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ERIGON 3

A New **Paradigm** for Ethereum Clients

ABOUT US

#erigon.tech Is global remote development team specializing in efficient blockchain client software

Erigon a combined **CL/EL** Client

- Based on **Turbogeth** it was designed to synchronize a **Full Archive Node** on commodity hardware
- Supports multiple EVM based chains including **Ethereum, Gnosis** and **Polygon**
- **Erigon 3** is the latest version and is in **alpha** for all supported chains, due for **beta** by **perctra**

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OVERVIEW

PARADIGM

SHIFT

JOURNEY

ARCHITECTURE

IMPLICATIONS

FUTURE

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THE PARADIGM SHIFT

*From **Consensus vs Execution** , to **Dissemination vs Distribution***

Chain Dissemination	Chain Distribution
Operates in real time	Operates after finalization
Interpreted	Compiled
Negotiated Serialized Data	Verifiable Binary Data
Block/Slot/Batch Granularity	Transaction Granularity
Verified by Re-Execution	Verified by Data Hashing

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JOURNEY

Erigon 1,2 ...
How we got here

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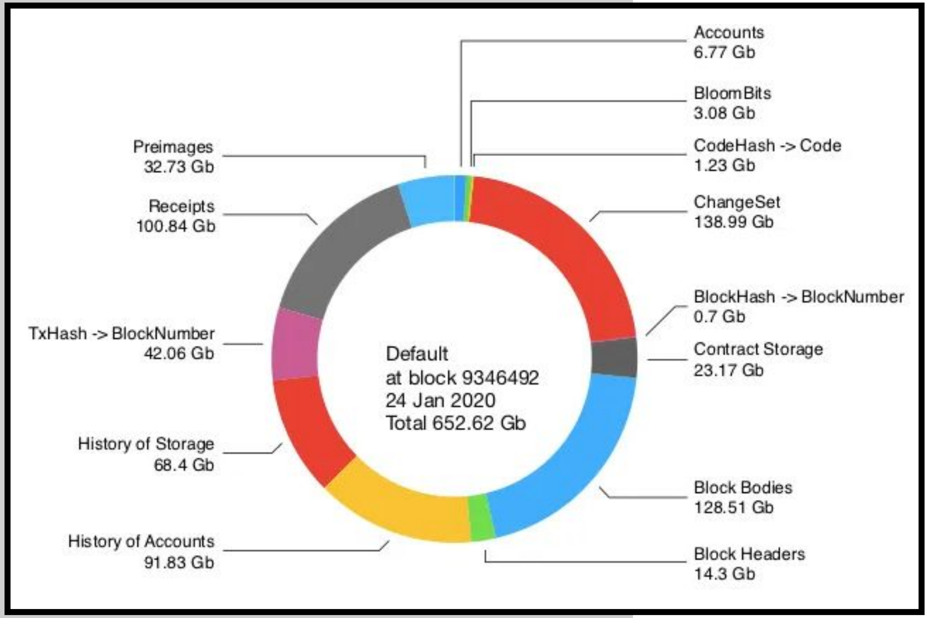
TURBO-GETH

2017-2020: Optimized Ethereum Client

An experiment to challenge the design choices made in major Ethereum clients

- Optimized Ethereum storage
- Used Bucketing to increase data retrieval speed
- Used third party B+- Trees instead of LSM as its underlying database model



Chain Size Block No. 9346492:

