

Node 10.0: value+voting against value
value-only workload

Federico Mastellone, Michael Karg, Cardano Performance team

2024-10-28

Contents

1	Manifest	2
2	Analysis	4
2.1	Resource Usage	4
2.2	Anomaly control	4
2.3	Forging	5
2.4	Individual peer propagation	5
2.5	End-to-end propagation	5
I	Appendix A: charts	6
3	Cluster performance charts	7
II	Appendix B: data dictionary	25
4	Block propagation metrics	26
5	Cluster performance metrics	28

Chapter 1

Manifest

We compare `value+voting` (Conway) relative to `value+utxo` (Conway).

	value+utxo	value+voting
Analysis date	2024-10-27	2024-10-26
Cluster system start date	2024-10-26	2024-10-25
Cluster system start time	15:51:20	15:20:03
Identifier	10.0	10.0
Run batch	10.0.0-pre	10.0.0-pre
GHC version	8.10.7	8.10.7
cardano-node version	10.0	10.0
ouroboros-consensus version	0.21.0.0	0.21.0.0
ouroboros-network version	0.17.1.2	0.17.1.2
cardano-ledger-core version	1.15.0.0	1.15.0.0
plutus-core version	1.36.0.0	1.36.0.0
cardano-crypto version	1.1.2	1.1.2
cardano-prelude version	0.2.0.0	0.2.0.0
cardano-node git	93a4a25	1d0607f
ouroboros-consensus git	358305b	358305b
ouroboros-network git	df3431f	df3431f
cardano-ledger-core git	0ba8e73	0ba8e73
plutus-core git	fb82893	fb82893
cardano-crypto git	6568a5e	6568a5e
cardano-prelude git	273167c	273167c
Era	conway	conway
Delegation map size	1000000	1000000
Starting UTxO set size	4000000	4000000
DRep count	10000	10000
Extra tx payload	100	100
Tx inputs	2	2
Tx Outputs	2	2
TPS	12.0	12.0
Transaction count	768000	768000
Plutus script	—	—
Machines	52	52
Number of filters applied	3	3
Log text lines emitted per host	4864227.2692	4650996.6730
Log objects emitted per host	4864197.2692	4650966.6730
Log objects analysed per host	2120533.4807	1829606.0576
Host run time, s	63863.8	63836.5
Host log line rate, Hz	76.166	72.858
Total log objects analysed	110267741	95139515
Run time, s	63873	63846
Analysed run duration, s	48049	48020
Run time efficiency	0.75	0.75
Node start spread, s	19.378171	18.160744
Node stop spread, s	7.0088149	6.8401947
Perf analysis start spread, s	0	0
Perf analysis stop spread, s	7	6
Slots analysed	48044	48015
Blocks analysed	2277	2329
Blocks rejected	861	891

Chapter 2

Analysis

2.1 Resource Usage

	value+utxo	value+voting	Δ	$\Delta\%$
Forge loop starts, #	0.99808	0.99802	-0.000	0
Process CPU usage, %	8.6629	9.0542	0.391	5
RTS GC CPU usage, %	1.0644	1.5837	0.519	49
RTS Mutator CPU usage, %	7.5902	7.465	-0.125	-2
Major GCs, #	0.00099	0.001	0.000	0
Minor GCs, #	2.0652	2.0722	0.007	0
Kernel RSS, MB	9142.8	9130.7	-12.100	0
RTS heap size, MB	9090.8	9078.6	-12.200	0
RTS live GC dataset, MB	4091.9	4081.4	-10.500	0
RTS alloc rate, MB/s	64.269	64.19	-0.079	0
Filesystem reads, KB/s	0.00177	2e-05	-0.002	-113
Filesystem writes, KB/s	248.46	248.76	0.300	0
CPU 85% spans, slots	4.4995	2.0248	-2.475	-55
Sample count	(249>)	(249>)		

2.2 Anomaly control

	value+utxo	value+voting	Δ	$\Delta\%$
Blocks per host, blocks	62.134	63.826	1.692	3
Filtered to chained block ratio, /	0.72605	0.72294	-0.003	0
Chained to forged block ratio, /	0.9711	0.97019	-0.001	0
Height & slot battles, blocks	0.00658	0.00644	-0.000	0
Block size, B	88908	88769	-139	0
Sample count	(52)	(52)		

2.3 Forging

	value+utxo	value+voting	Δ	$\Delta\%$
Started forge loop iteration, s	0.00073	0.00123	0.001	137
Acquired block context, s	0.02522	0.02802	0.003	12
Acquired ledger state, s	6e-05	7e-05	0.000	0
Acquired ledger view, s	2e-05	3e-05	0.000	0
Leadership check duration, s	0.00043	0.00074	0.000	0
Ledger ticking, s	0.02911	0.03301	0.004	14
Mempool snapshotting, s	0.07252	0.08275	0.010	14
Leadership to forged, s	0.00084	0.00093	0.000	0
Forged to announced, s	0.00077	0.00081	0.000	0
Forged to sending, s	0.00633	0.0072	0.001	16
Forged to self-adopted, s	0.08348	0.09324	0.010	12
Slot start to announced, s	0.12975	0.14763	0.018	14
Sample count	(2277)	(2329)		

2.4 Individual peer propagation

	value+utxo	value+voting	Δ	$\Delta\%$
First peer notice, s	0.13179	0.1499	0.018	14
First peer fetch, s	0.14204	0.16223	0.020	14
Notice to fetch request, s	0.00141	0.00161	0.000	0
Fetch duration, s	0.35616	0.36111	0.005	1
Fetch to announced, s	-0.0	0.0	0.000	nan
Fetch to sending, s	0.04453	0.04639	0.002	4
Fetch to adopted, s	0.08589	0.09749	0.012	14
Sample count	(2277)	(2329)		

2.5 End-to-end propagation

	value+utxo	value+voting	Δ	$\Delta\%$
0.50 adoption, s	0.68536	0.72326	0.038	6
0.80 adoption, s	1.0441	1.0895	0.045	4
0.90 adoption, s	1.0645	1.115	0.051	5
0.92 adoption, s	1.0703	1.1225	0.052	5
0.94 adoption, s	1.0779	1.1338	0.056	5
0.96 adoption, s	1.0855	1.1459	0.060	6
0.98 adoption, s	1.1037	1.165	0.061	6
1.00 adoption, s	1.1606	1.2318	0.071	6
Sample count	(2277)	(2329)		

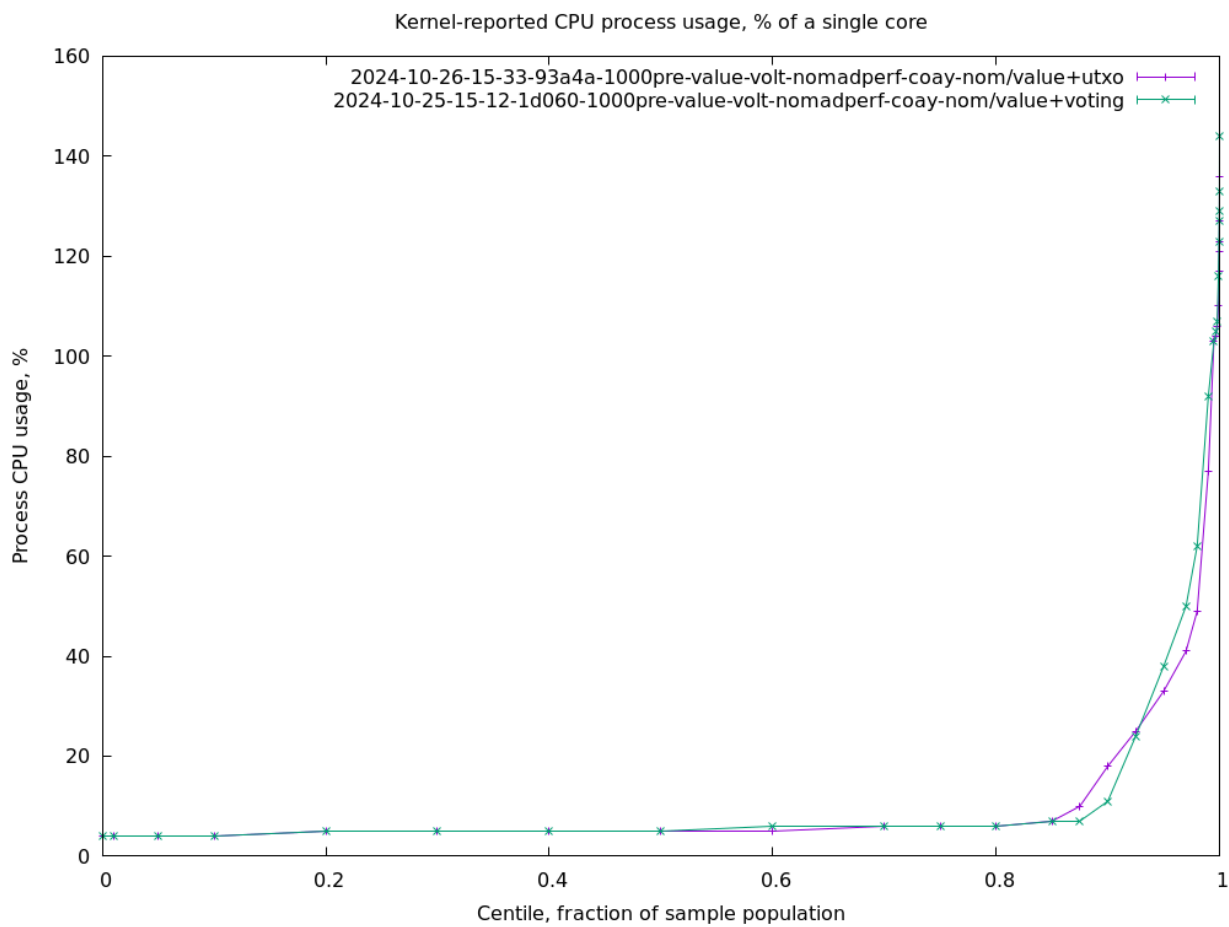
Part I

Appendix A: charts

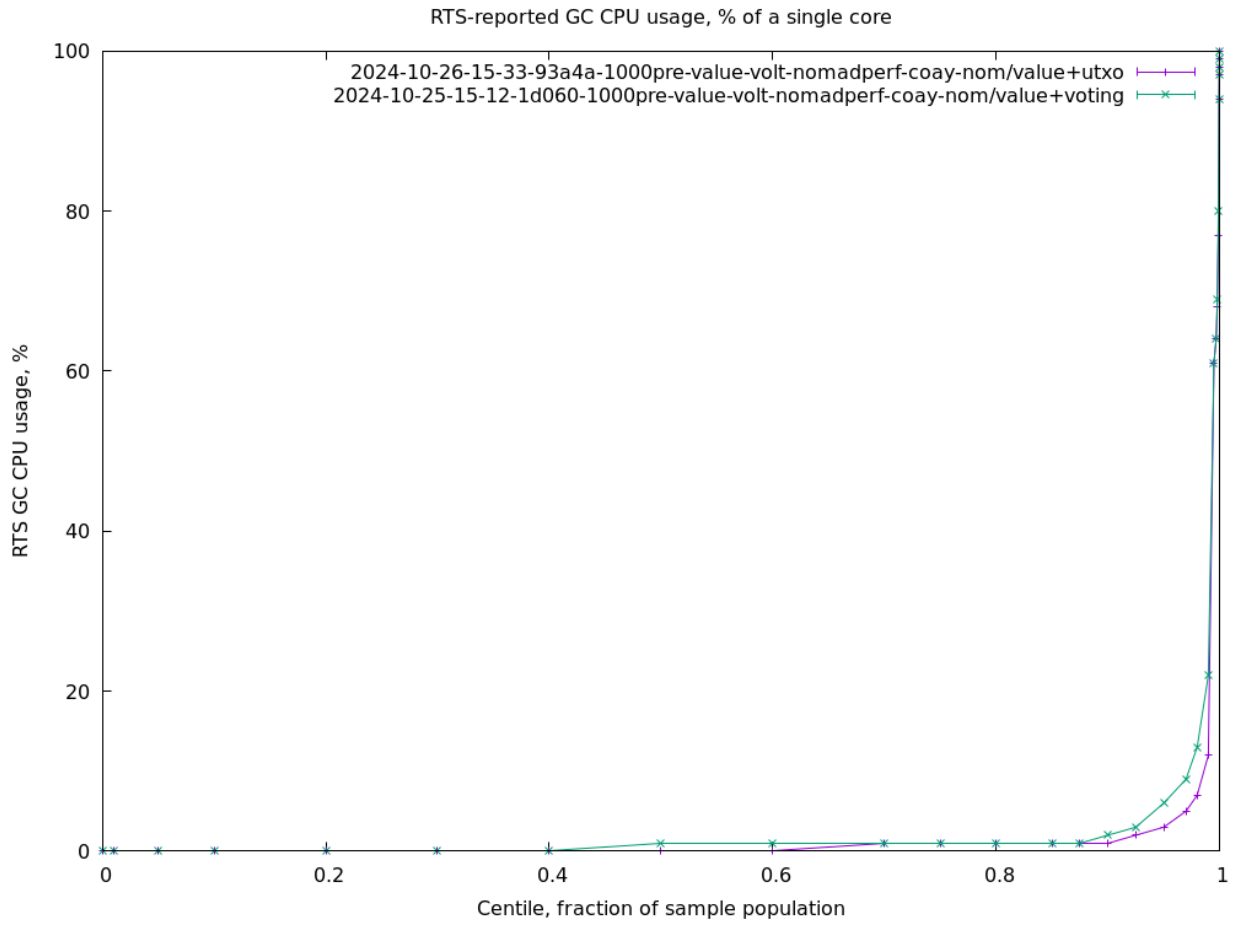
Chapter 3

Cluster performance charts

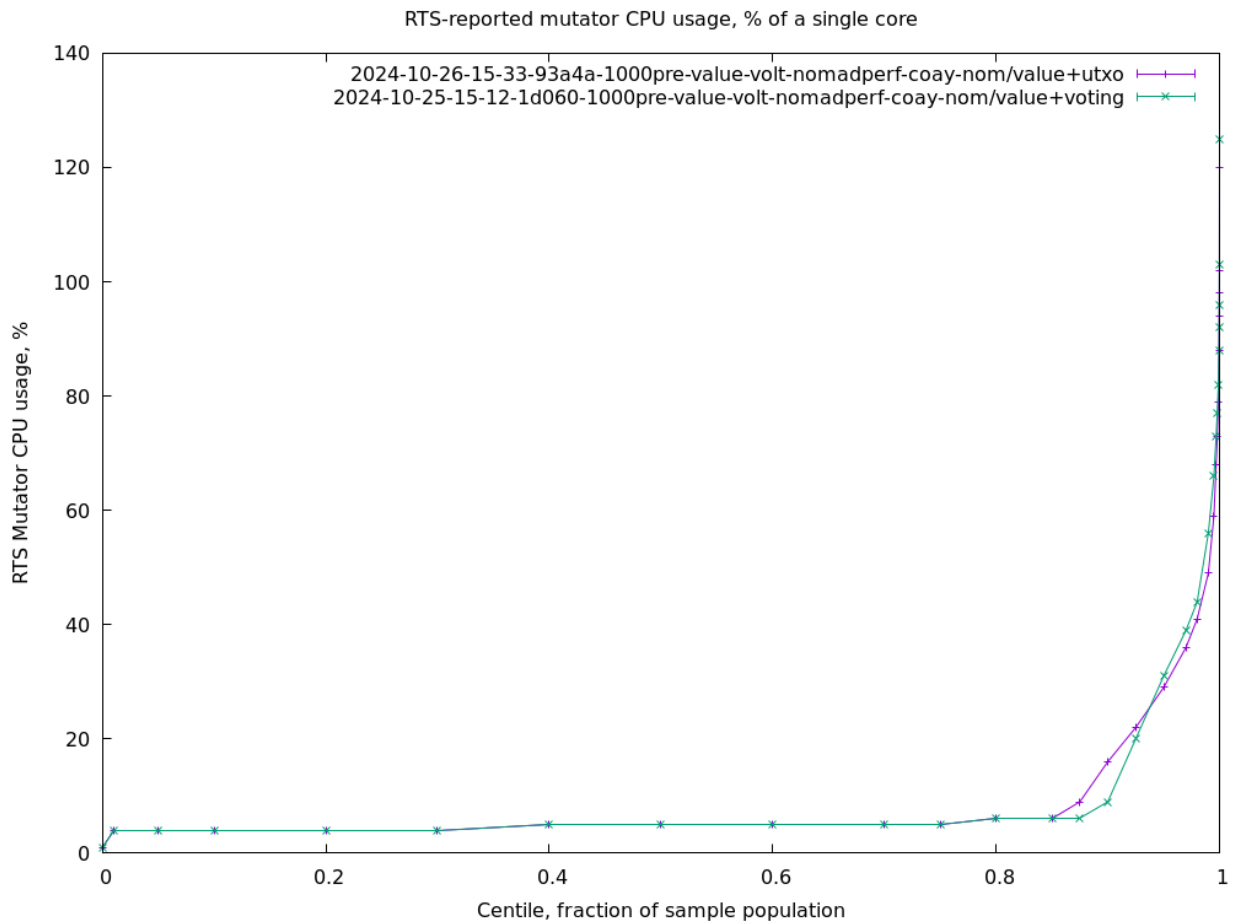
Process CPU usage (CentiCpu) Kernel-reported CPU process usage, % of a single core



