10.3.0 against 10.2 - GHC8.10 and GHC9.6 builds

value-only workload

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Contents

Chapter 1

Manifest

We compare `10.3.0-ghc8107` (Conway) and `10.3.0-ghc965` (Conway) relative to `10.2` (Conway), under value-only workload.

	10.2	10.3.0-ghc8107	10.3.0-ghc965
Analysis date	2025-01-30	2025-04-14	2025-04-12
Cluster system start date	2025-01-29	2025-04-13	2025-04-11
Cluster system start time	09:04:31	09:00:10	13:59:34
Identifier	10.2	10.3.0	10.3.0
Run batch	10.2.0	1030ghc8	10.3.0
GHC version	8.10.7	8.10.7	9.6.5
cardano-node version	10.2	10.3.0	10.3.0
ouroboros-consensus version	0.22.0.0	0.24.0.0	0.24.0.0
ouroboros-network version	0.19.0.1	0.20.1.0	0.20.1.0
cardano-ledger-core version	1.16.0.0	1.17.0.0	1.17.0.0
plutus-core version	1.37.0.0	1.43.1.0	1.43.1.0
cardano-crypto version	1.1.2	1.3.0	1.3.0
cardano-prelude version	0.2.1.0	0.2.1.0	0.2.1.0
cardano-node git	c4d675b	f3bec95	d0dcd9b
ouroboros-consensus git	e924f61	da502c2	da502c2
ouroboros-network git	e91d5c4	d5d2042	d5d2042
cardano-ledger-core git	b7fe1c3	a9e78ae	a9e78ae
plutus-core git	0effd6c	cdf0de7	cdf0de7
cardano-crypto git	6568a5e	unknown	unknown
cardano-prelude git	68e015f	68e015f	68e015f
Era	conway	conway	conway
Delegation map size	1000000	1000000	1000000
Stuffed UTxO size	4000000	4000000	4000000
DRep count	10000	10000	10000
Extra tx payload	100	100	100
Tx inputs	2	2	2
Tx Outputs	2	2	2
TPS	12.0	12.0	12.0
Transaction count	768000	768000	768000
Plutus script	—	—	—
Machines	52	52	52
Number of filters applied	3	3	3
Log objects emitted per host	6246465.8076	5610120.5576	4056349.5384
Log objects analysed per host	2660800.5961	2418580.5192	1873407.0769
Host run time, s	63834.1	63873.7	63837.1
Host log line rate, Hz	97.855	87.832	63.542
Total log objects analysed	138361631	125766187	97417168
Run time, s	63840	63880	63842
Analysed run duration, s	48020	48042	48010
Run time efficiency	0.75	0.75	0.75
Node start spread, s	8.8315893	6.0817513	6.0992588
Node stop spread, s	4.4862600	5.9872453	3.2060487
Slots analysed	48016	48037	48008
Blocks analysed	2299	2228	2244
Blocks rejected	996	932	845

Chapter 2

Analysis

2.1 Resource Usage

	10.2	10.3.0-ghc8107	Δ	$\Delta\%$	10.3.0-ghc965	Δ	$\Delta\%$
Forge loop starts, #	0.99837	0.99849	0.000	0	0.9986	0.000	0
Process CPU usage, %	9.7846	8.8426	-0.942	-10	7.3977	-2.387	-24
RTS GC CPU usage, %	1.2495	1.0973	-0.152	-12	0.40834	-0.841	-67
RTS Mutator CPU usage, %	8.5324	7.7296	-0.803	-9	6.9828	-1.550	-18
Major GCs, #	0.00105	0.00088	-0.000	0	0.00085	-0.000	0
Minor GCs, #	2.2408	2.0017	-0.239	-11	1.7081	-0.533	-24
Kernel RSS, MB	9273.7	9220.1	-53.600	-1	8699.7	-574.000	-6
RTS heap size, MB	9220.1	9163.1	-57.000	-1	8640.8	-579.300	-6
RTS live GC dateset, MB	4018.1	3965.4	-52.700	-1	3992.7	-25.400	-1
RTS alloc rate, MB/s	69.846	62.037	-7.809	-11	52.847	-16.999	-24
Filesystem reads, KB/s	0.04703	5e-05	-0.047	-100	0.00039	-0.047	-100
Filesystem writes, KB/s	252.19	254.54	2.350	1	256.51	4.320	2
CPU 85% spans, slots	4.5605	6.6292	2.069	45	5.2009	0.640	14
Sample count	(249>)	(249>)			(249>)		

2.2 Anomaly control

	10.2	10.3.0-ghc8107	Δ	$\Delta\%$	10.3.0-ghc965	Δ	$\Delta\%$
Blocks per host, blocks	65.211	62.807	-2.404	-4	61.423	-3.788	-6
Filtered to chained block ratio, /	0.69827	0.70389	0.006	1	0.7267	0.028	4
Chained to forged block ratio, /	0.97174	0.96749	-0.004	0	0.96676	-0.005	-1
Height & slot battles, blocks	0.00478	0.00493	0.000	0	0.00534	0.001	21
Block size, B	88951	88947	-4	0	88966	15	0
Sample count	(52)	(52)			(52)		

