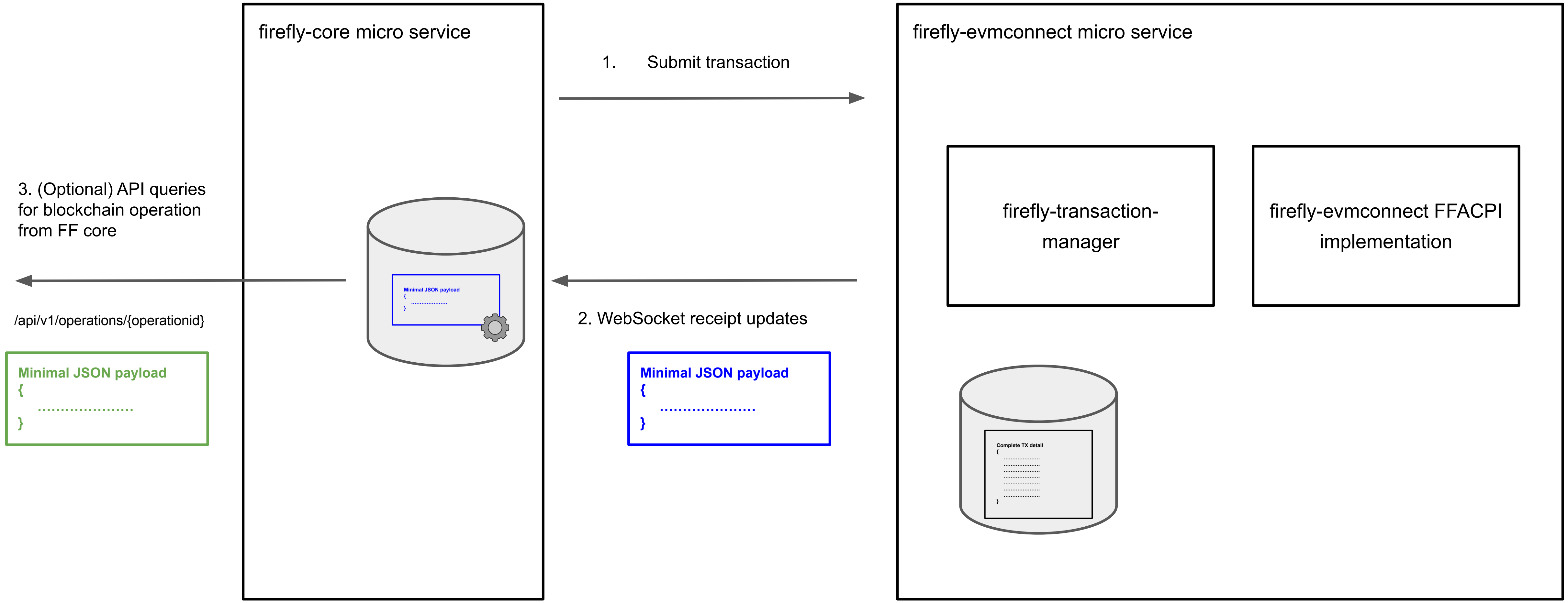

firefly-core micro service
1. Submit transaction
e.g. firefly-evmconnect micro service
firefly-transaction-manager
firefly-evmconnect FFACPI implementation
3. (Optional) API queries for blockchain operation from FF core
/api/v1/operations/{operationid}
2. WebSocket receipt updates
Large JSON payload
Large JSON payload
Large JSON payload
Complete TX detail

Downsides

1. Unnecessarily chatty between connector and FireFly core
2. FireFly core stores a lot of extra information that might never be needed
3. Data stored by the connector is duplicated