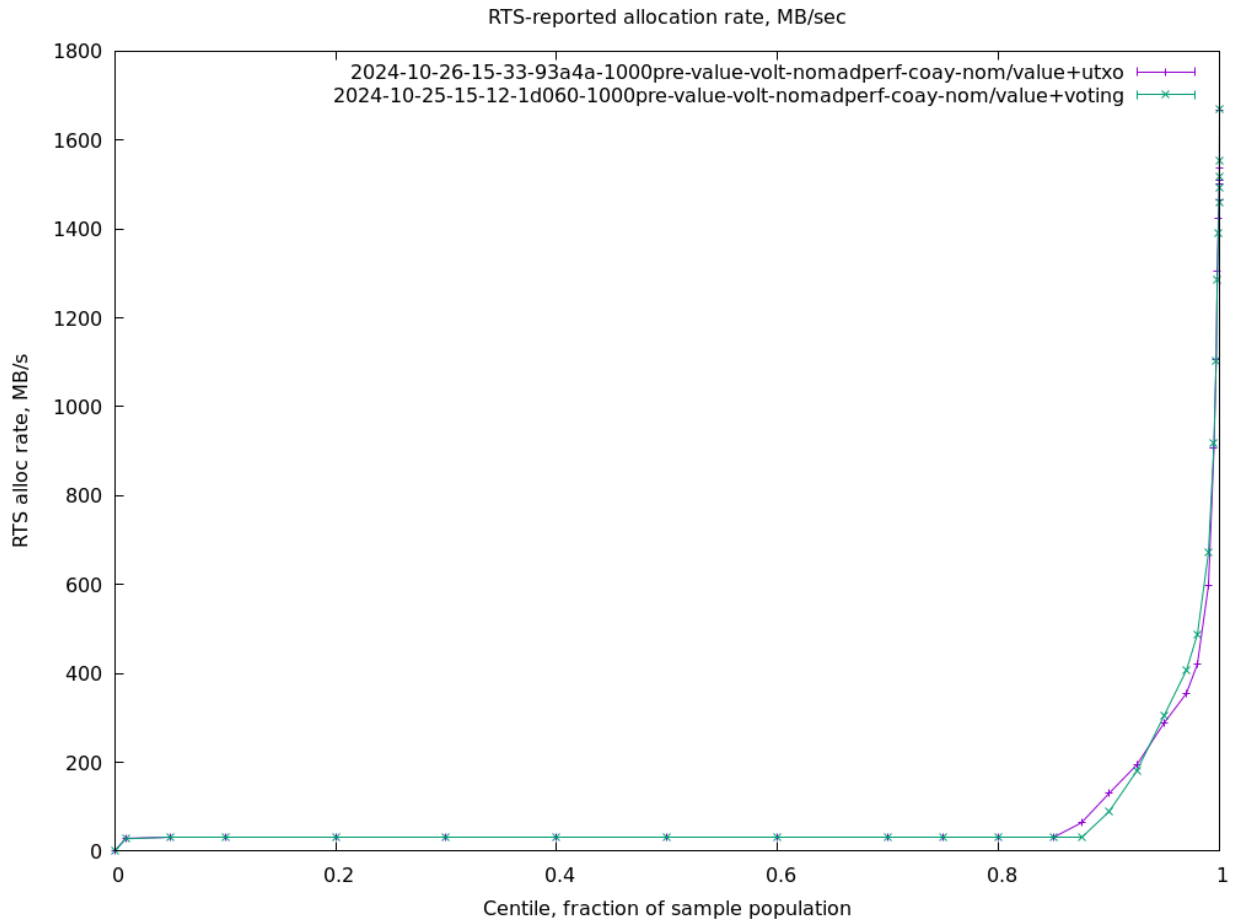
RTS GC CPU usage (CentiGC) RTS-reported GC CPU usage, % of a single core



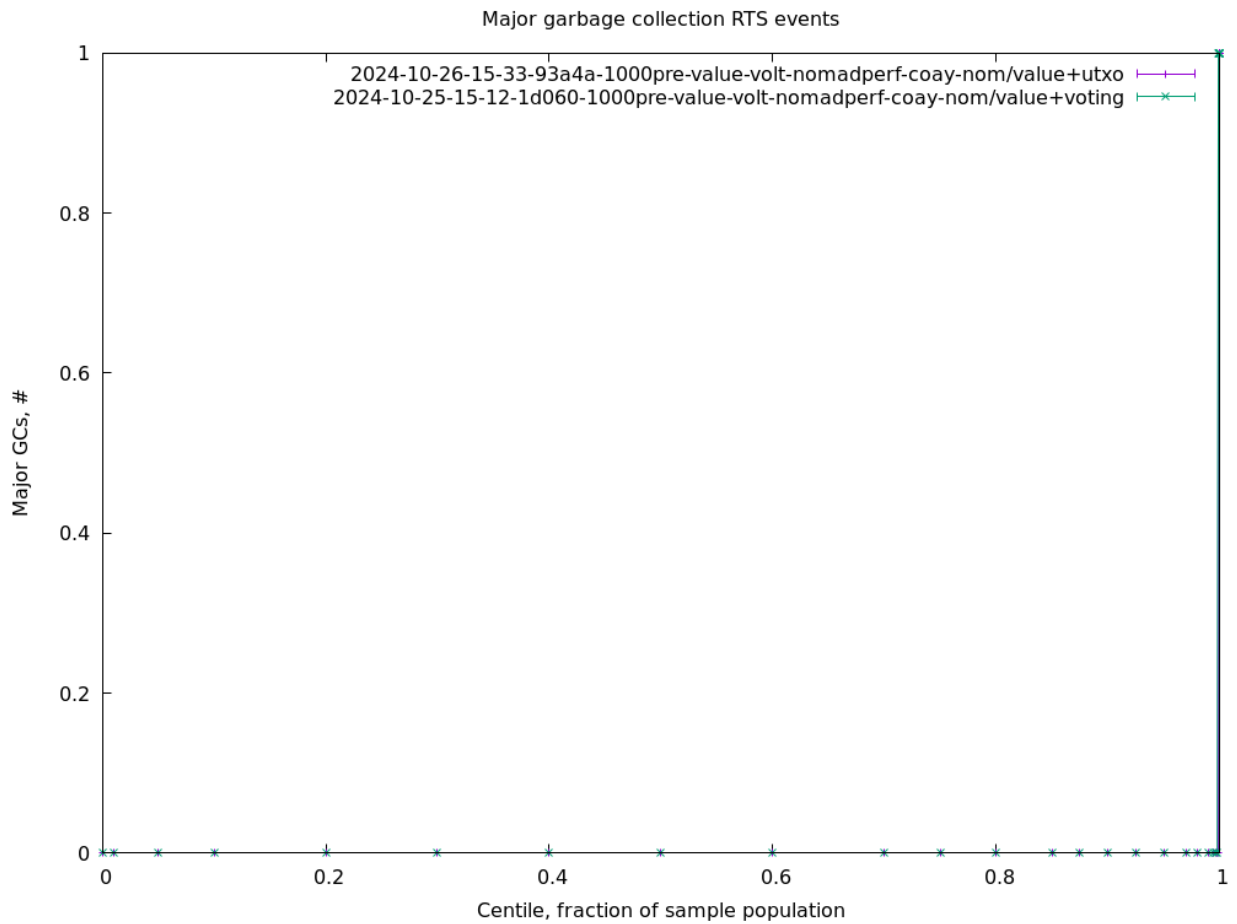
RTS Mutator CPU usage (CentiMut) RTS-reported mutator CPU usage, % of a single core



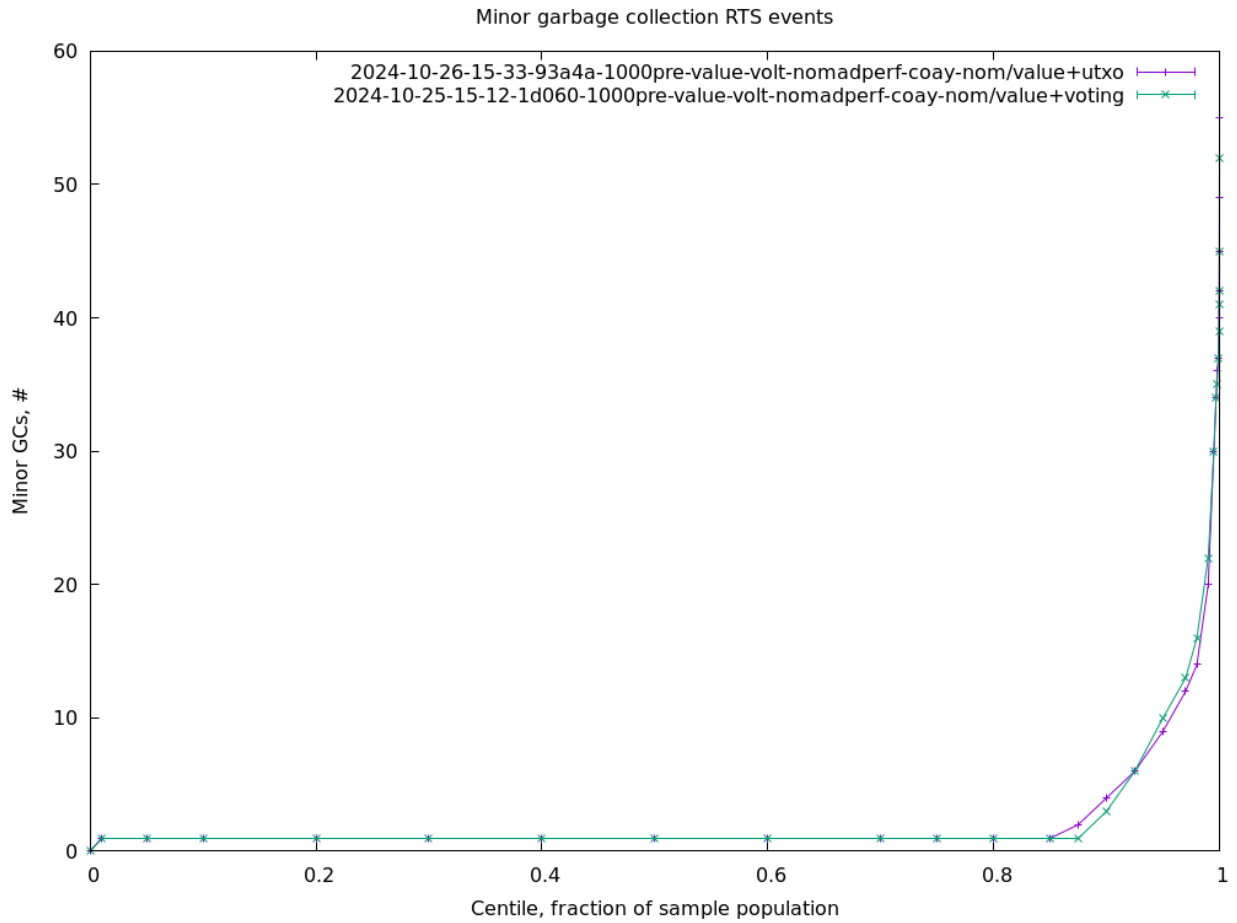
RTS alloc rate (Alloc) RTS-reported allocation rate, MB/sec



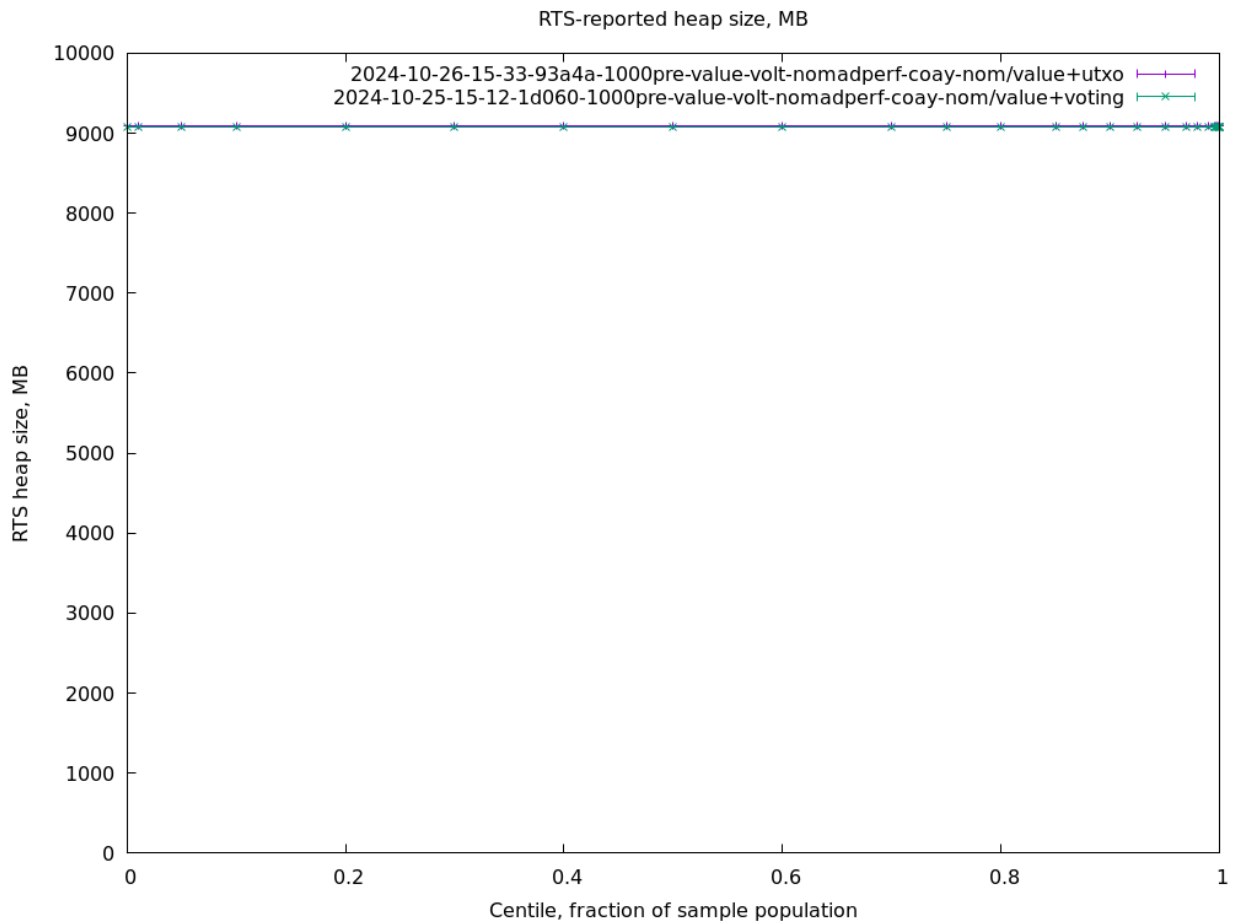
Major GCs (GcsMajor) Major garbage collection RTS events