2.3 Forging

	10.2	10.3.0-ghc8107	Δ	Δ%	10.3.0-ghc965	Δ	Δ%
Started forge loop iteration, s	0.00119	0.00205	0.001	84	0.00242	0.001	84
Acquired block context, s	0.02778	0.02589	-0.002	-7	0.02472	-0.003	-11
Acquired ledger state, s	7e-05	5e-05	-0.000	0	5e-05	-0.000	0
Acquired ledger view, s	2e-05	2e-05	0.000	0	2e-05	0.000	0
Leadership check duration, s	0.00046	0.0004	-0.000	0	0.00042	-0.000	0
Ledger ticking, s	0.02914	0.02609	-0.003	-10	0.02437	-0.005	-17
Mempool snapshotting, s	0.07662	0.05824	-0.018	-23	0.05517	-0.021	-27
Leadership to forged, s	0.00088	0.00089	0.000	0	0.00076	-0.000	0
Forged to announced, s	0.0008	0.00073	-0.000	0	0.00075	-0.000	0
Forged to sending, s	0.00656	0.00646	-0.000	0	0.00761	0.001	15
Forged to self-adopted, s	0.08271	0.07355	-0.009	-11	0.07447	-0.008	-10
Slot start to announced, s	0.137	0.11441	-0.023	-17	0.10874	-0.028	-20
Sample count	(2299)	(2228)			(2244)		

2.4 Individual peer propagation

	10.2	10.3.0-ghc8107	Δ	Δ%	10.3.0-ghc965	Δ	Δ%
First peer notice, s	0.13906	0.11637	-0.023	-17	0.1121	-0.027	-19
First peer fetch, s	0.14925	0.12672	-0.023	-15	0.12137	-0.028	-19
Notice to fetch request, s	0.00142	0.00132	-0.000	0	0.00135	-0.000	0
Fetch duration, s	0.34239	0.34938	0.007	2	0.3654	0.023	7
Fetched to announced, s	0.0014	0.00117	-0.000	0	0.00124	-0.000	0
Fetched to sending, s	0.04767	0.04633	-0.001	-2	0.04759	-0.000	0
Fetched to adopted, s	0.08803	0.0766	-0.011	-12	0.07567	-0.012	-14
Sample count	(2299)	(2228)			(2244)		

2.5 End-to-end propagation

|	10.2	10.3.0-ghc8107	Δ	Δ%	10.3.0-ghc965	Δ	Δ%
0.50 adoption, s	0.68612	0.65417	-0.032	-5	0.66615	-0.020	-3
0.80 adoption, s	1.0266	1.0117	-0.015	-1	1.0359	0.009	1
0.90 adoption, s	1.0451	1.0298	-0.015	-1	1.0553	0.010	1
0.92 adoption, s	1.0494	1.0348	-0.015	-1	1.0598	0.010	1
0.94 adoption, s	1.0551	1.0399	-0.015	-1	1.0646	0.010	1
0.96 adoption, s	1.0629	1.0453	-0.018	-2	1.0708	0.008	1
0.98 adoption, s	1.0729	1.0584	-0.015	-1	1.0814	0.009	1
1.00 adoption, s	1.1183	1.085	-0.033	-3	1.1172	-0.001	0
Sample count	(2299)	(2228)			(2244)		