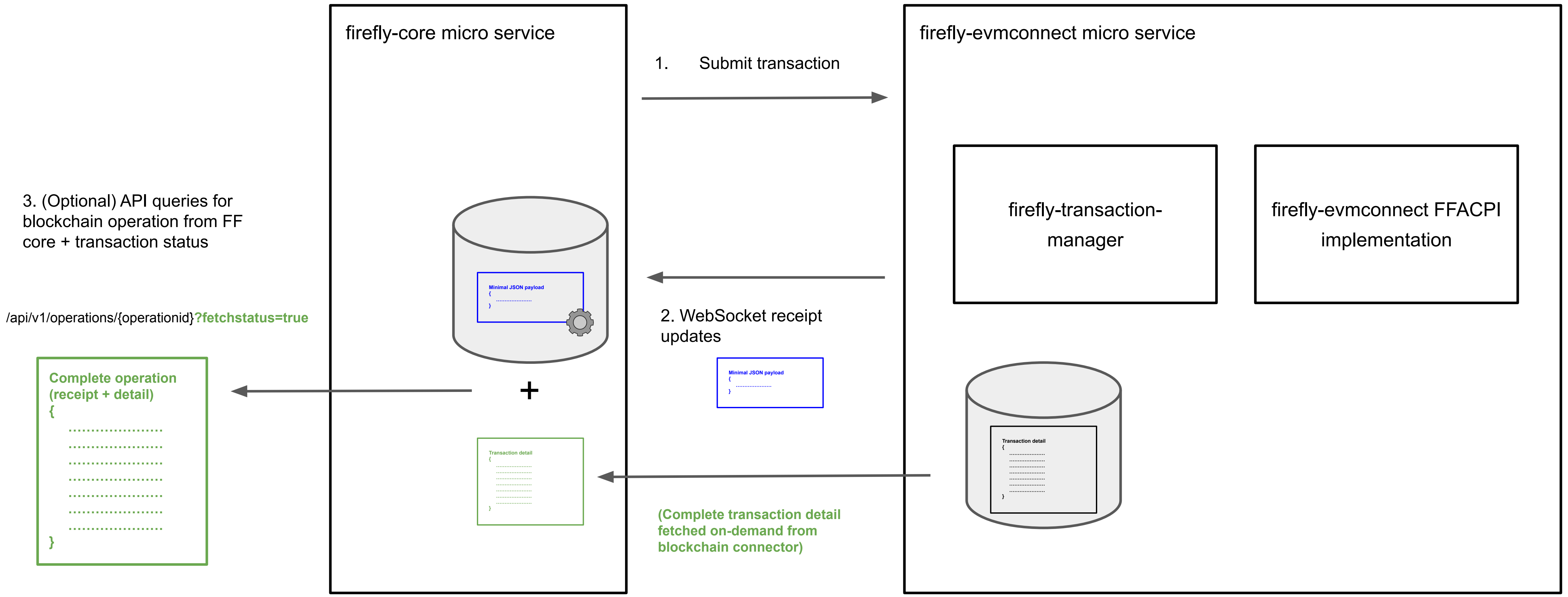
2. Blockchain connector receipt handling improvements

Proposed behaviour


firefly-core micro service
1. Submit transaction
firefly-evmconnect micro service
firefly-transaction-manager
firefly-evmconnect FFACPI implementation
3. (Optional) API queries for blockchain operation from FF core
Minimal JSON payload { .... }
2. WebSocket receipt updates
/api/v1/operations/{operationid}
Minimal JSON payload { .... }
Minimal JSON payload { .... }
Complete TX detail { .... }