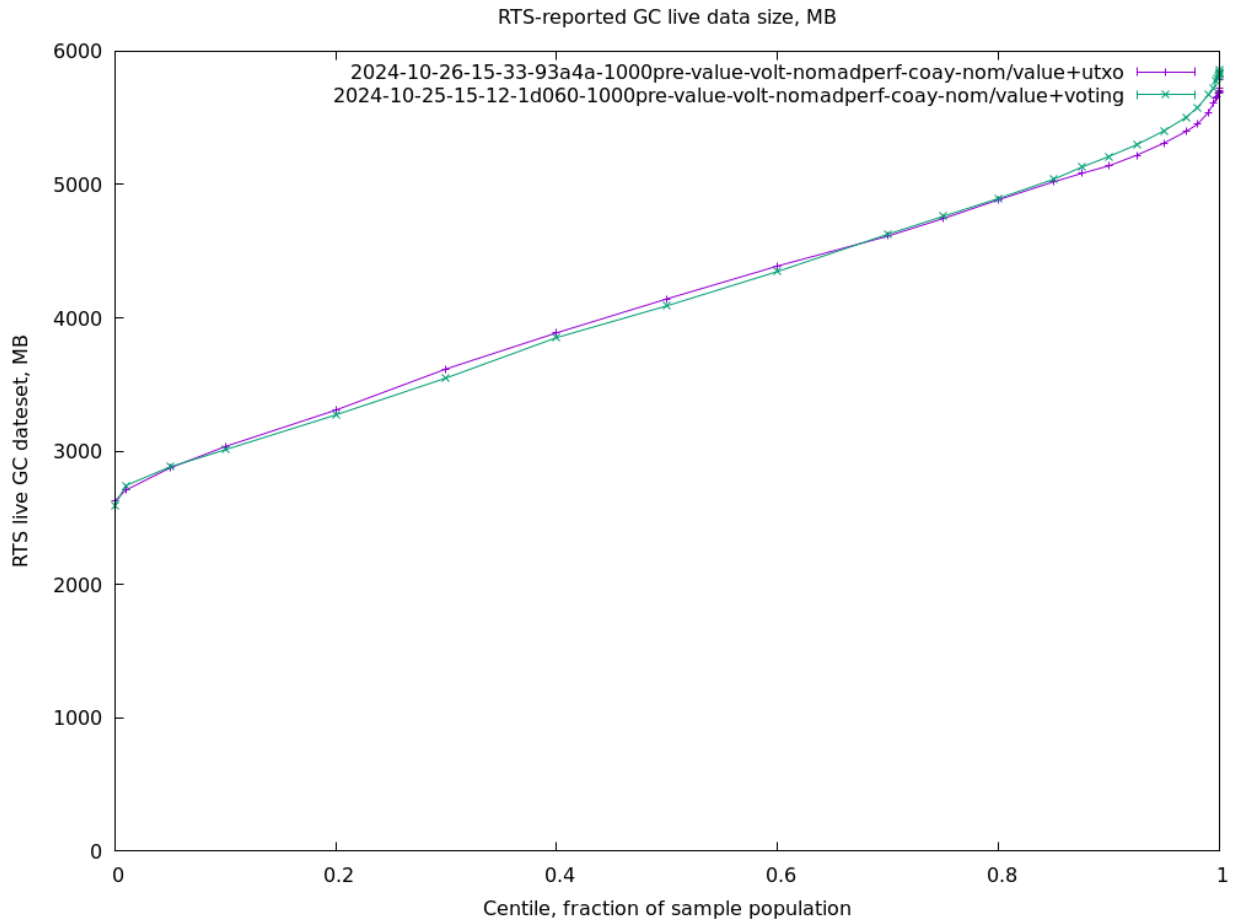
Minor GCs (GcsMinor) Minor garbage collection RTS events



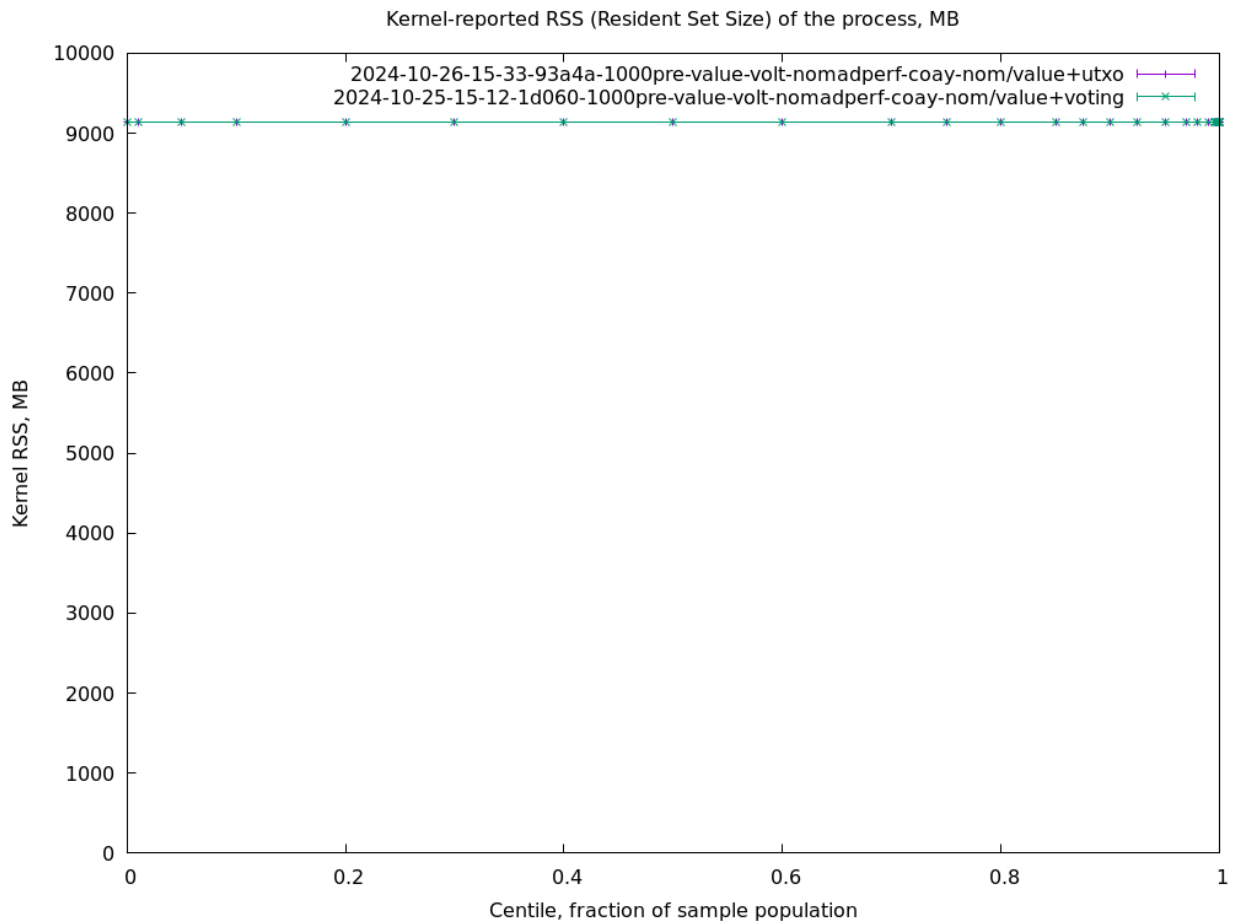
RTS heap size (Heap) RTS-reported heap size, MB



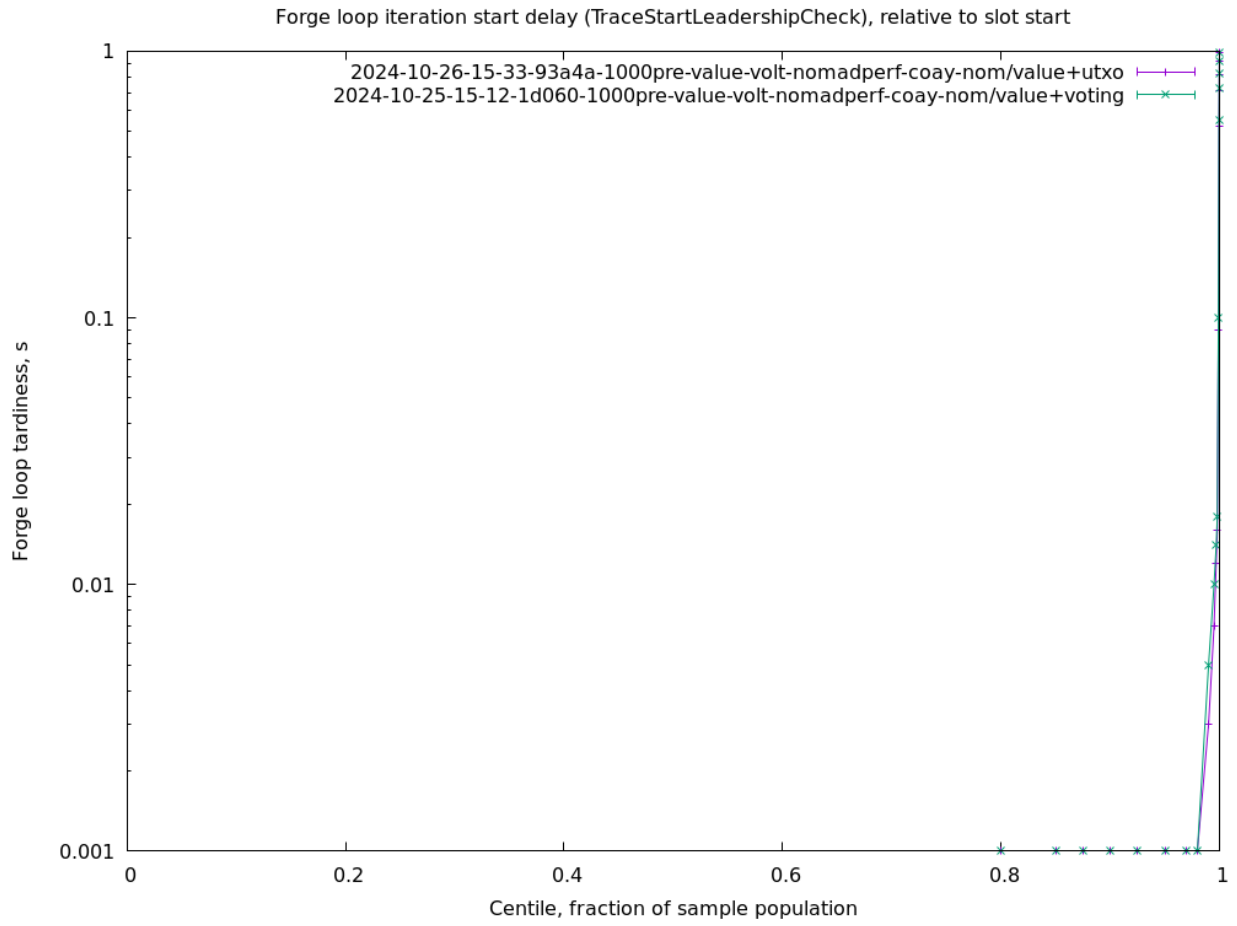
RTS live GC dataset (Live) RTS-reported GC live data size, MB



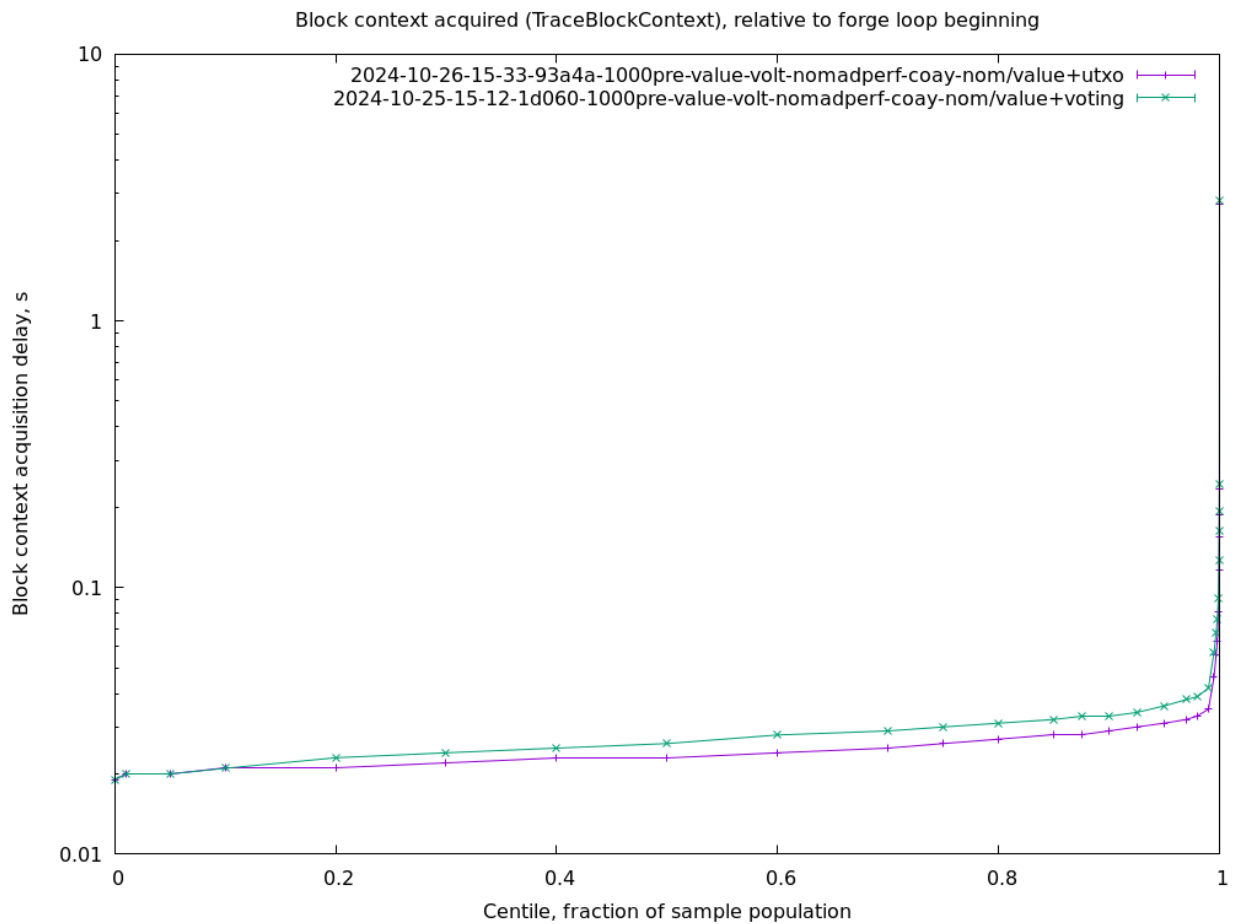
Kernel RSS (RSS) Kernel-reported RSS (Resident Set Size) of the process, MB