Part I
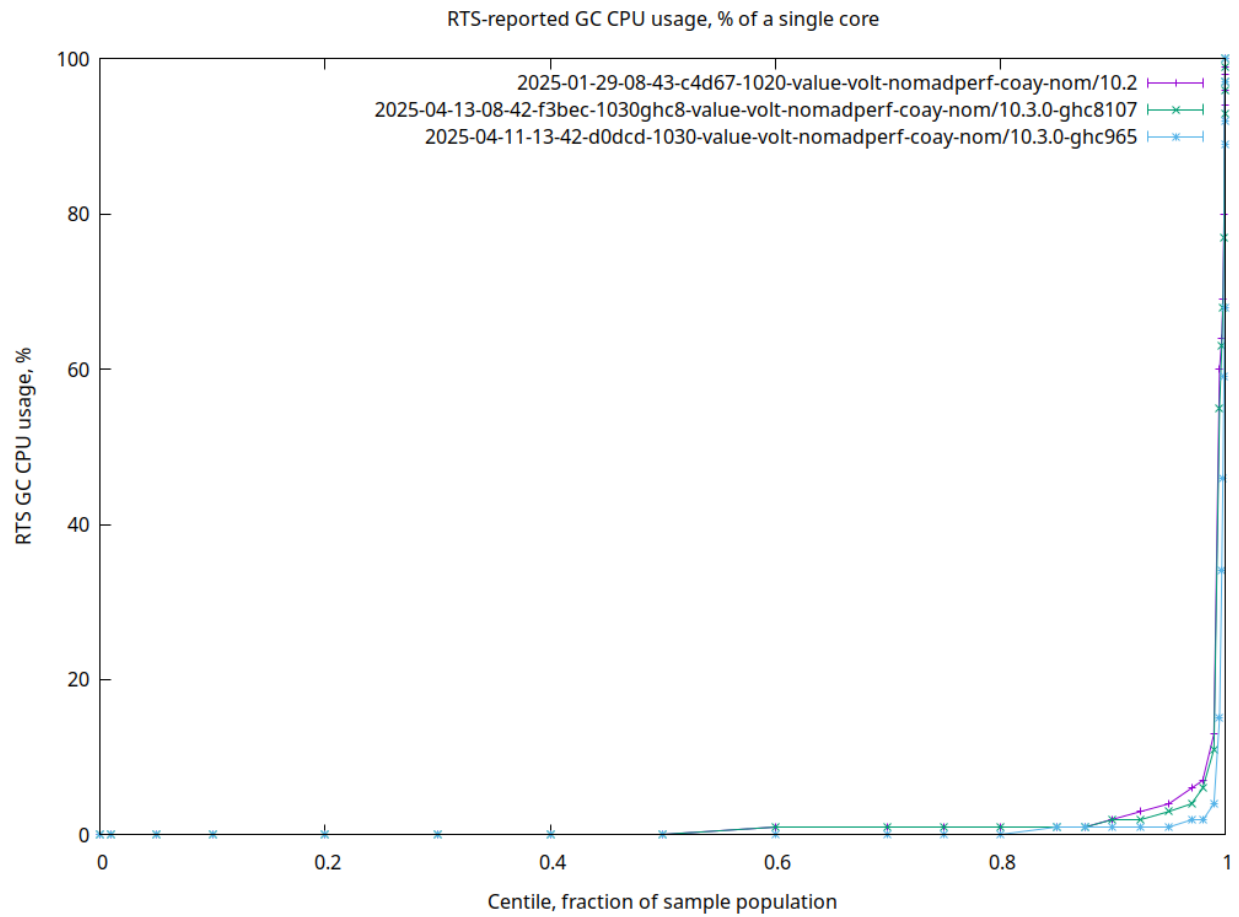
Appendix A: charts

Chapter 3

Cluster performance charts

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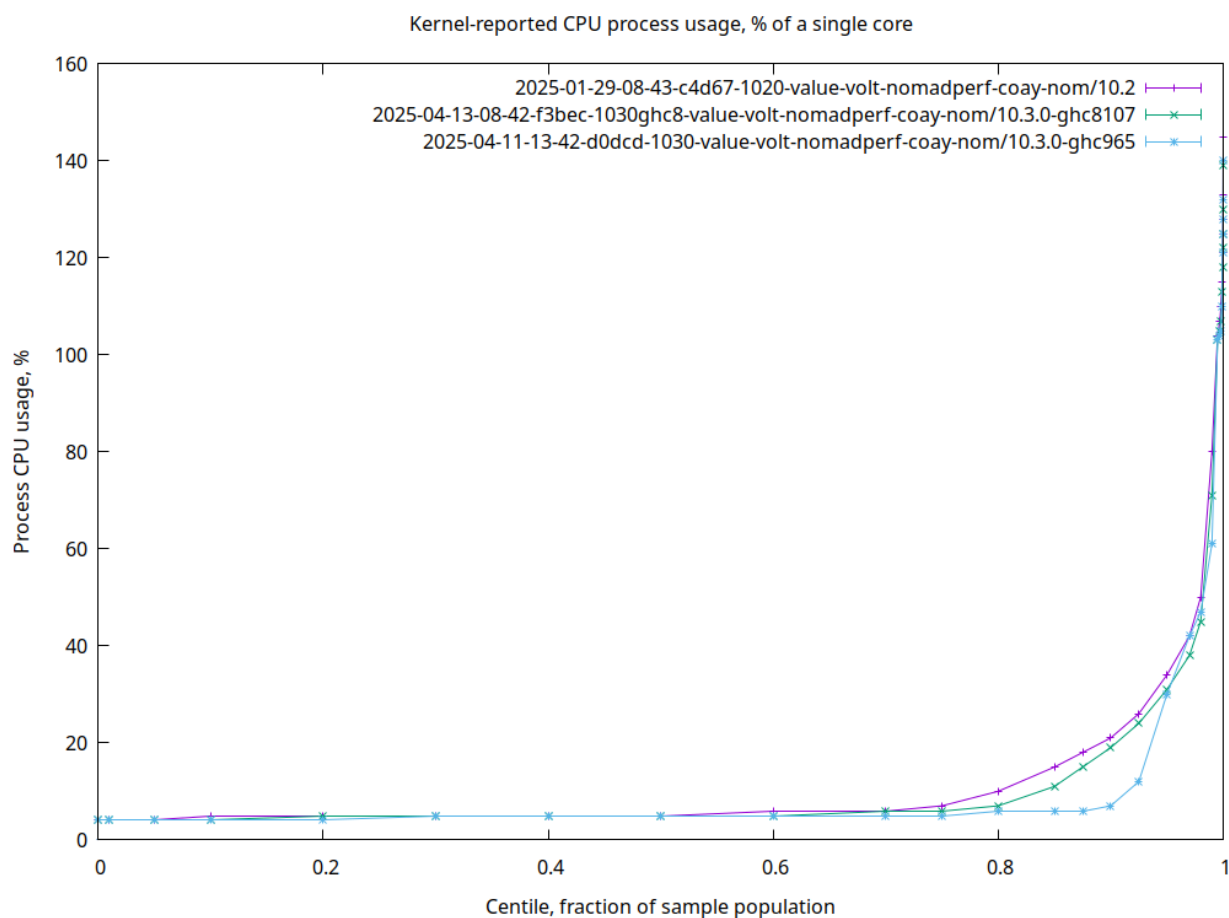
**RTS GC CPU usage (CentiGC)** RTS-reported GC CPU usage, % of a single core