Geth:	**3.7 TB**
Parity:	**3.6 TB**
Turbo-Geth:	**0.7 TB**

#**tubo.geth:** DEVCON 4

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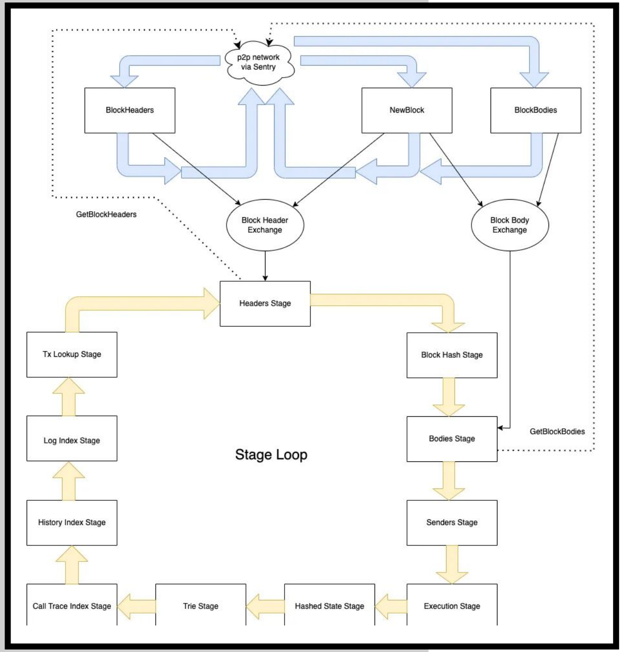
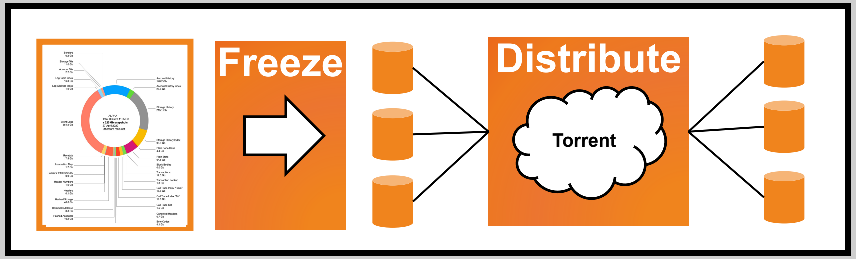
ERIGON 2

2020-2022: Staged Client With Snapshots

A new name and a performance-oriented re-imagining of the turbo-geth data model

- Dynamic export of aged **frozen** transaction data
- Transition to a **page-based** loading strategy
- Torrent distribution of hash protected historic data
- Componentized **stages** with **ACID** guarantees and long running transactions





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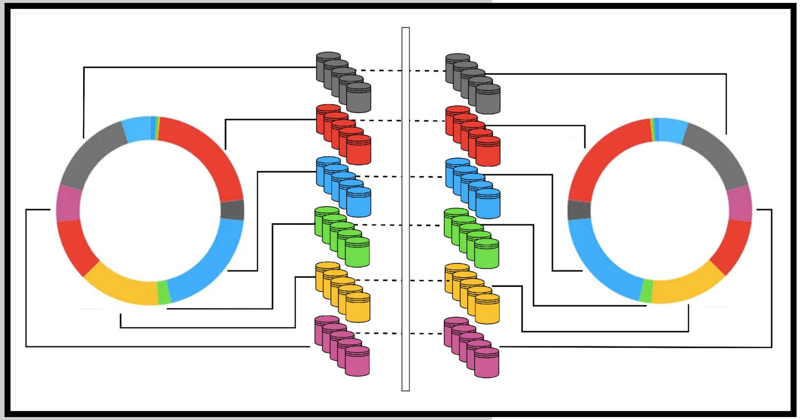
2022-2024: Ethereum Client With Native DLT Storage Model

Erigon 2 evolved to complete the extraction of all data types into an aged data store designed from the disk up to handle DLT specific requirements



- Dynamic export of aged **frozen** transaction and state, core database storage minimization
- **Temporal** sharding of all significant data types using a monotonic transaction identifiers
- **Deterministic** persistent data which can be distributed and validated without the need for re-execution.
- **Transaction granularity** history and re-execution when processing queries

#**Erigon 3** is more cold-start-friendly, os-pre-fetch-friendly, cloud-drives-friendly than Erigon 2, avoiding the reliance on expensive NVME disk capacity.