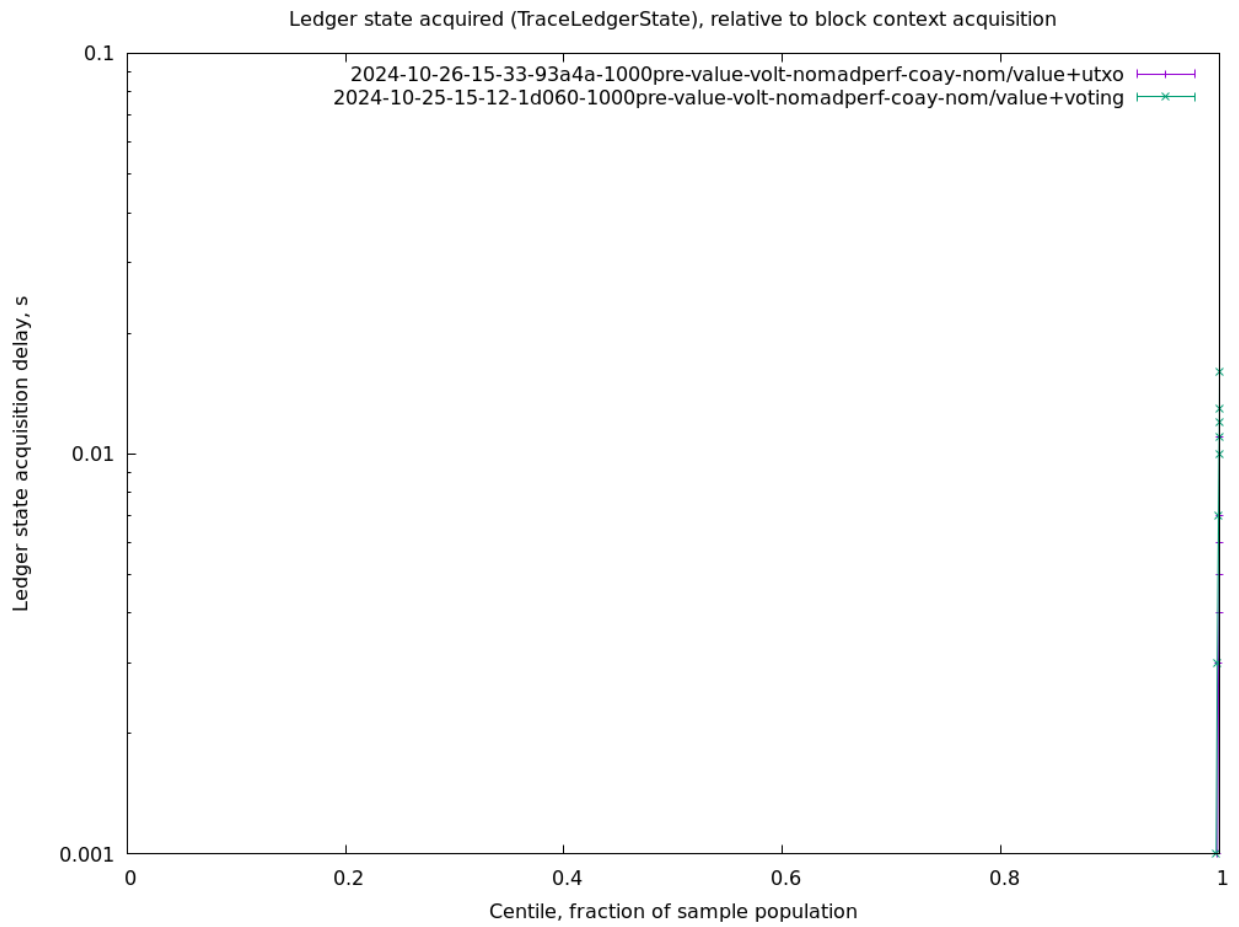
Forge loop tardiness (cdfStarted) Forge loop iteration start delay (TraceStartLeadershipCheck), relative to slot start



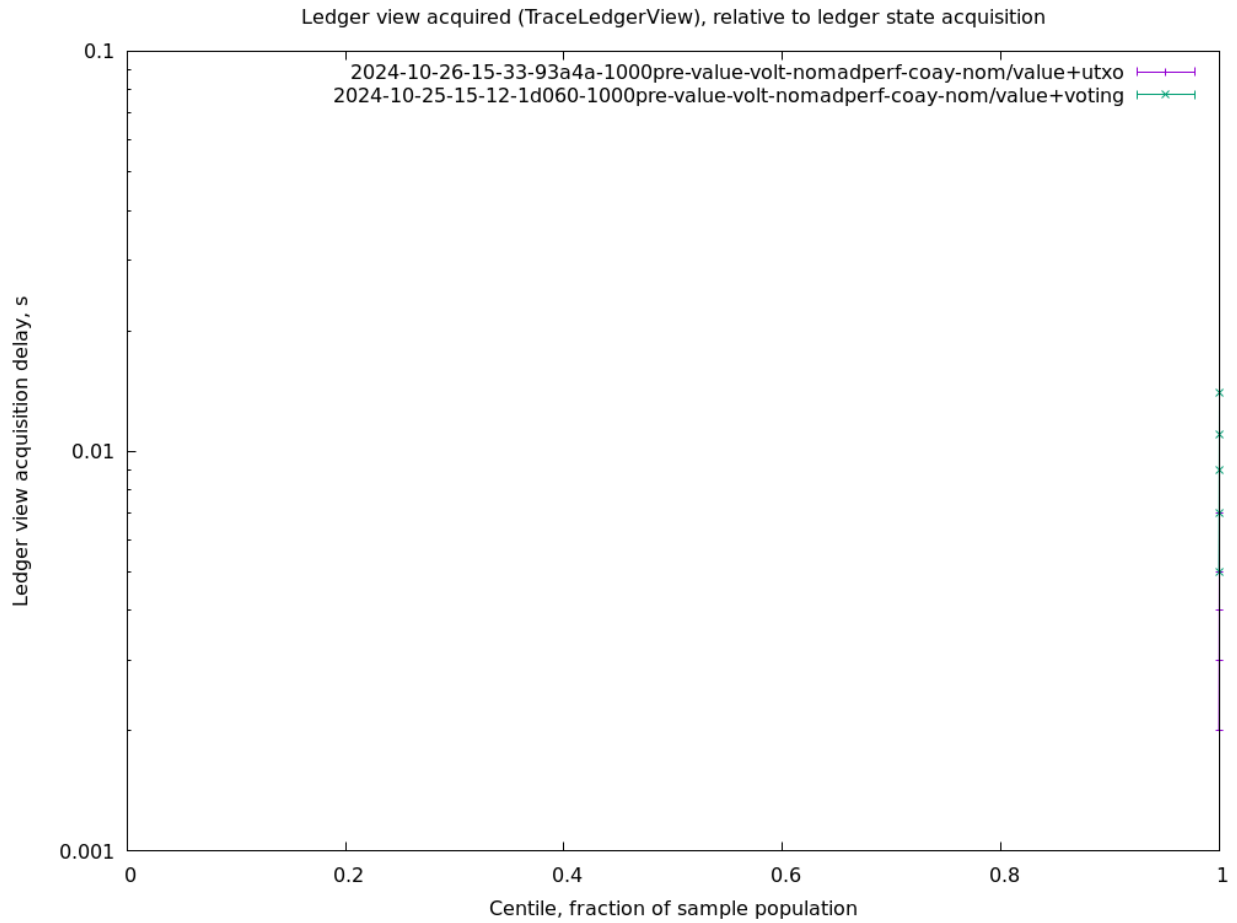
Block context acquisition delay (cdfBlkCtx) Block context acquired (TraceBlockContext), relative to forge loop beginning



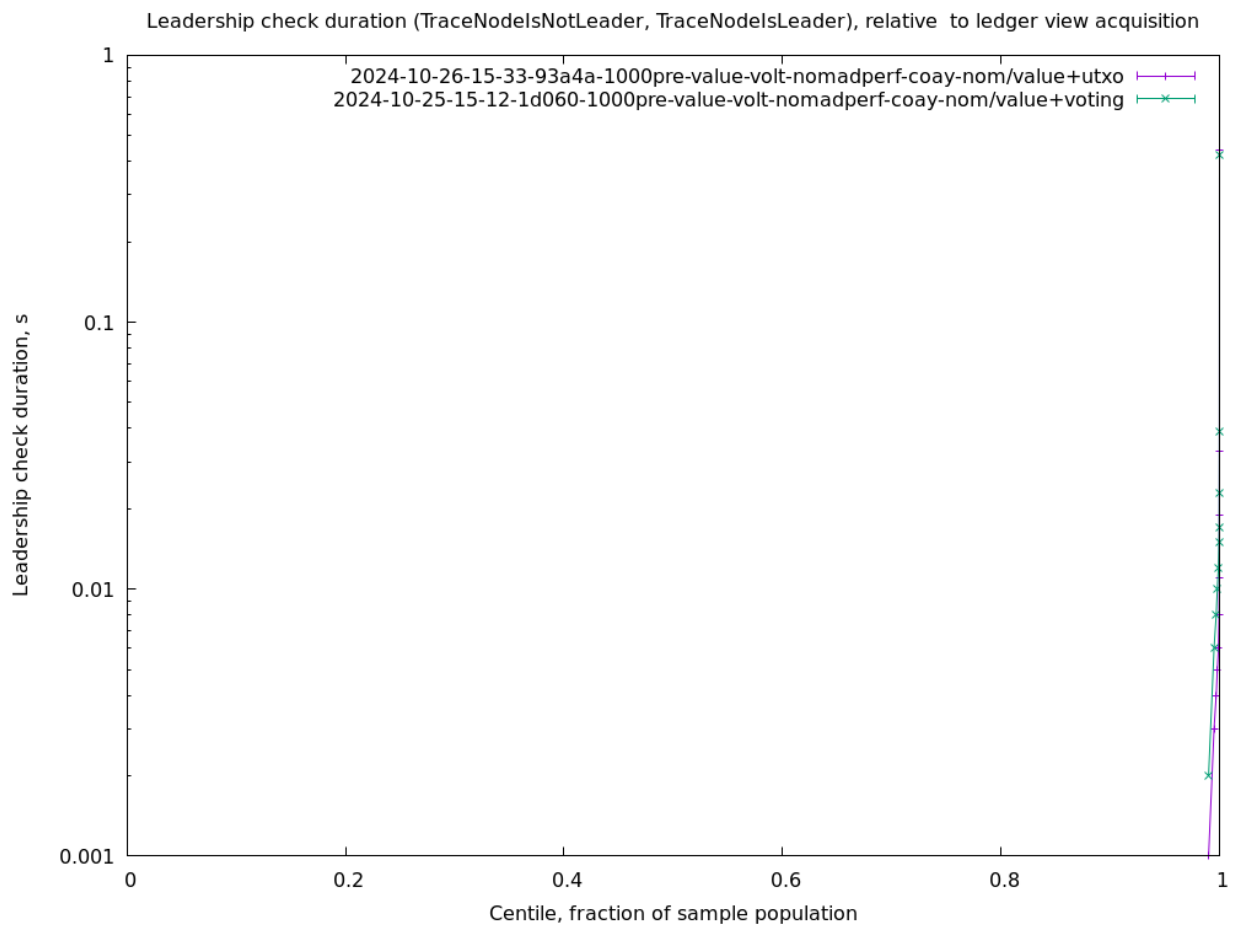
Ledger state acquisition delay (cdfLgrState) Ledger state acquired (TraceLedgerState), relative to block context acquisition



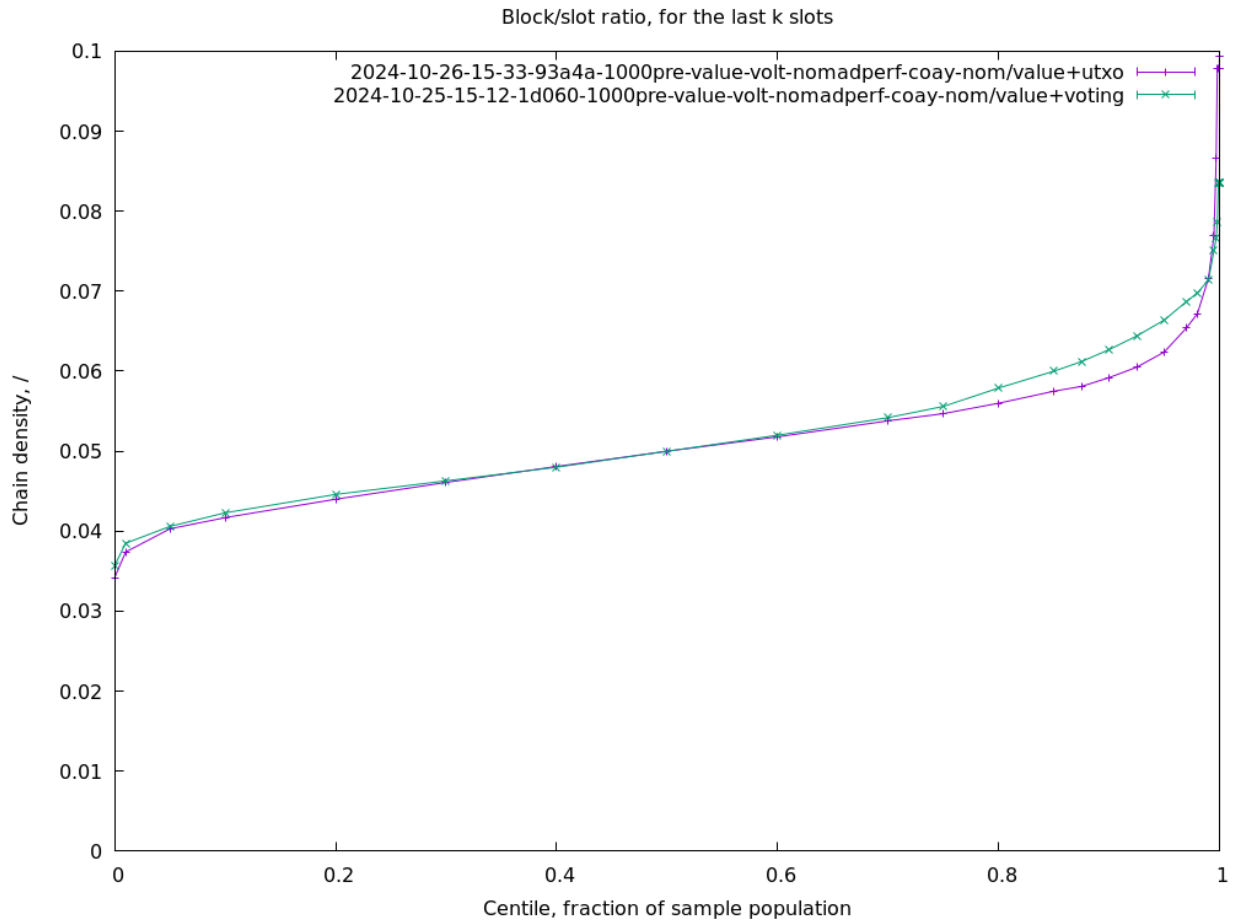
Ledger view acquisition delay (cdfLgrView) Ledger view acquired (TraceLedgerView), relative to ledger state acquisition