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

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

RTS-reported mutator CPU usage, % of a single core

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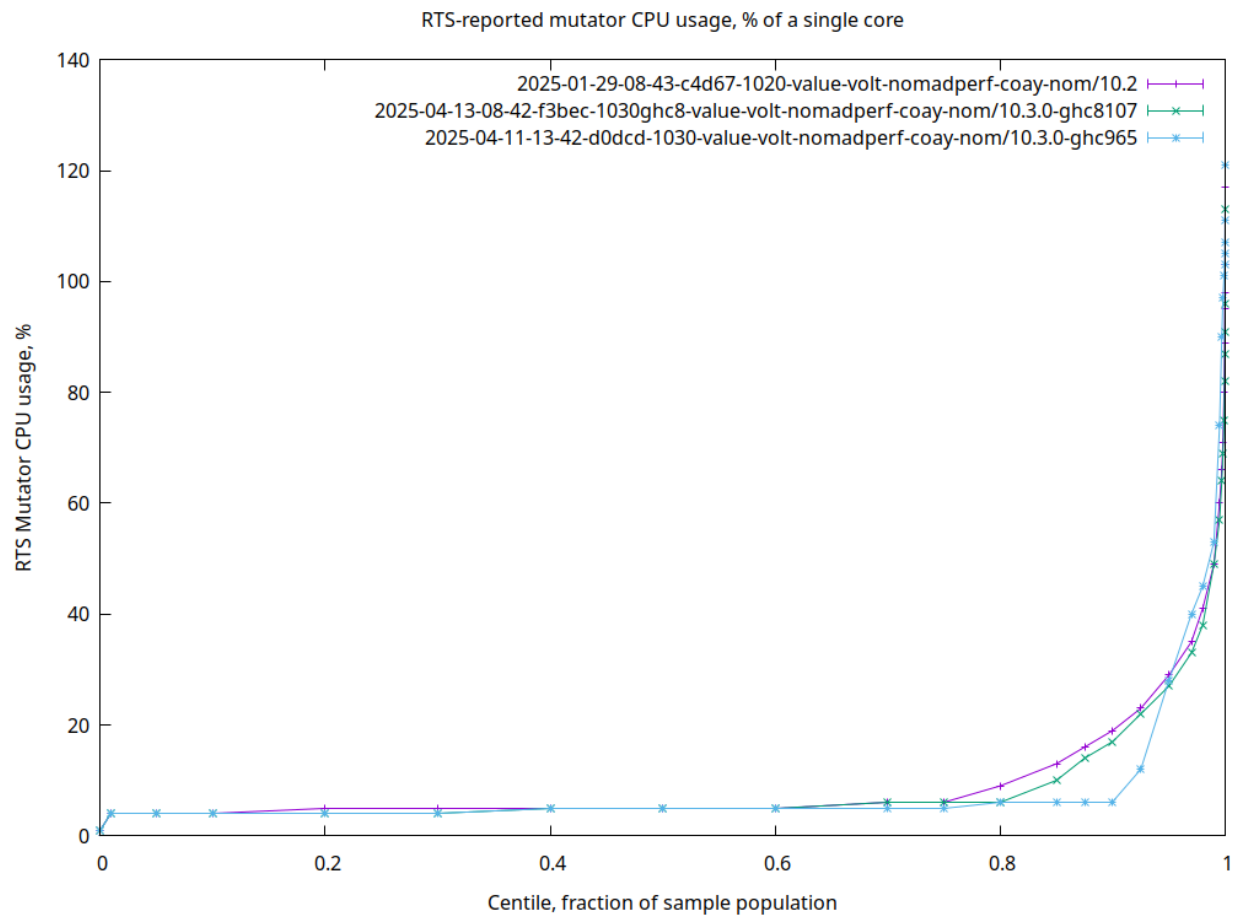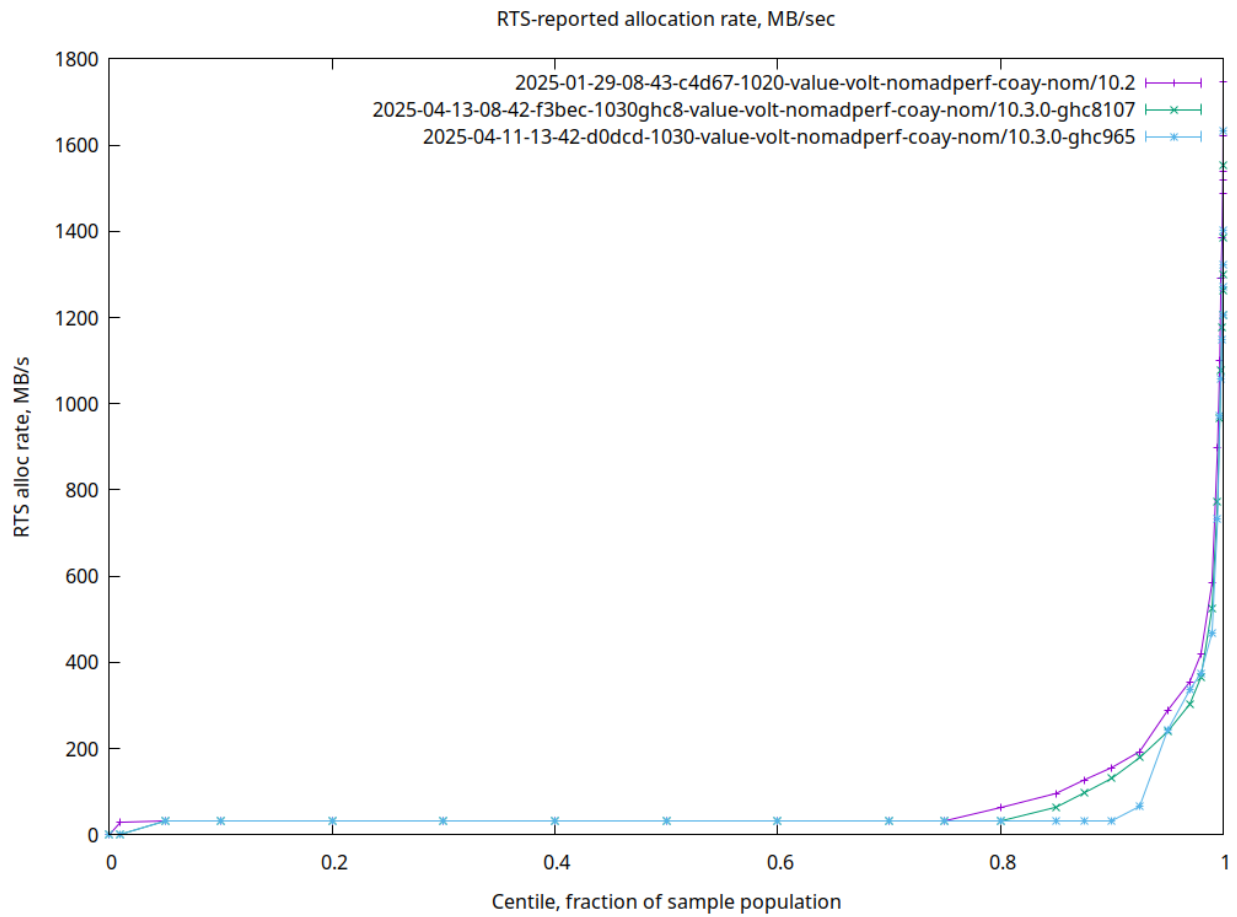
RTS-reported allocation rate, MB/sec