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ARCHITECTURE

Where we are now

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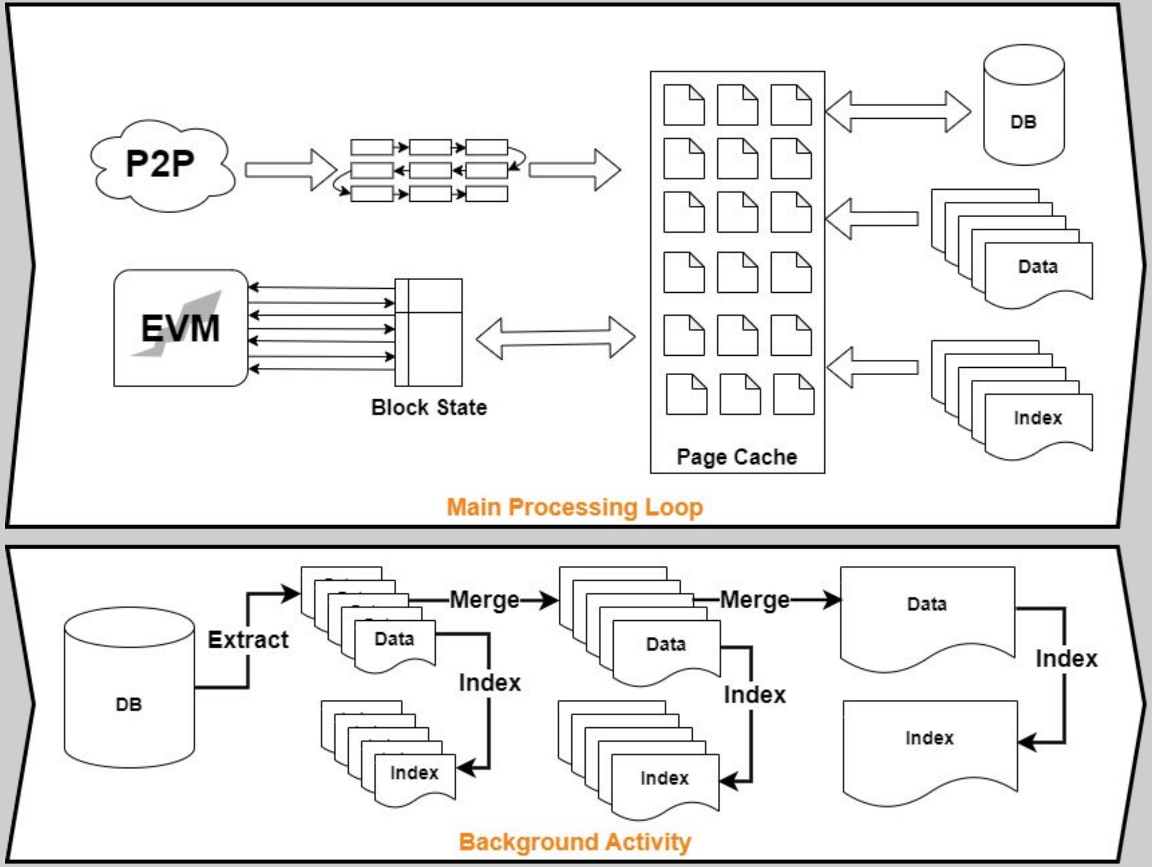
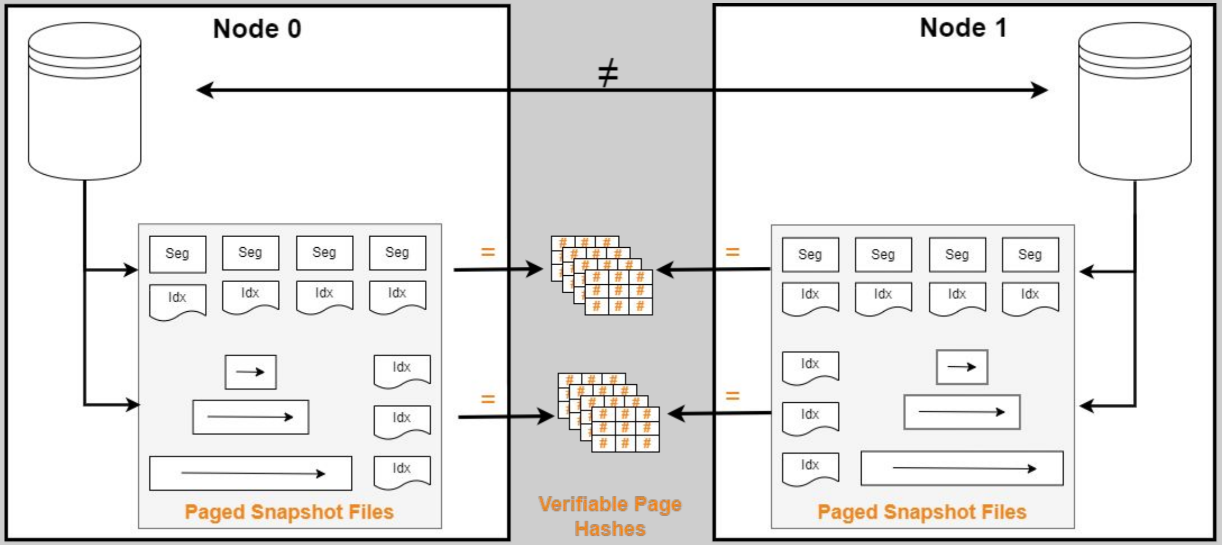
PROCESS FLOW