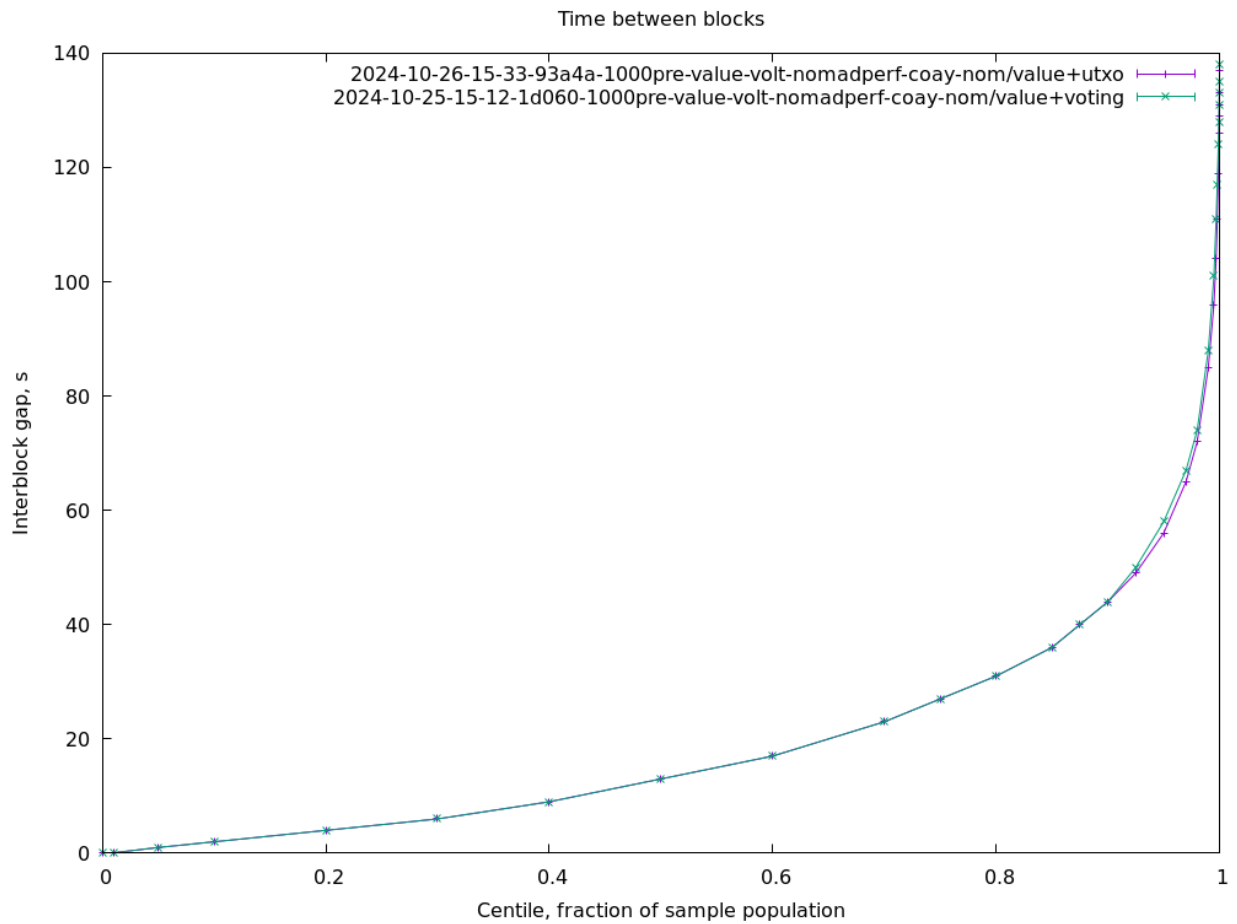
Leadership check duration (cdfLeading) Leadership check duration (TraceNodeIsNotLeader, TraceNodeIsLeader), relative to ledger view acquisition



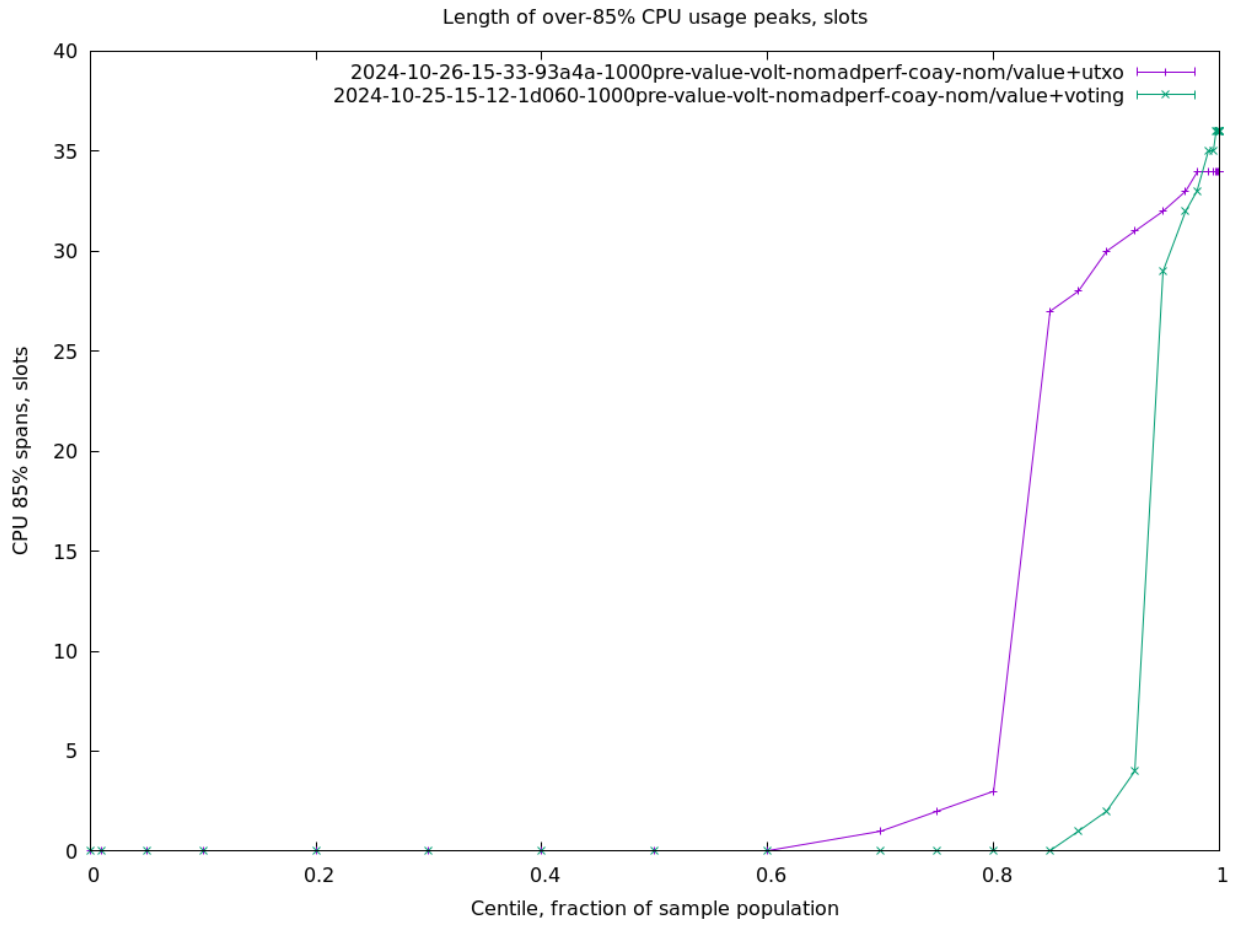
Chain density (cdfDensity) Block/slot ratio, for the last 'k' slots



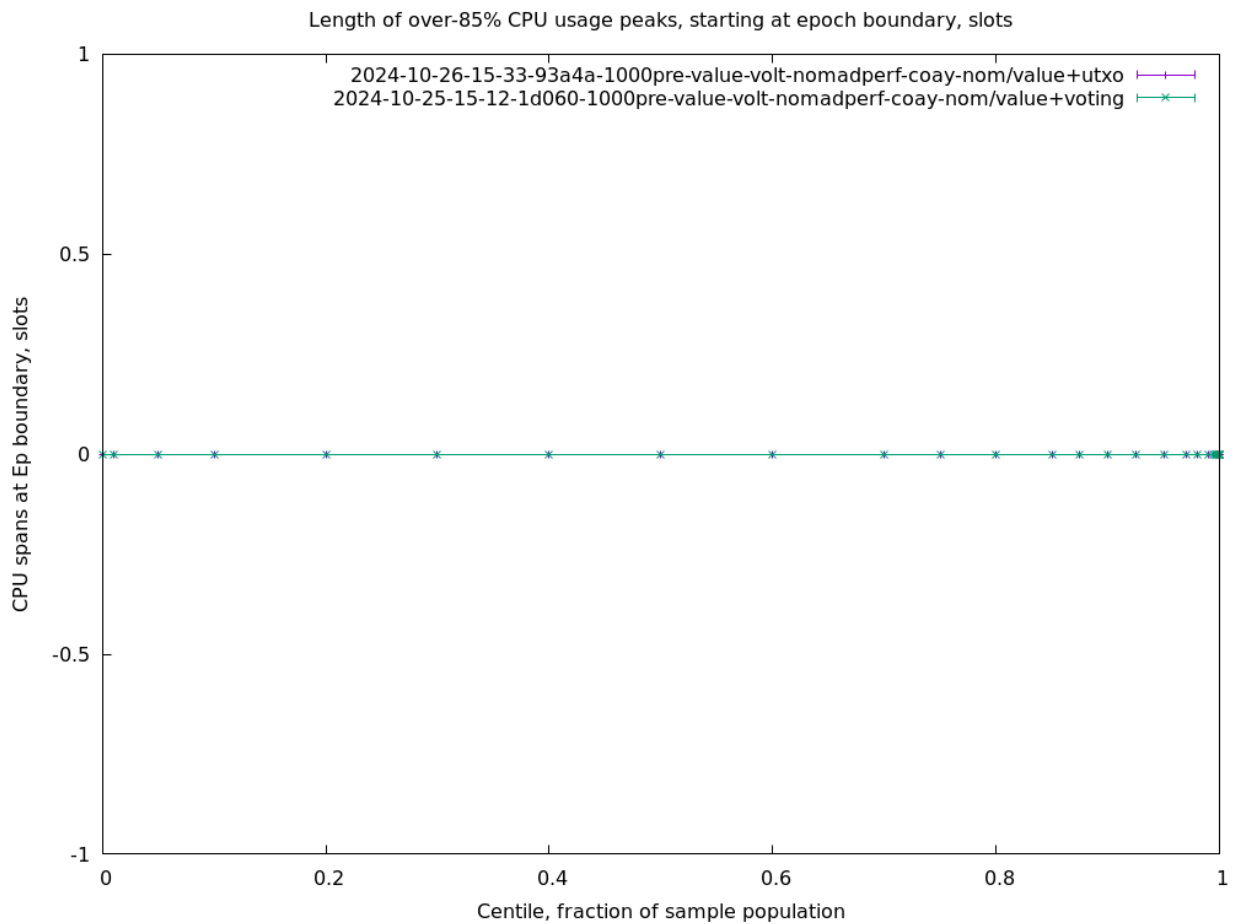
Interblock gap (cdfBlockGap) Time between blocks



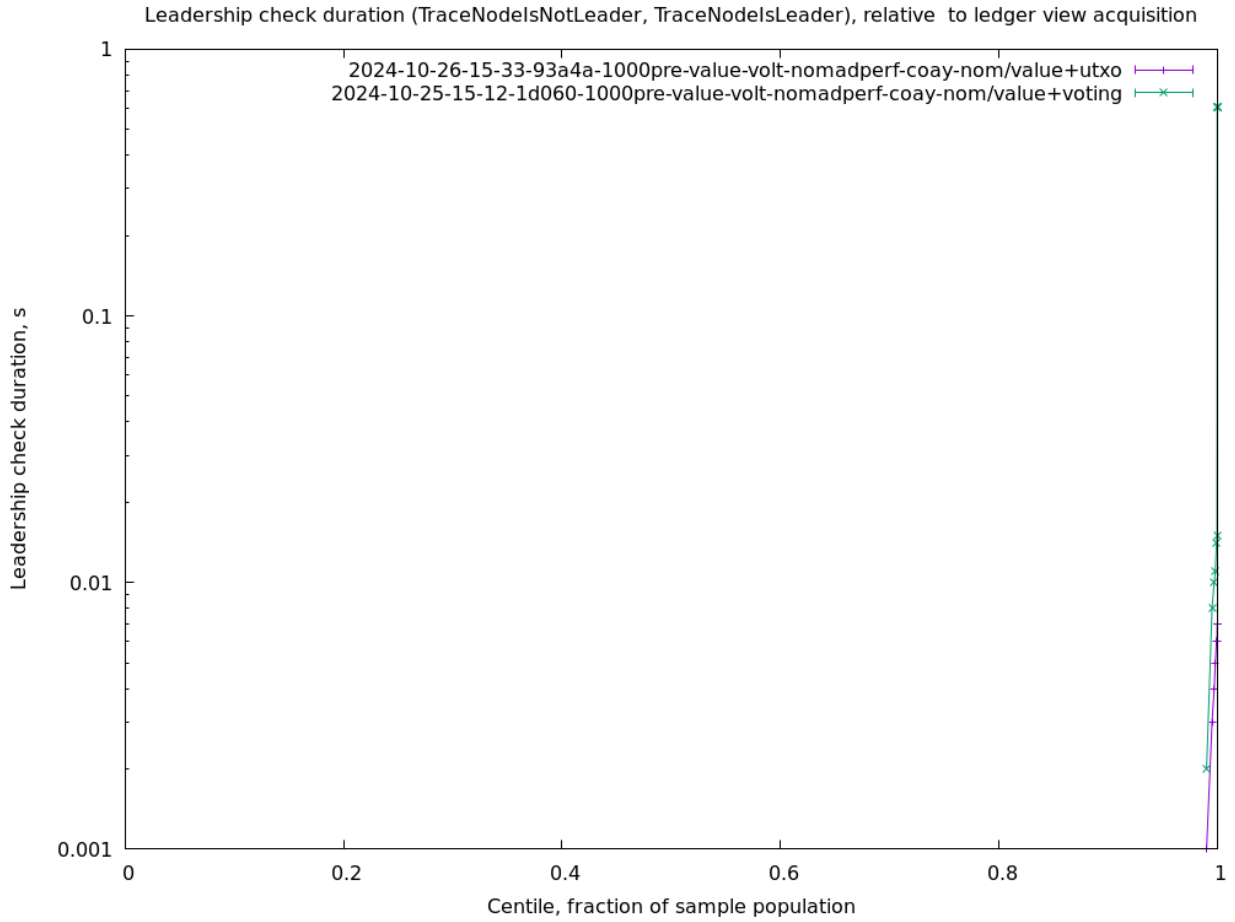
CPU 85% spans (cdfSpanLensCpu) Length of over-85% CPU usage peaks, slots