Major GCs (GcsMajor) Major garbage collection RTS events
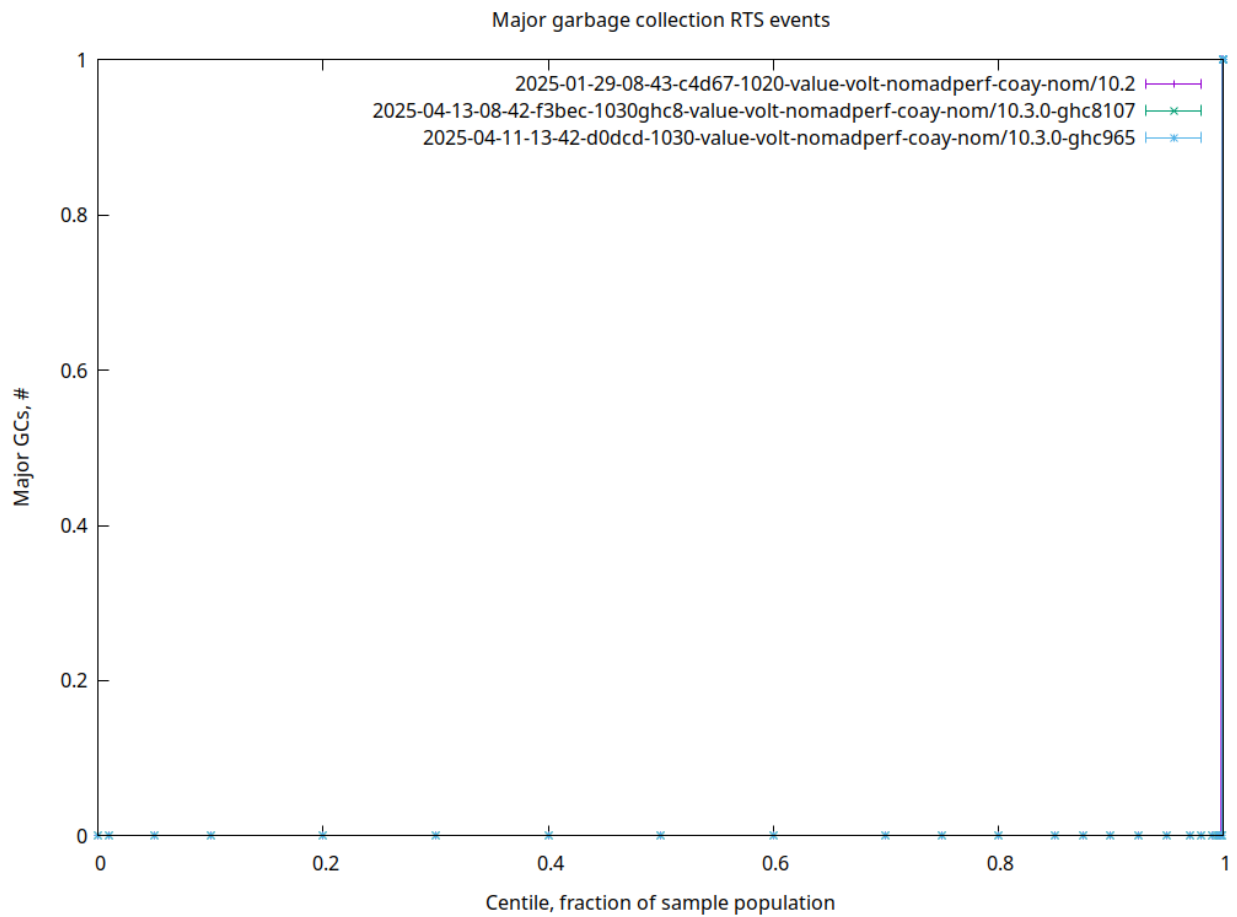
Major garbage collection RTS events