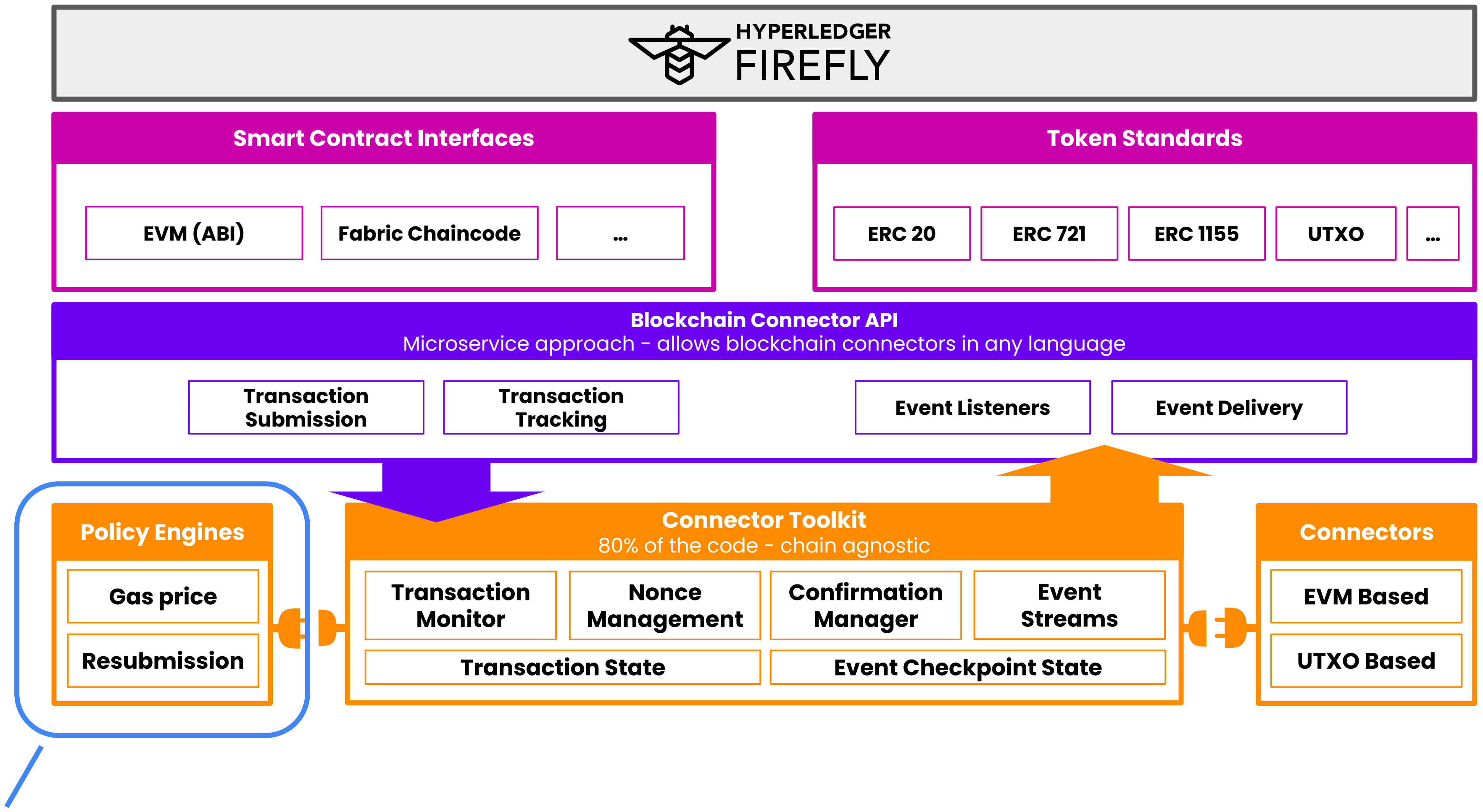
2. Blockchain connector receipt handling improvements

Proposed behaviour



firefly-core micro service
firefly-evmconnect micro service
1. Submit transaction
firefly-transaction-manager
firefly-evmconnect FFACPI implementation
3. (Optional) API queries for blockchain operation from FF core + transaction status
/api/v1/operations/{operationid}?fetchstatus=true
Minimal JSON payload
2. WebSocket receipt updates
Complete operation (receipt + detail)
Transaction detail
(Complete transaction detail fetched on-demand from blockchain connector)

3. FireFly Transaction Managed Policy Engine Changes



Pluggable policy engine

3. FireFly Transaction Managed Policy Engine Changes - Aims:

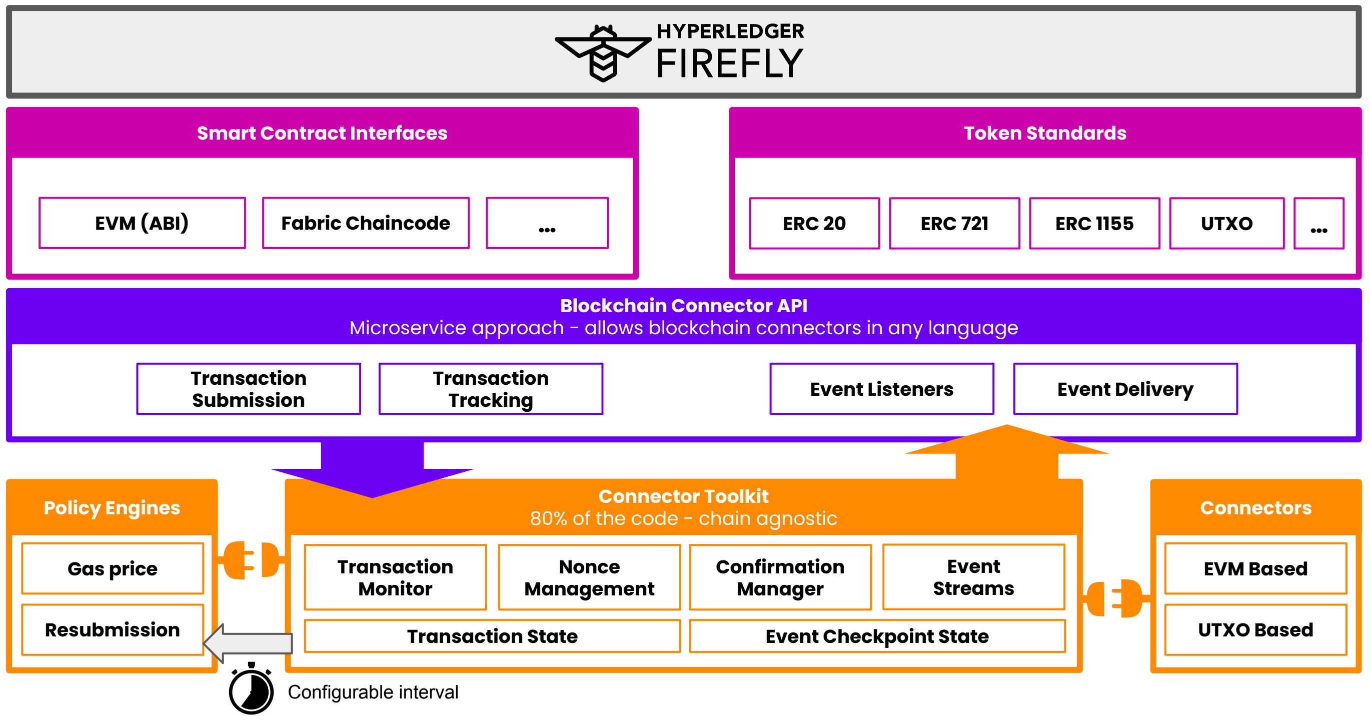
- Continue to perform common required tasks outside of policy engine:
    - Provide API endpoints
    - Receipt and confirmation tracking
    - Event stream management
        - Creation/deletion
        - Checkpointing