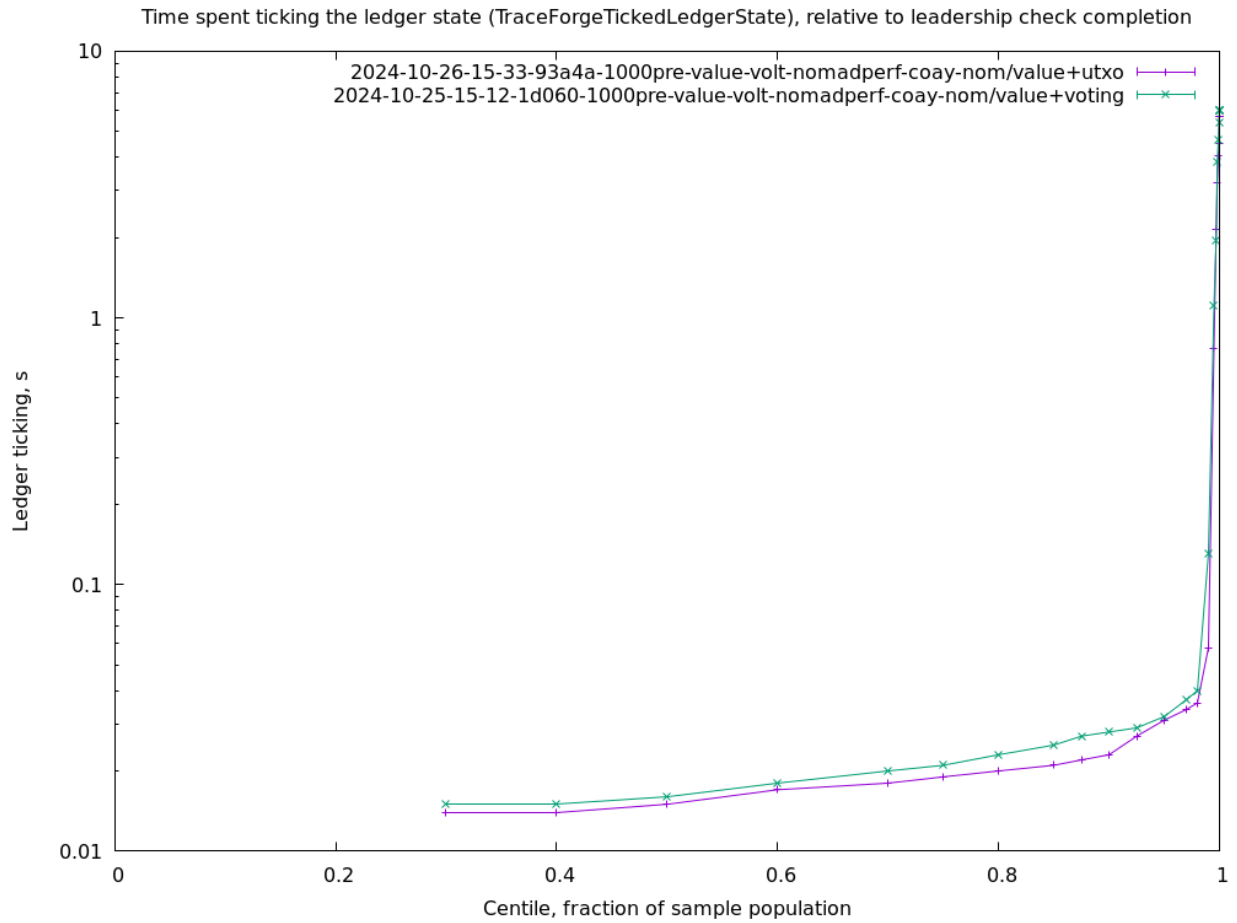
CPU spans at Ep boundary (cdfSpanLensCpuEpoch) Length of over-85% CPU usage peaks, starting at epoch boundary, slots



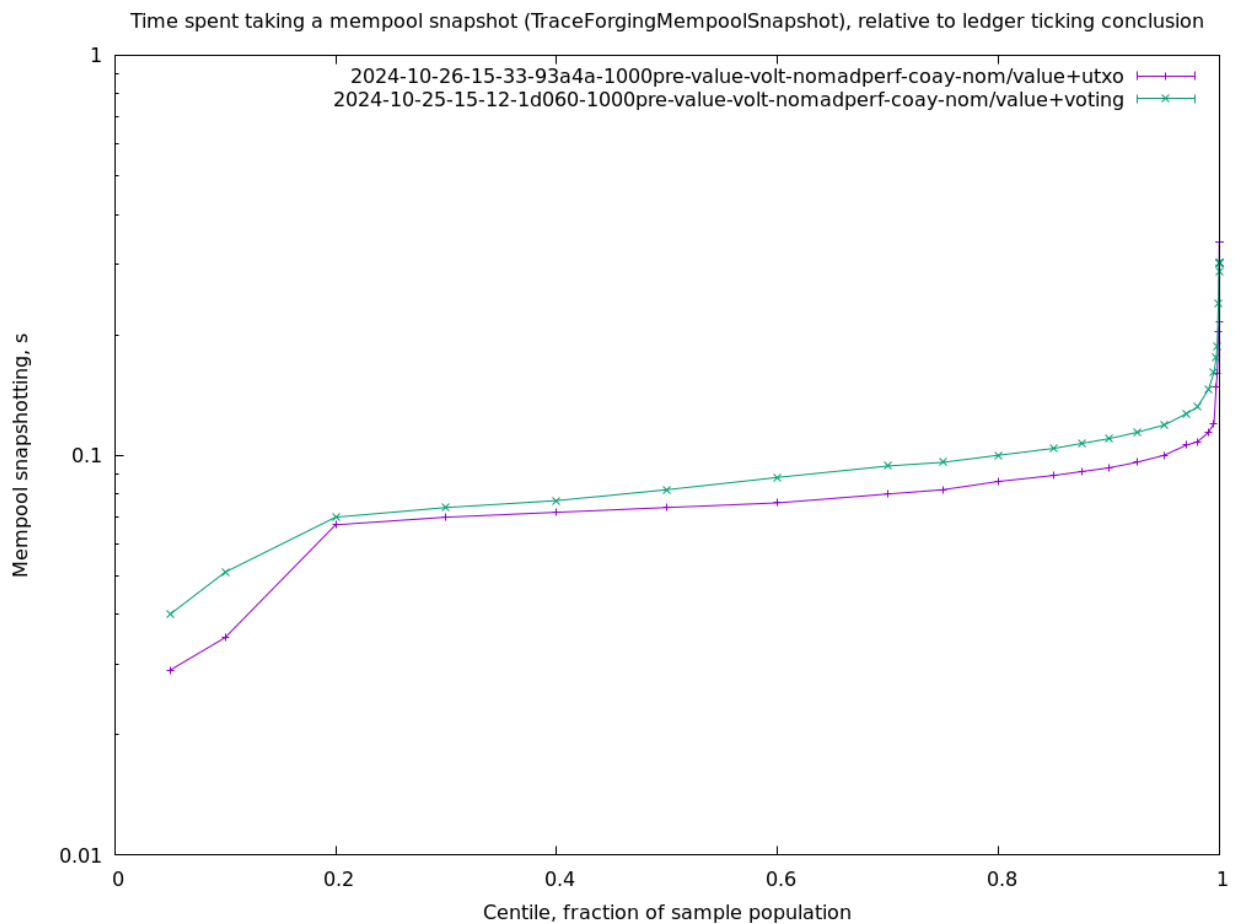
Leadership check duration (cdfForgerLead) Leadership check duration (TraceNodeIsNotLeader, TraceNodeIsLeader), relative to ledger view acquisition



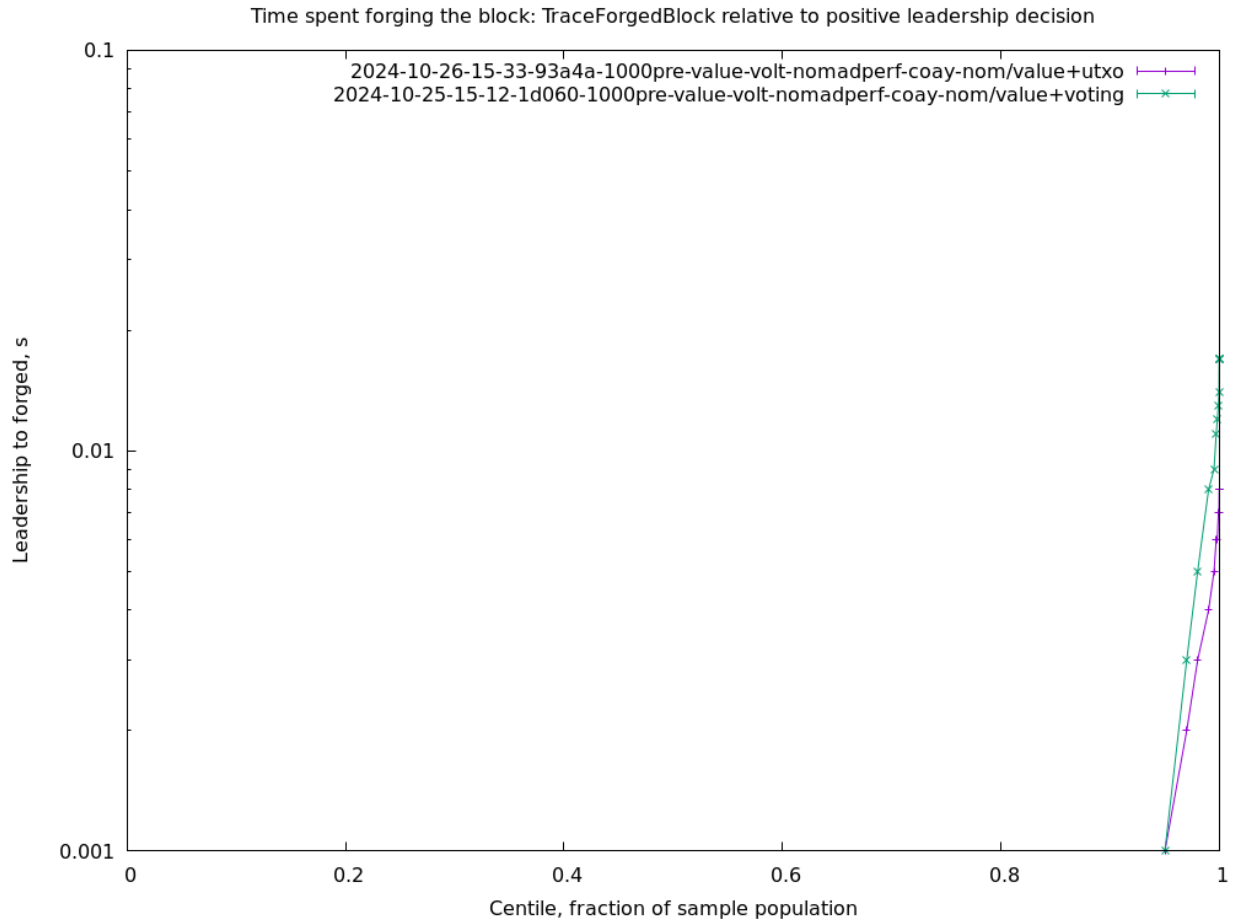
Ledger ticking (cdfForgerTicked) Time spent ticking the ledger state (TraceForgeTickedLedgerState), relative to leadership check completion



Mempool snapshotting (cdfForgerMemSnap) Time spent taking a mempool snapshot (TraceForgingMempool-Snapshot), relative to ledger ticking conclusion

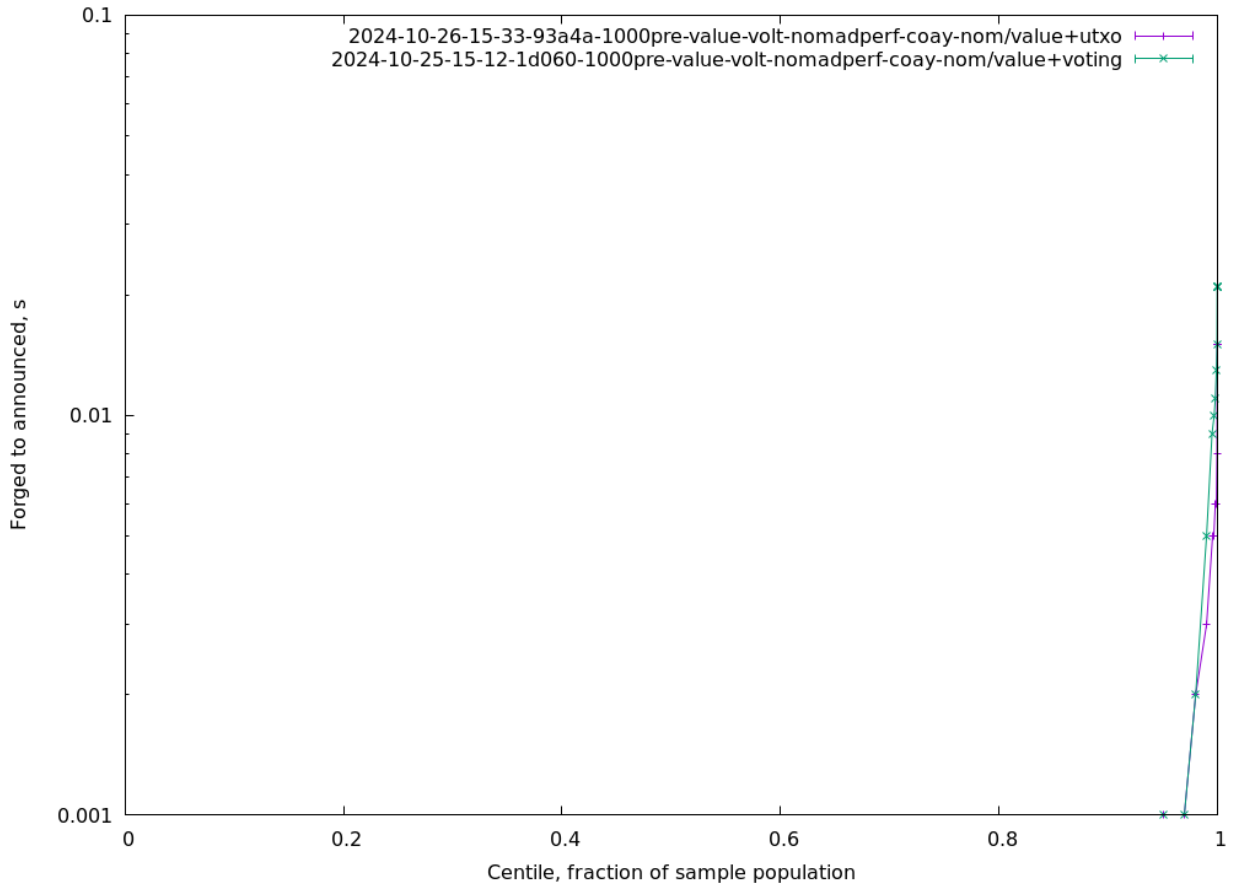


Leadership to forged (cdfForgerForge) Time spent forging the block: TraceForgedBlock relative to positive leadership decision