Minor GCs (GcsMinor) Minor garbage collection RTS events

RTS heap size (Heap) RTS-reported heap size, MB
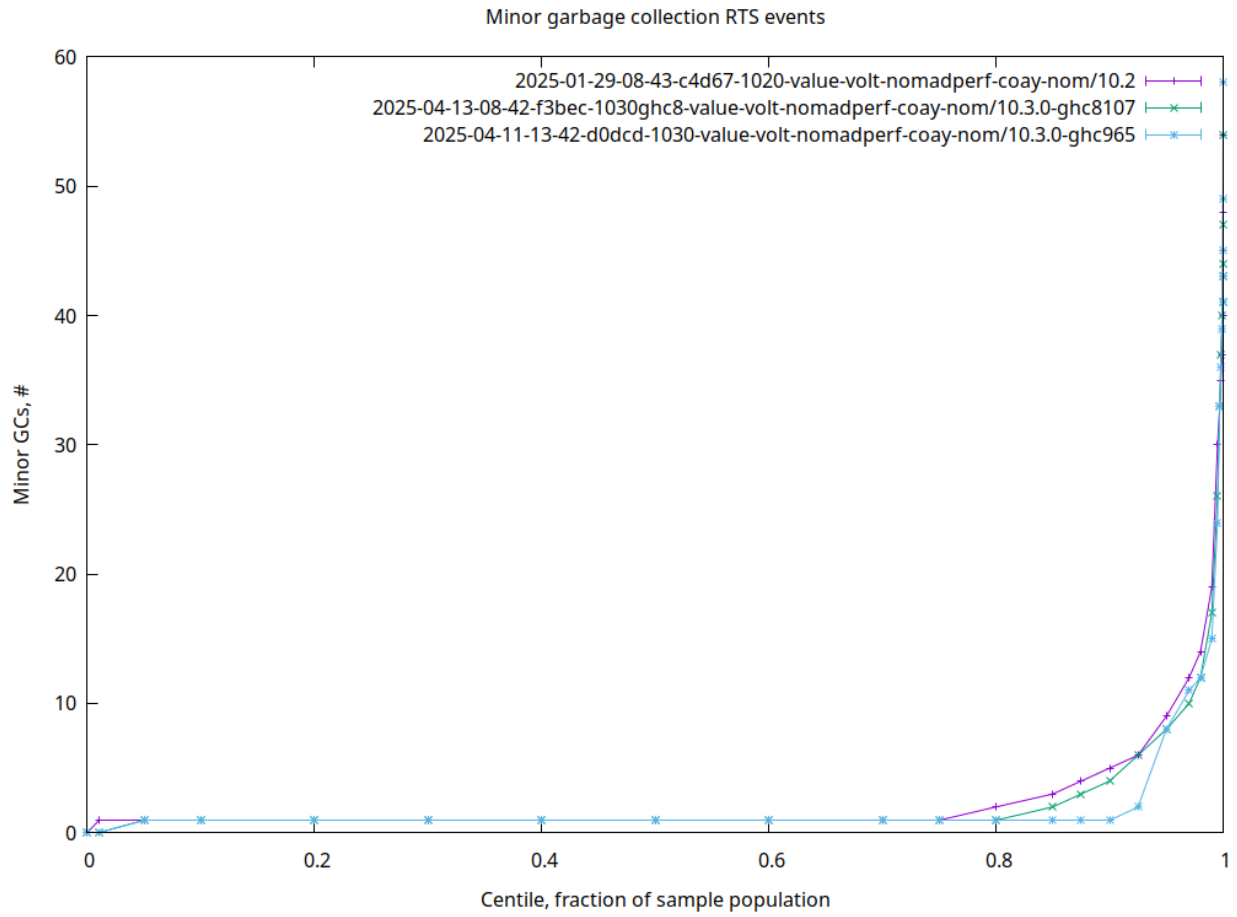
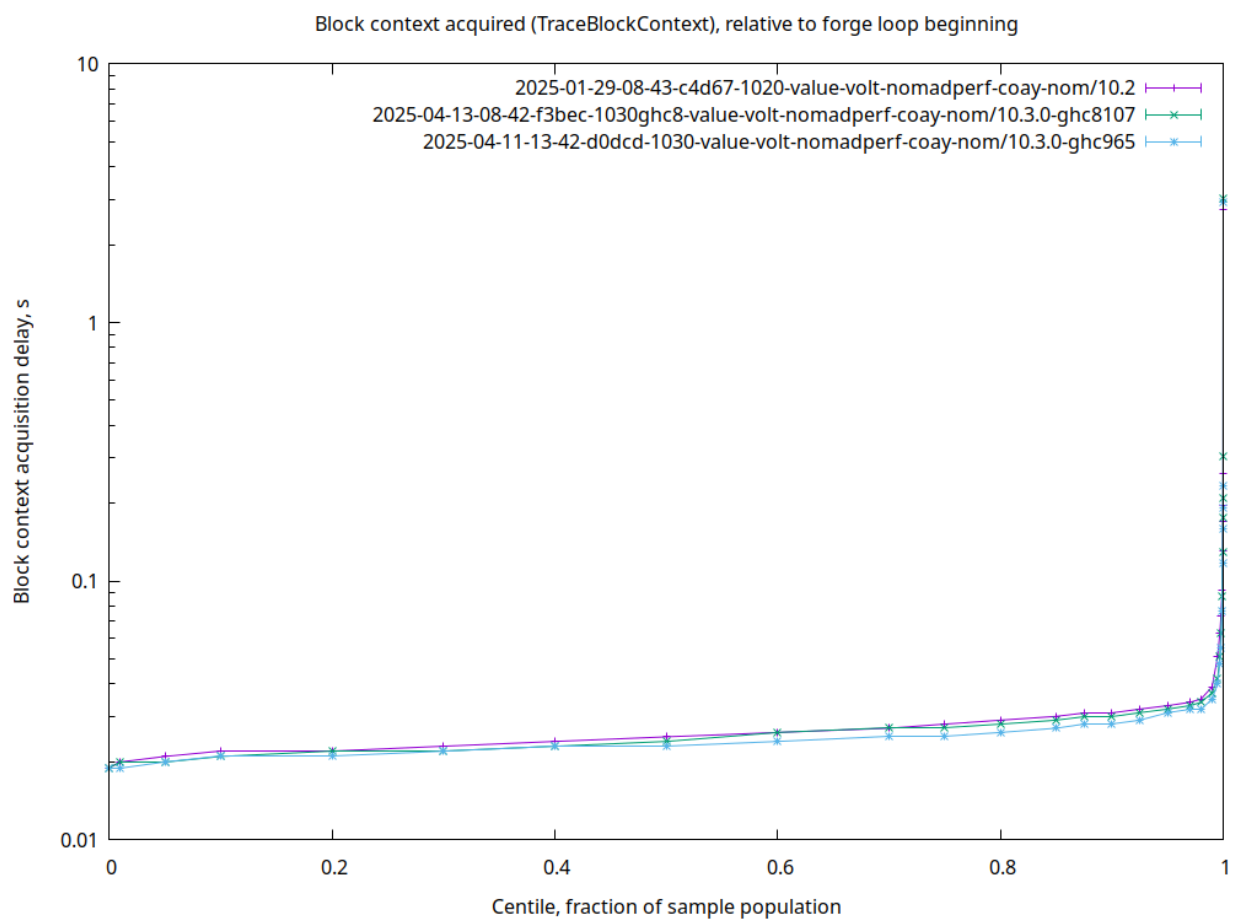**RTS