- Allow enough flexibility for policy engines to do:
    - More powerful nonce management
    - Efficiently dispatch granular status updates directly to consumers
    - Control the limits of new transaction buffering
    - Manage transactions at signing-key scope
        - Per-key buffer/queue
        - Sign/submit concurrently for different signing keys

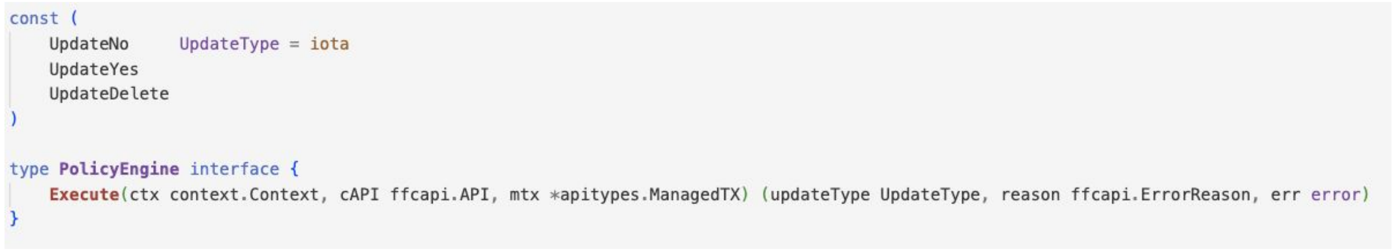
- Continue to provide a simple policy engine in the box

Characteristics of the current model

- Operates on an interval dictated by the transaction monitor
- Acts on one transaction at a time
  - Inhibits concurrent transaction processing
- Nonces can't be influenced by the policy engine
- Cannot update transaction state directly