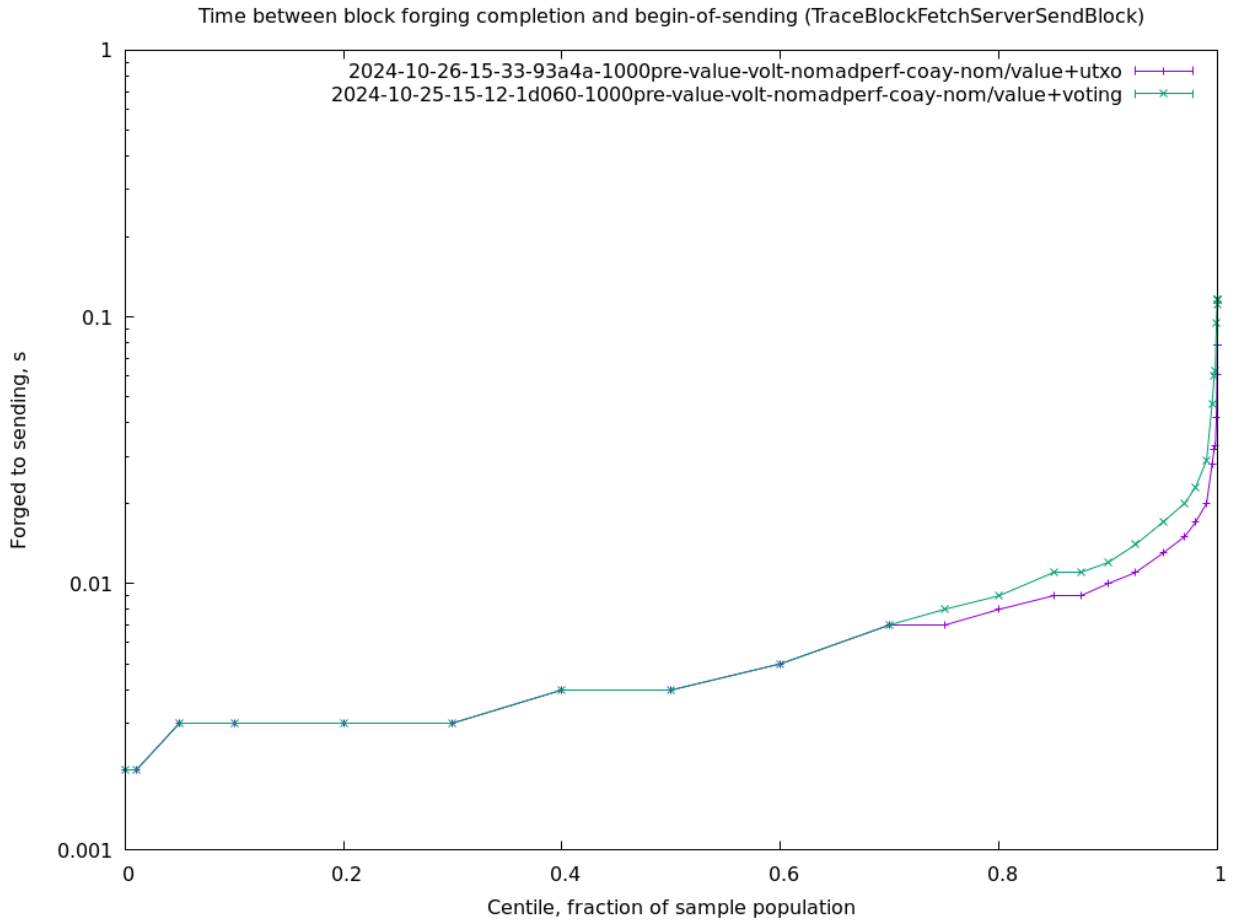


Forged to announced (cdfForgerAnnounce) Time between block forging completion and header announcement (ChainSyncServerEvent.TraceChainSyncServerRead.AddBlock)

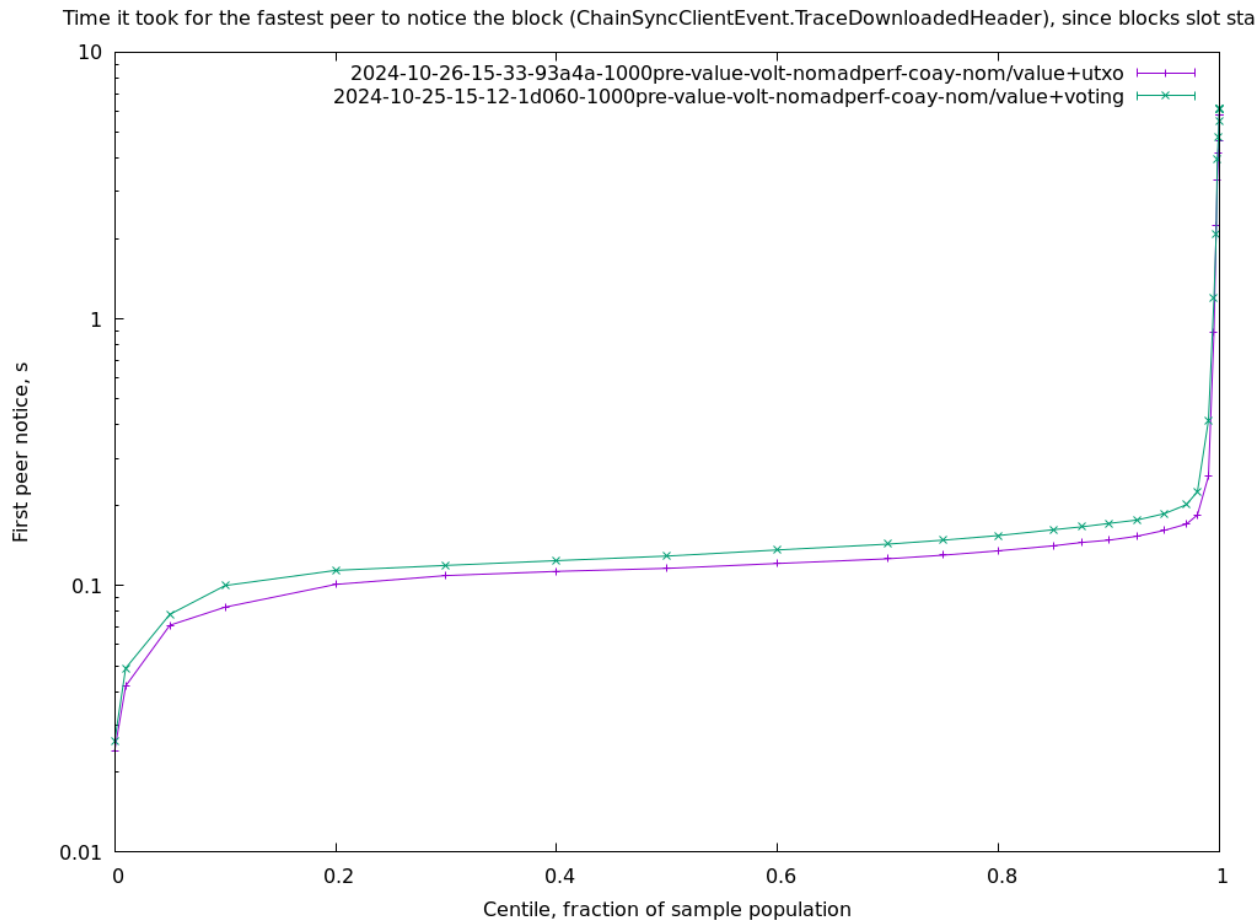
Time between block forging completion and header announcement (ChainSyncServerEvent.TraceChainSyncServerRead.AddF



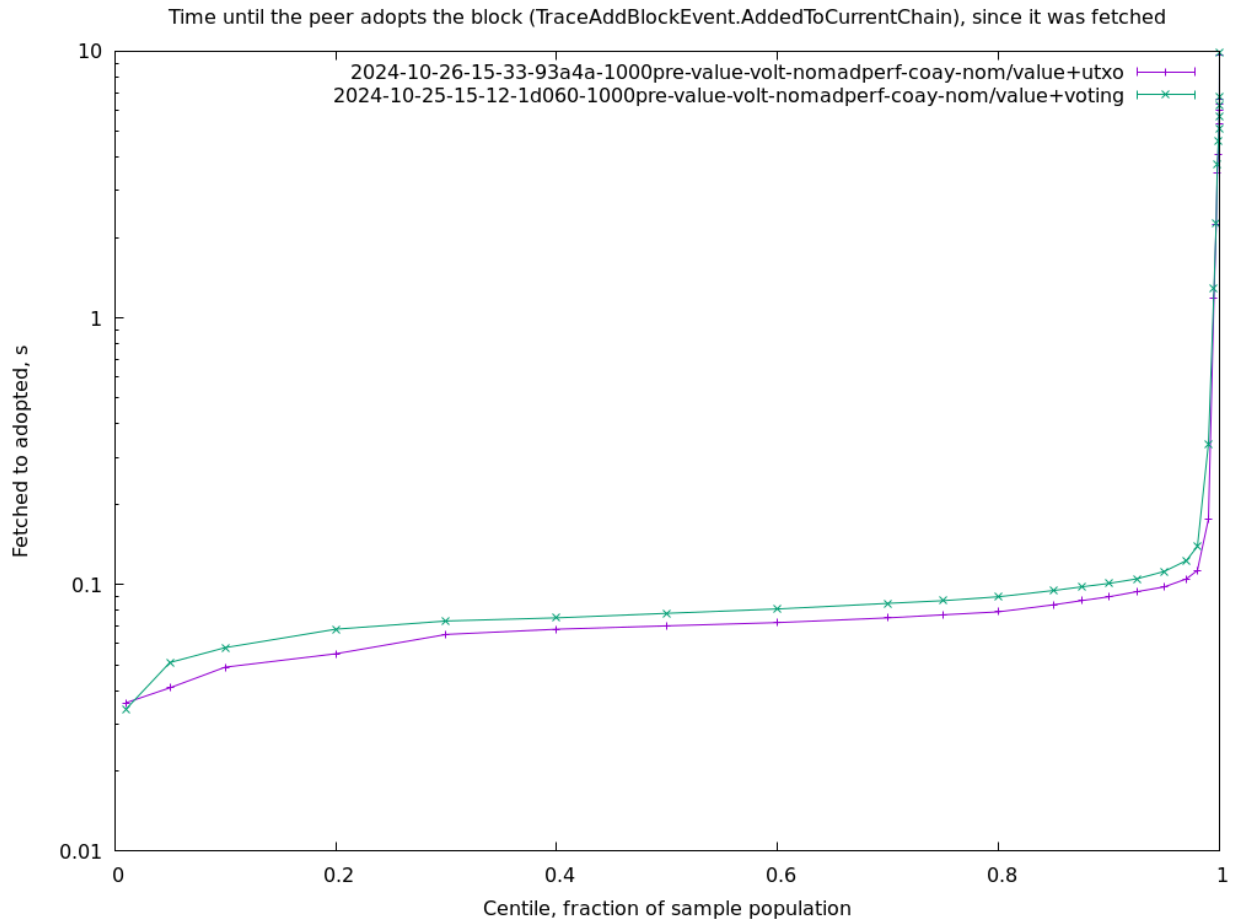
Forged to sending (cdfForgerSend) Time between block forging completion and begin-of-sending (TraceBlockFetchServerSendBlock)



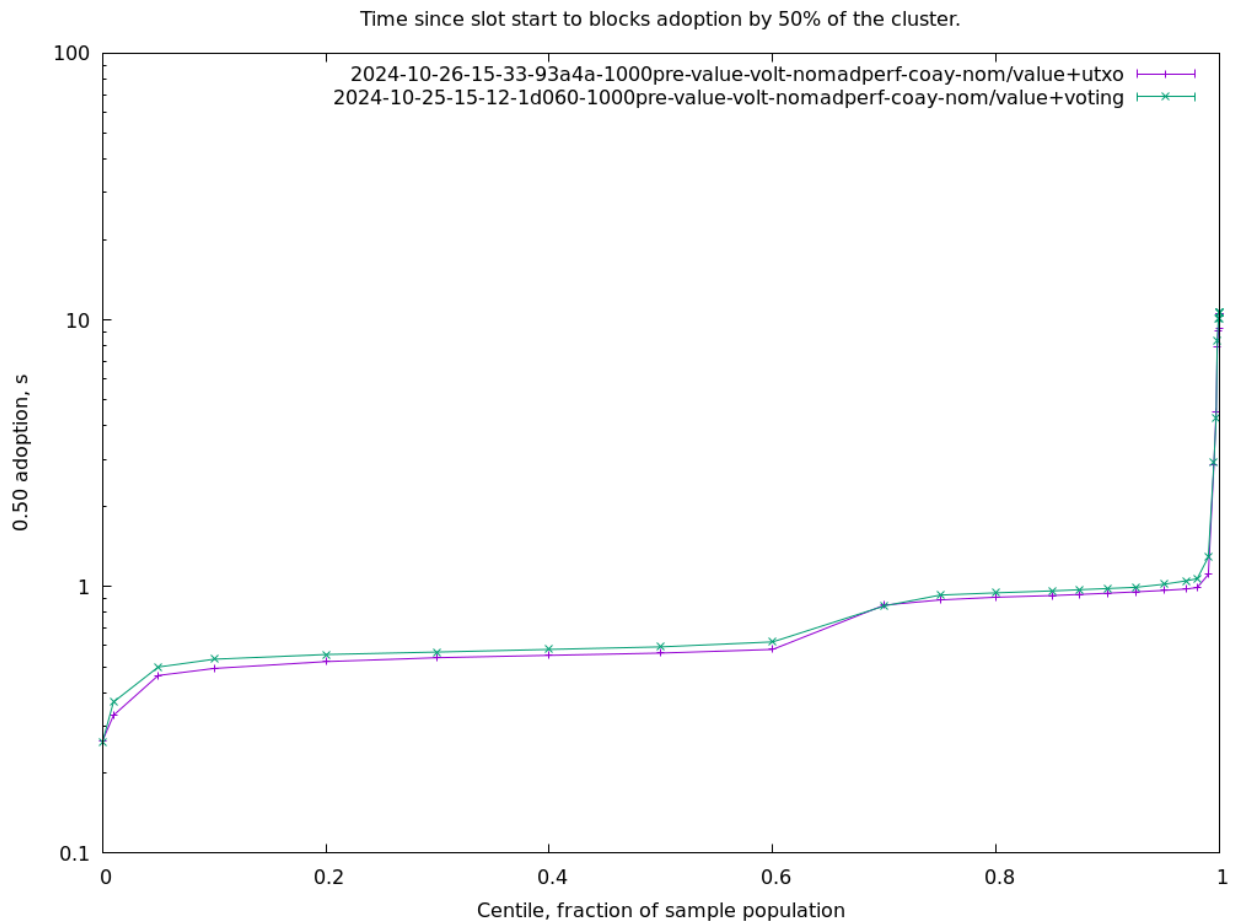
First peer notice (cdfPeerNoticeFirst) Time it took for the fastest peer to notice the block (ChainSyncClientEvent.TraceDownloadedHeader), since block's slot start



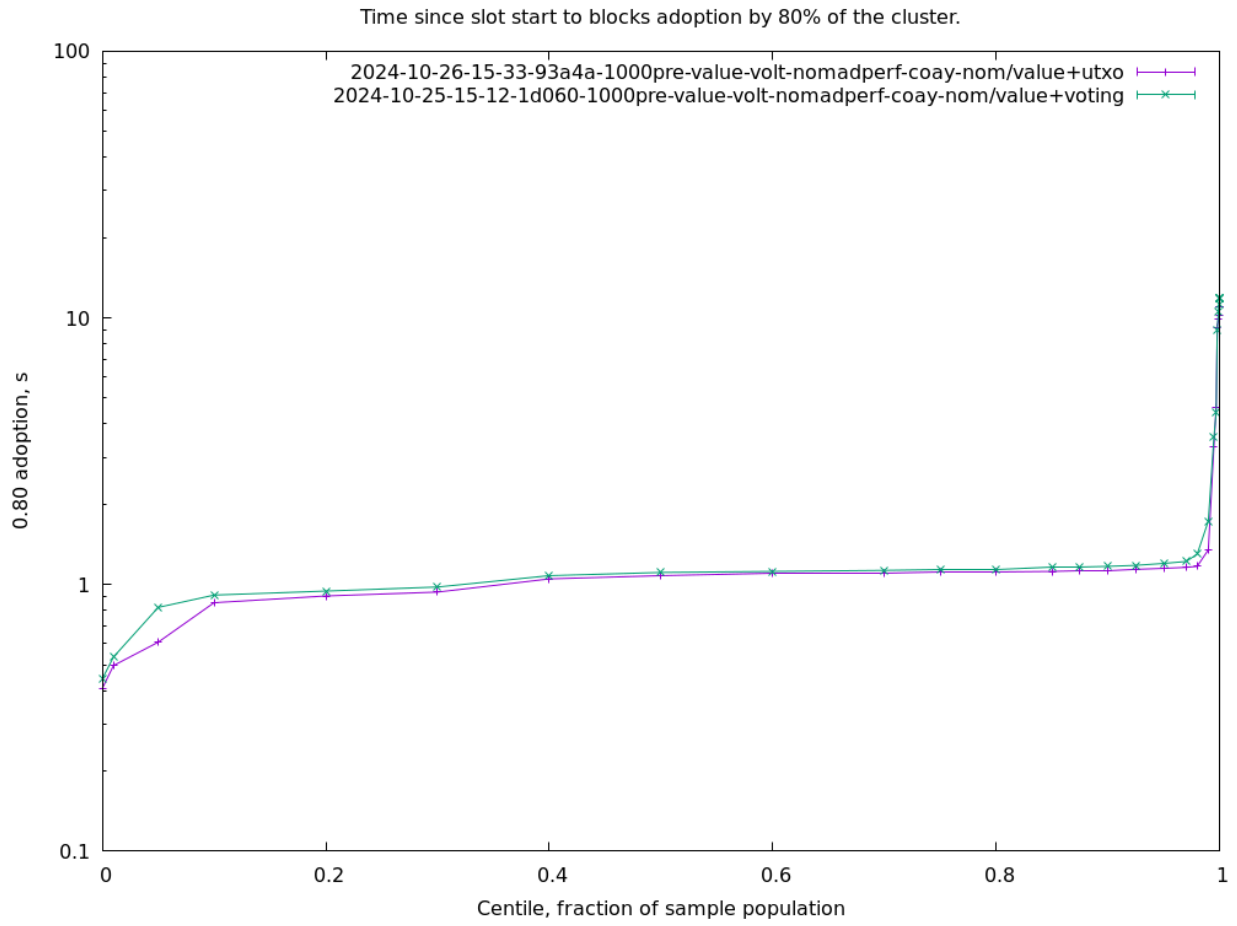
Fetches to adopted (cdfPeerAdoption) Time until the peer adopts the block (TraceAddBlockEvent.AddedToCurrentChain), since it was fetched