Erigon 3 has three types of mapped files:

- Appendable Segments
- QLSM State
- Indexes

PAGE FILE DETERMINISM



- **Database** files deal with interspersed read/write operations where page operations and optimisation lead to physical file layouts which **change** between nodes and process runs

- **Snapshot** files have a **consistent** optimized layout which is guaranteed during the snapshot creation process.

IMPLICATIONS

What this means for chain operations

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SYNC PERFORMANCE

Database sizes after first sync

Chain	Archive	Full	Minimal
Ethereum (EL+CL)	1.6 TB	838 GB	235 GB
Gnosis (EL+CL)	486 GB	268 GB	91 GB
Polygon	4.2 TB	2 TB	873 GB

Sync times from scratch to chain tip (100 Mbyte/Sec Network)

Chain	Archive	Full	Minimal
Ethereum (EL+CL)	7h 55m	4h 23m	1h 41m
Gnosis (EL+CL)	2h 10m	1h 05m	33m
Polygon	42h 50m	21h 41m	11h 54m

Erigon 3 sync times are proportional to available network bandwidth.

On a **1GByte/Sec** network a **Polygon** archive node syncs in **2h 40m**

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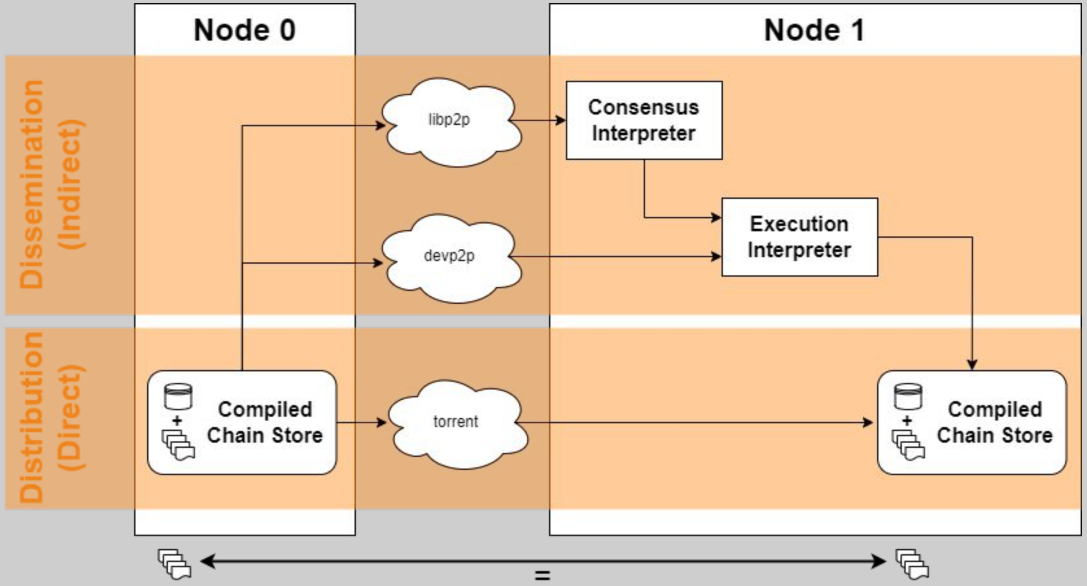
CHAIN DISTRIBUTION



- **Distributed** data in binary form is available for processing after its hashes are verified – files can be delivered via any available transfer medium.