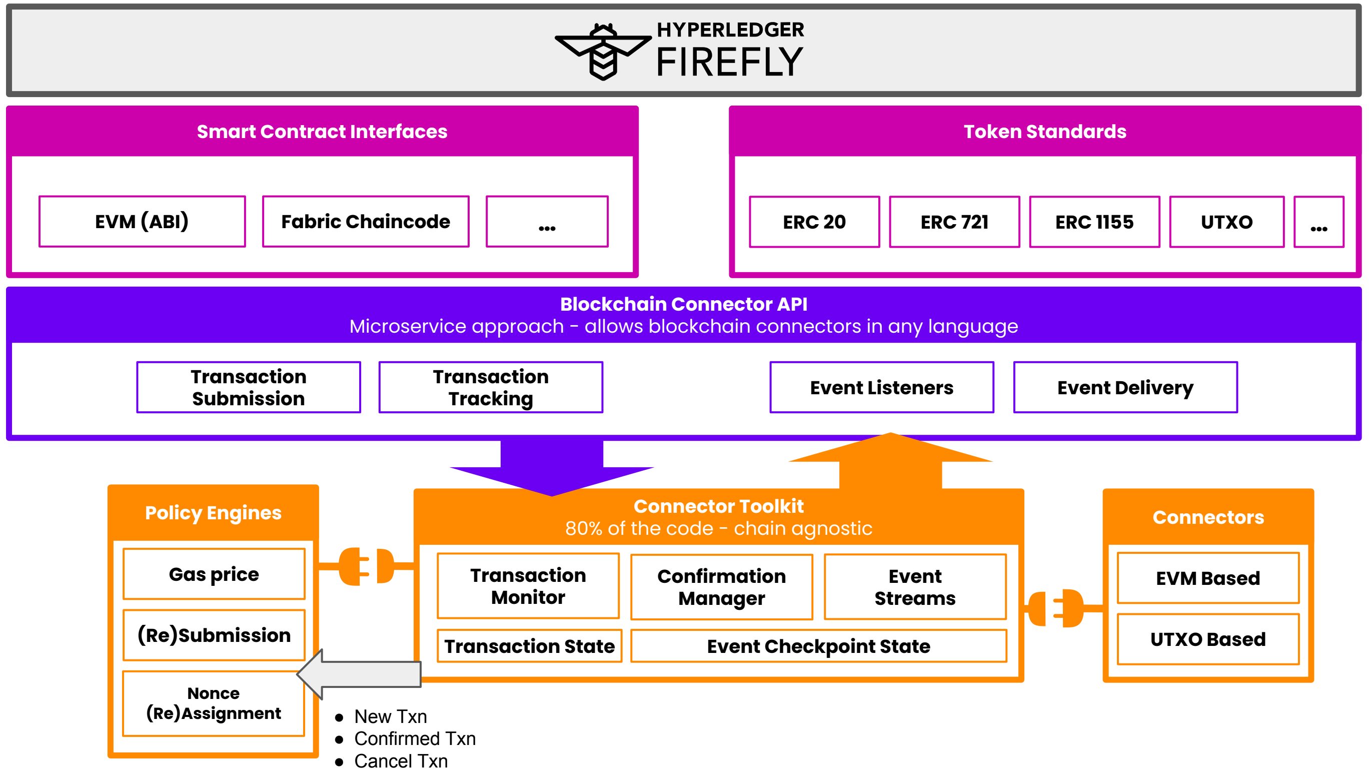
PolicyEngine Interface



```
const (
    UpdateNo     UpdateType = iota
    UpdateYes
    UpdateDelete
)

type PolicyEngine interface {
    Execute(ctx context.Context, cAPI ffcapi.API, mtx *apitypes.ManagedTX) (updateType UpdateType, reason ffcapi.ErrorReason, err error)
}
```

Proposals for a new approach

- Policy engine notified when a transaction arrives, not on an interval
- Can make decisions based on multiple transactions
- Engine is responsible for updating transaction persisted state via toolkit API
  - Transaction state no longer read only to policy engine
  - E.g. could set state=SUBMITTING before calling RPC endpoint, state=SUBMITTED after
- Can make more complex decisions about how nonaces are used
  - E.g. TXN3 hasn't been mined, cancel it and re-use its nonce for TXN4