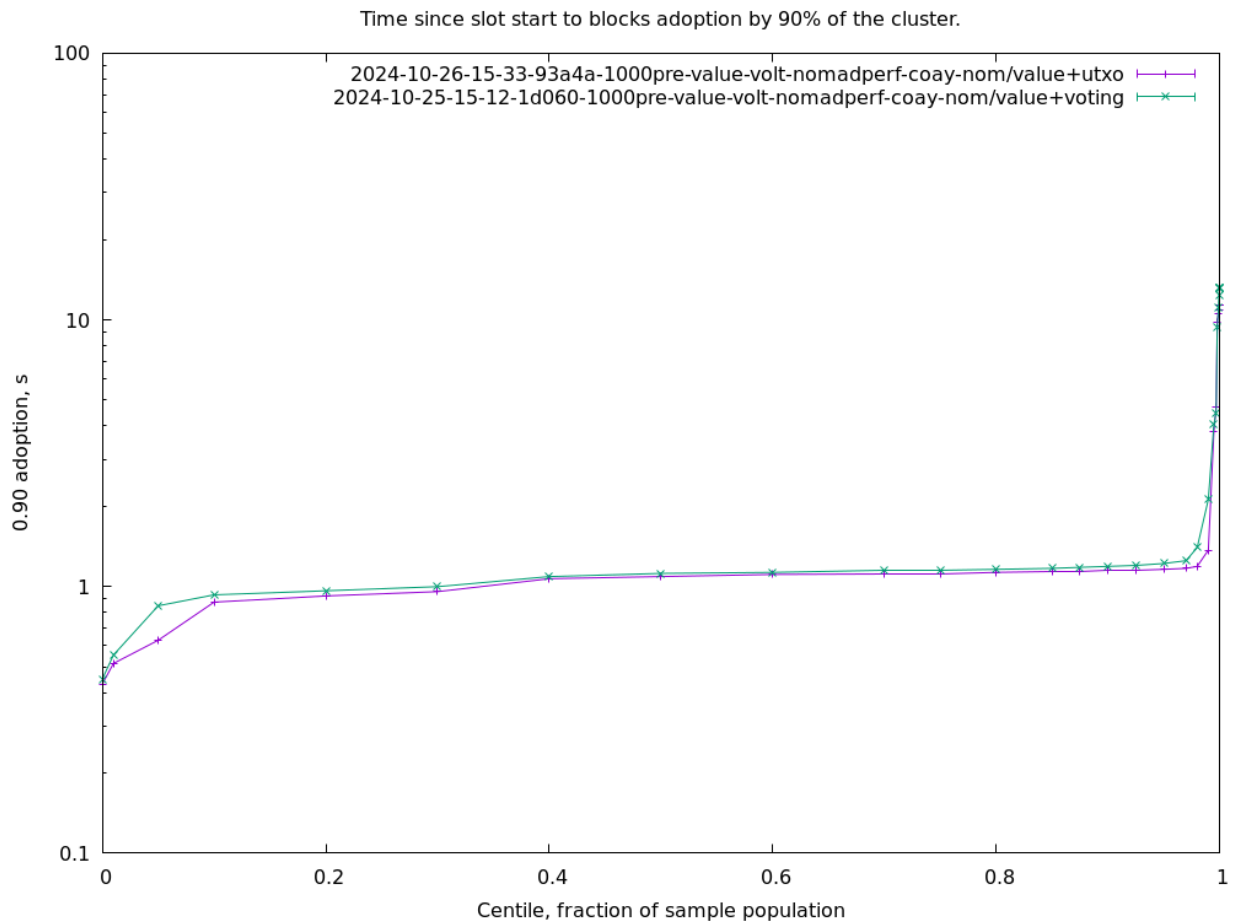
0.50 adoption (cdf0.50) Time since slot start to block's adoption by 50% of the cluster.



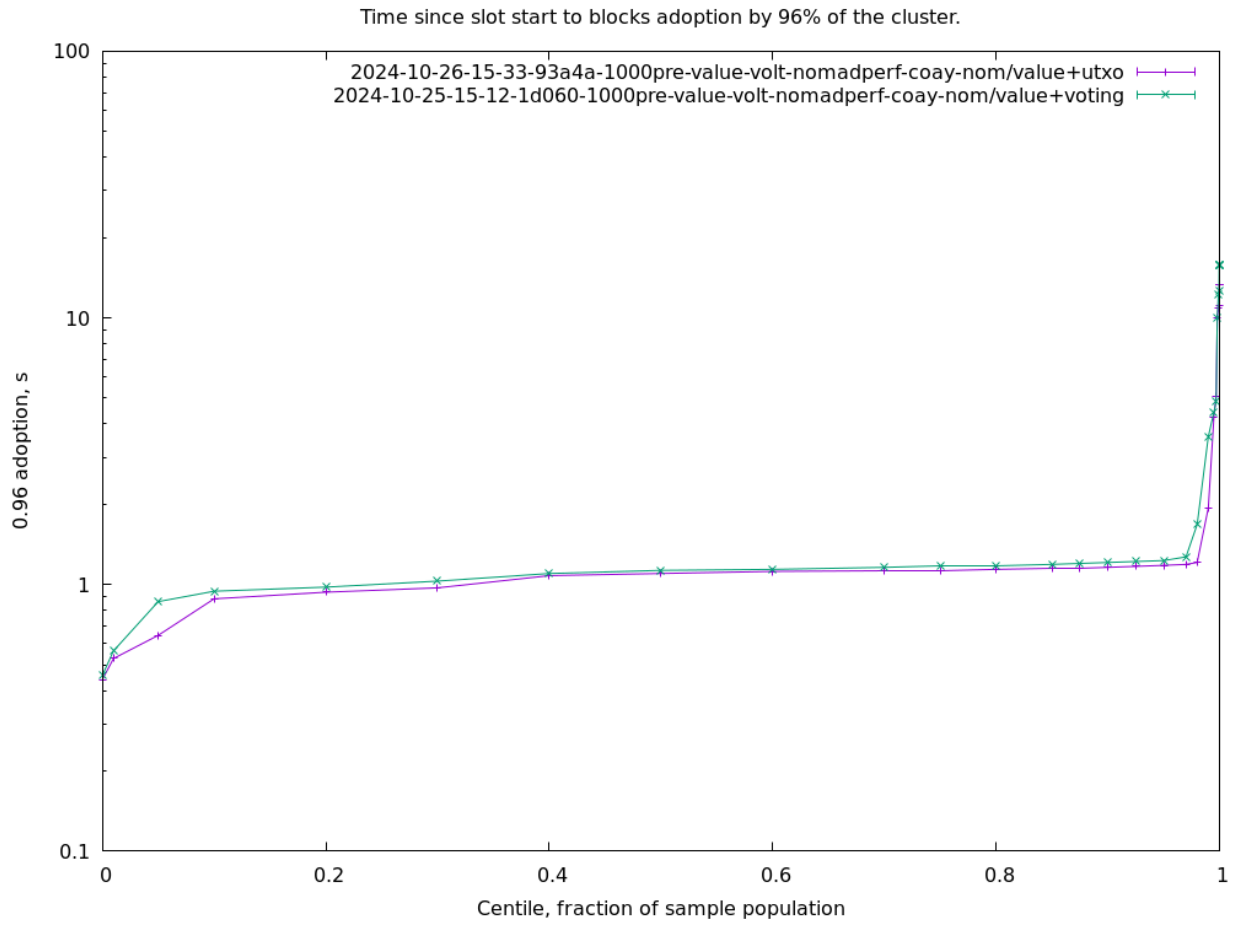
0.80 adoption (cdf0.80) Time since slot start to block's adoption by 80% of the cluster.



0.90 adoption (cdf0.90) Time since slot start to block's adoption by 90% of the cluster.



0.96 adoption (cdf0.96) Time since slot start to block's adoption by 96% of the cluster.



Part II

Appendix B: data dictionary

Chapter 4

Block propagation metrics

0.50 adoption (cdf0.50) Time since slot start to block's adoption by 50% of the cluster.

0.80 adoption (cdf0.80) Time since slot start to block's adoption by 80% of the cluster.

0.90 adoption (cdf0.90) Time since slot start to block's adoption by 90% of the cluster.

0.92 adoption (cdf0.92) Time since slot start to block's adoption by 92% of the cluster.

0.94 adoption (cdf0.94) Time since slot start to block's adoption by 94% of the cluster.

0.96 adoption (cdf0.96) Time since slot start to block's adoption by 96% of the cluster.

0.98 adoption (cdf0.98) Time since slot start to block's adoption by 98% of the cluster.

1.00 adoption (cdf1.00) Time since slot start to block's adoption by 100% of the cluster.

Height & slot battles (cdfBlockBattle) For a given block, number of all abandoned blocks at its block height. Sum of height and slot battles

Block size (cdfBlockSize) Block size, in bytes

Chained to forged block ratio (cdfBlocksChainedRatio) For each host, ratio of blocks that made into chain / all forged

Filtered to chained block ratio (cdfBlocksFilteredRatio) For each host, ratio of blocks that passed filtering / all on chain

Blocks per host (cdfBlocksPerHost) For each host, number of blocks made during the entire observation period

Forged to self-adopted (cdfForgerAdoption) Time between block forging completion and adoption (TraceAdoptedBlock)

Forged to announced (cdfForgerAnnounce) Time between block forging completion and header announcement (ChainSyncServerEvent.TraceChainSyncServerRead.AddBlock)

Slot start to announced (cdfForgerAnnounceCum) Time since slot start until header announcement (ChainSyncServerEvent.TraceChainSyncServerRead.AddBlock)

Acquired block context (cdfForgerBlkCtx) Block context acquired (TraceBlockContext), relative to forge loop beginning

Leadership to forged (cdfForgerForge) Time spent forging the block: TraceForgedBlock relative to positive leadership decision

Leadership check duration (cdfForgerLead) Leadership check duration (TraceNodeIsNotLeader, TraceNodeIsLeader), relative to ledger view acquisition

Acquired ledger state (cdfForgerLgrState) Ledger state acquired (TraceLedgerState), relative to block context acquisition

Acquired ledger view (cdfForgerLgrView) Ledger view acquired (TraceLedgerView), relative to ledger state acquisition

Mempool snapshotting (cdfForgerMemSnap) Time spent taking a mempool snapshot (TraceForgingMempoolSnapshot), relative to ledger ticking conclusion

Forged to sending (cdfForgerSend) Time between block forging completion and begin-of-sending (TraceBlockFetchServerSendBlock)

Started forge loop iteration (cdfForgerStart) Forge loop iteration delay (TraceStartLeadershipCheck), relative to slot start

Ledger ticking (cdfForgerTicked) Time spent ticking the ledger state (TraceForgeTickedLedgerState), relative to leadership check completion

Fetches to adopted (cdfPeerAdoption) Time until the peer adopts the block (TraceAddBlockEvent.AddedToCurrentChain), since it was fetched

Fetches to announced (cdfPeerAnnounce) Time it took a peer to announce the block (ChainSyncServerEvent.TraceChainSync), since it was fetched

Fetch duration (cdfPeerFetch) Time it took the peer to complete fetching the block (BlockFetchClient.CompletedBlockFetch), after having requested it

First peer fetch (cdfPeerFetchFirst) Time it took for the fastest peer to fetch the block (BlockFetchClient.CompletedBlockFetch), since block's slot start

First peer notice (cdfPeerNoticeFirst) Time it took for the fastest peer to notice the block (ChainSyncClientEvent.TraceDownloadedHeader), since block's slot start

Notice to fetch request (cdfPeerRequest) Time it took the peer to request the block body (BlockFetchClient.SendFetchRequest), after it have seen its header

Fetches to sending (cdfPeerSend) Time until the peer started sending the block (BlockFetchServer.SendBlock), since it was fetched

Chapter 5

Cluster performance metrics

RTS alloc rate (Alloc) RTS-reported allocation rate, MB/sec

Process CPU usage (CentiCpu) Kernel-reported CPU process usage, % of a single core

RTS GC CPU usage (CentiGC) RTS-reported GC CPU usage, % of a single core

RTS Mutator CPU usage (CentiMut) RTS-reported mutator CPU usage, % of a single core

Filesystem reads (FsRd) Number of bytes which this process really did cause to be fetched from the storage layer, per second

Filesystem writes (FsWr) Number of bytes which this process caused to be sent to the storage layer, modulo truncate(), per second

Major GCs (GcsMajor) Major garbage collection RTS events

Minor GCs (GcsMinor) Minor garbage collection RTS events

RTS heap size (Heap) RTS-reported heap size, MB

RTS live GC dataset (Live) RTS-reported GC live data size, MB

Network reads (NetRd) Network reads, kB/sec

Network writes (NetWr) Network writes, kB/sec

Kernel RSS (RSS) Kernel-reported RSS (Resident Set Size) of the process, MB

Block context acquisition delay (cdfBlkCtx) Block context acquired (TraceBlockContext), relative to forge loop beginning

Interblock gap (cdfBlockGap) Time between blocks

Chain density (cdfDensity) Block/slot ratio, for the last 'k' slots

Leadership check duration (cdfLeading) Leadership check duration (TraceNodeIsNotLeader, TraceNodeIsLeader), relative to ledger view acquisition

Ledger state acquisition delay (cdfLgrState) Ledger state acquired (TraceLedgerState), relative to block context acquisition

Ledger view acquisition delay (cdfLgrView) Ledger view acquired (TraceLedgerView), relative to ledger state acquisition

CPU 85% spans (cdfSpanLensCpu) Length of over-85% CPU usage peaks, slots

CPU spans at Ep boundary (cdfSpanLensCpuEpoch) Length of over-85% CPU usage peaks, starting at epoch boundary, slots

Forge loop tardiness (cdfStarted) Forge loop iteration start delay (TraceStartLeadershipCheck), relative to slot start

Forge loop starts (cdfStarts) For any given slot, how many forging loop starts were registered