- **Disseminated** data is serialized for transport and must be deserialized and interpreted before its available for processing

FUTURE

New opportunities…

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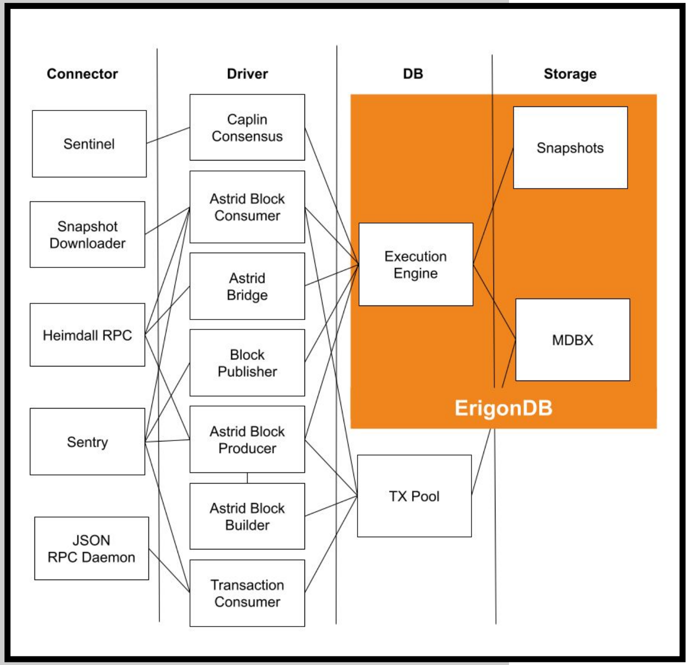
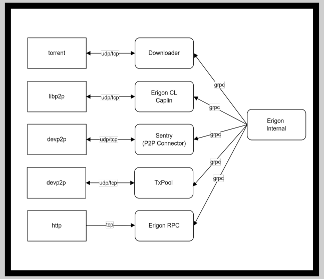
COMPONENTIZATION

Post Erigon 3 we will be adjusting Erigon's component model to achieve the following goals:

- Active vs Passive Components
- Functional Decomposition
- Development Compartmentalization
- Deployment Flexibility



Development

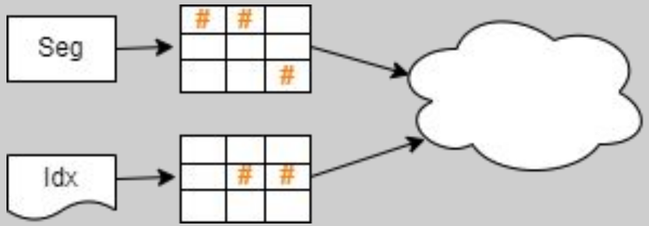


Deployment

Erigon has several incarnations of components with gRPC interfaces, stages and the engine-api based driver/db split. As the DB interface becomes more stable we can concentrate on engineering this for consistency, reliability and extensibility.

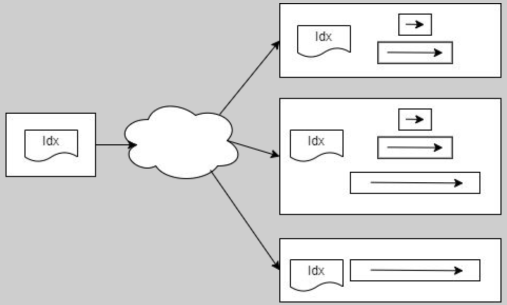
DISTRIBUTION MODEL EXTENSIONS

Sparse Clients



- For clients who inly need a defined subset of chain data
- Additional data can be retrieved via paging at the cost of network latency

Distributed Indexing



- For query operations from clients requiring full index access
- Index segregation strategies require further R&D effort

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QUESTIONS

- Hash verification is currently Erigon dependent. Can this, should this be more decentralized
- Hashing provides verification how about availability
- Is the model more widely adoptable. Can it, should it be standardized
- Are sparse clients an alternative to light clients
- Does the addressability of the binary format have uses other than distribution. For example, could it provide a proof target.

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THANK YOU

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