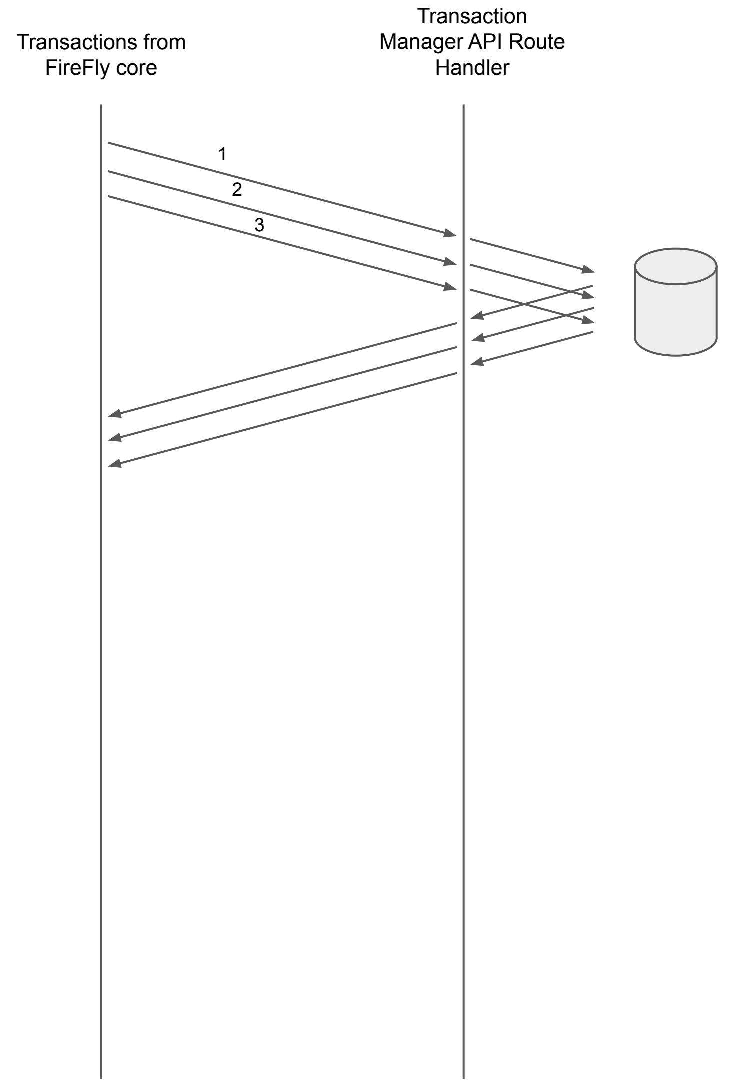


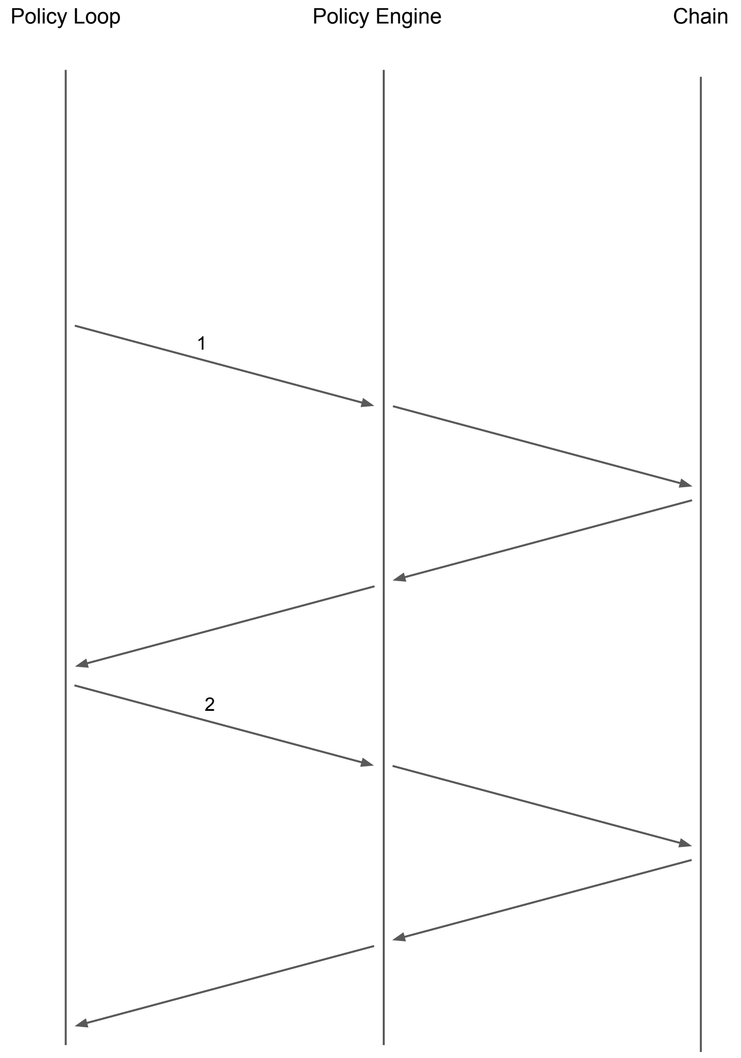
Example PolicyEngine Interface

```
type PolicyEngine interface {
        Init(toolkit *PolicyEngine.Toolkit)
        NewTransaction(mtx *ManagedTx)
        CancelTransaction(mtx *ManagedTx)
        TransactionConfirmed(mtx *ManagedTx)
}
```

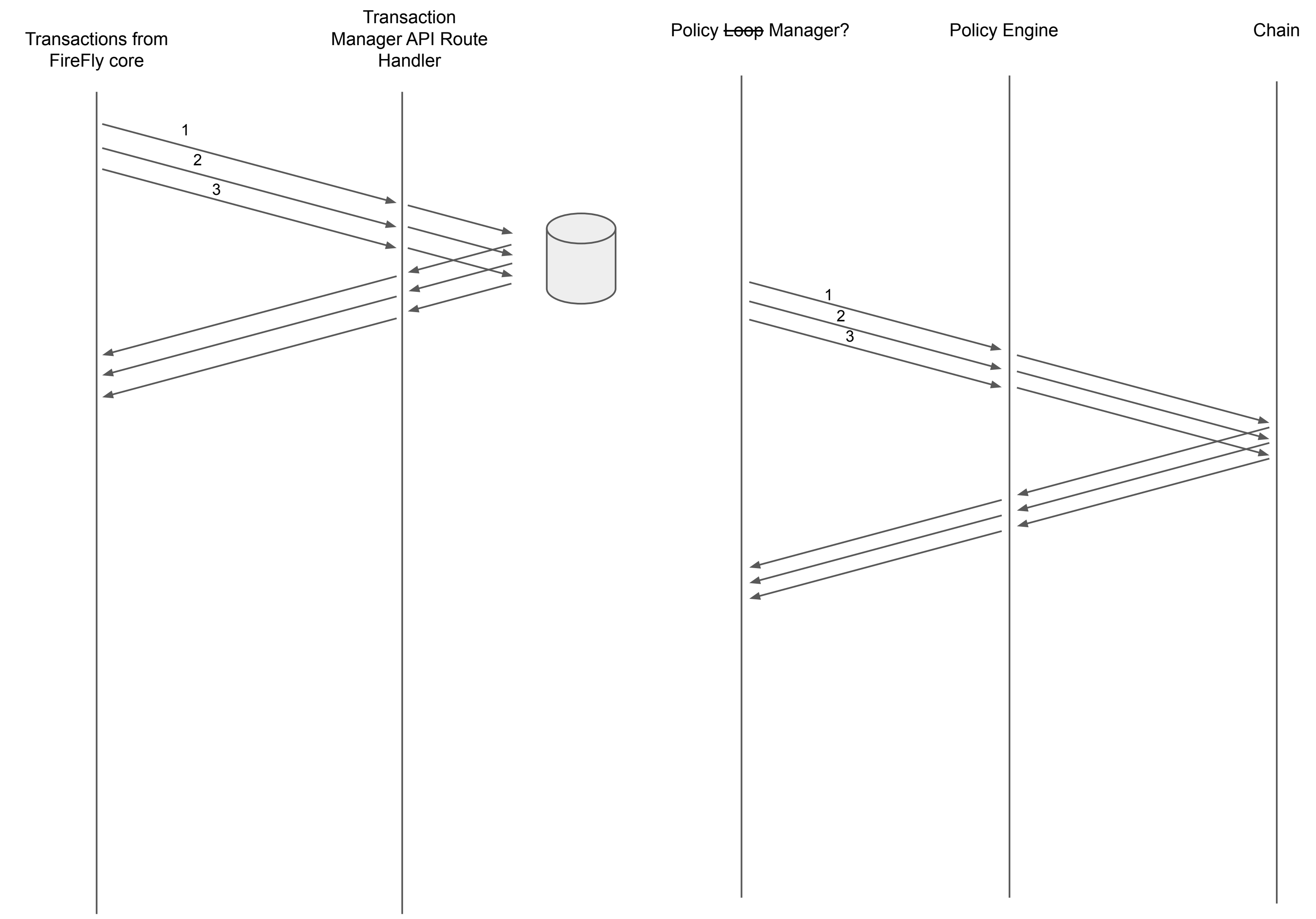
```
type Toolkit interface {
        persistence     persistence.TxnPersistenceAPI
        metrics         metrics.MetricsAPI
        statusUpdate    chan struct{}
}
```

Current threading model


Transactions from FireFly core
Transaction Manager API Route Handler
1
2
3



Threading model options with proposed changes

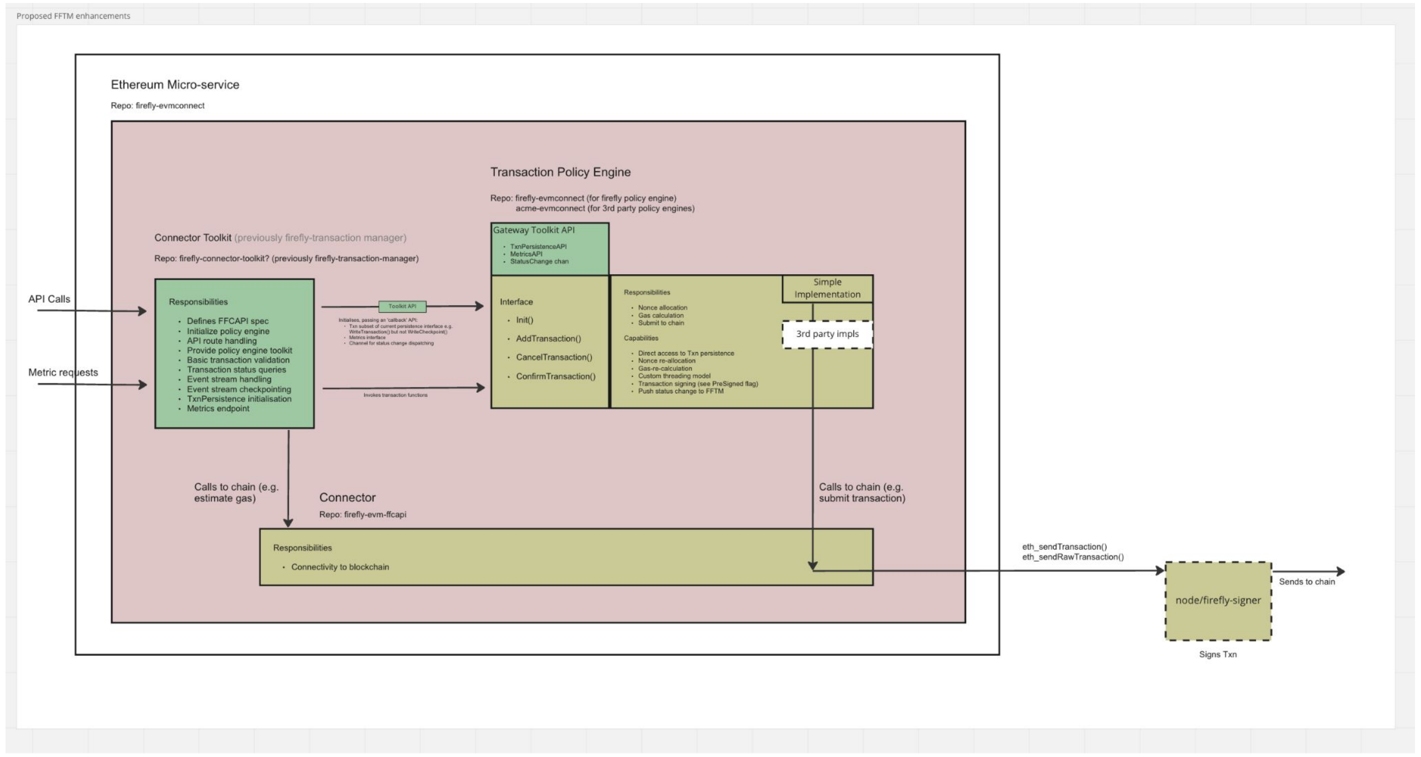

Transactions from FireFly core
Transaction Manager API Route Handler
Policy ~~Loop~~ Manager?
Policy Engine
Chain
1
2
3
1
2
3

Possibly do some refactoring as part of the same work

- Rename firefly-transaction-manager?
  - firefly-connector-toolkit?

- Move evmconnect FFCAPI implementation into its own repo?

- See FireFly contributor Miro board


Proposed FFTM enhancements
Ethereum Micro-service
Repo: firefly-evmconnect
Transaction Policy Engine
Repo: firefly-evmconnect (for firefly policy engine)
acme-evmconnect (for 3rd party policy engines)
Connector Toolkit (previously firefly-transaction manager)
Repo: firefly-connector-toolkit? (previously firefly-transaction-manager)
API Calls
Metric requests
Responsibilities
• Defines FFCAPI spec
• Initialize policy engine
• API route handling
• Provide policy engine toolkit
• Basic transaction validation
• Transaction status queries
• Event stream handling
• Event stream checkpointing
• TxnPersistence initialisation
• Metrics endpoint
Toolkit API
Initialises, passing an 'callback' API:
• Txn subset of current persistence interface e.g. WriteTransaction() but not WriteCheckpoint()
• Metrics interface
• Channel for status change dispatching
Invokes transaction functions
Gateway Toolkit API
• TxnPersistenceAPI
• MetricsAPI
• StatusChange chan
Interface
• Init()
• AddTransaction()
• CancelTransaction()
• ConfirmTransaction()
Responsibilities
• Nonce allocation
• Gas calculation
• Submit to chain
Capabilities
• Direct access to Txn persistence
• Nonce re-allocation
• Gas-re-calculation
• Custom threading model
• Transaction signing (see PreSigned flag)
• Push status change to FFTM
Simple Implementation
3rd party impls
Calls to chain (e.g. estimate gas)
Calls to chain (e.g. submit transaction)
Connector
Repo: firefly-evm-ffcapi
Responsibilities
• Connectivity to blockchain
eth_sendTransaction()
eth_sendRawTransaction()
node/firefly-signer
Signs Txn
Sends to chain

Open Discussion