live GC dateset (Live)** RTS-reported GC live data size, MB
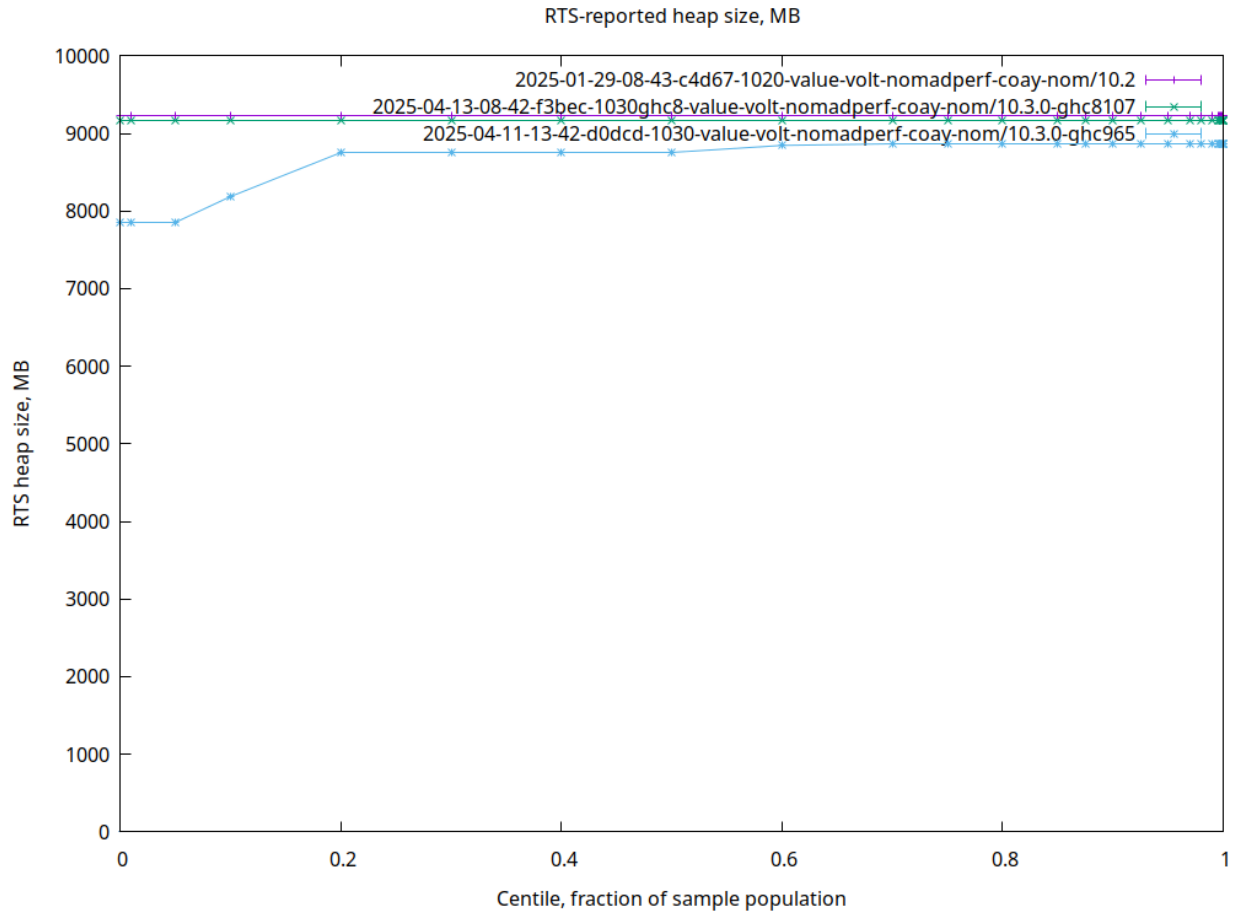
RTS-reported GC live data size, MB

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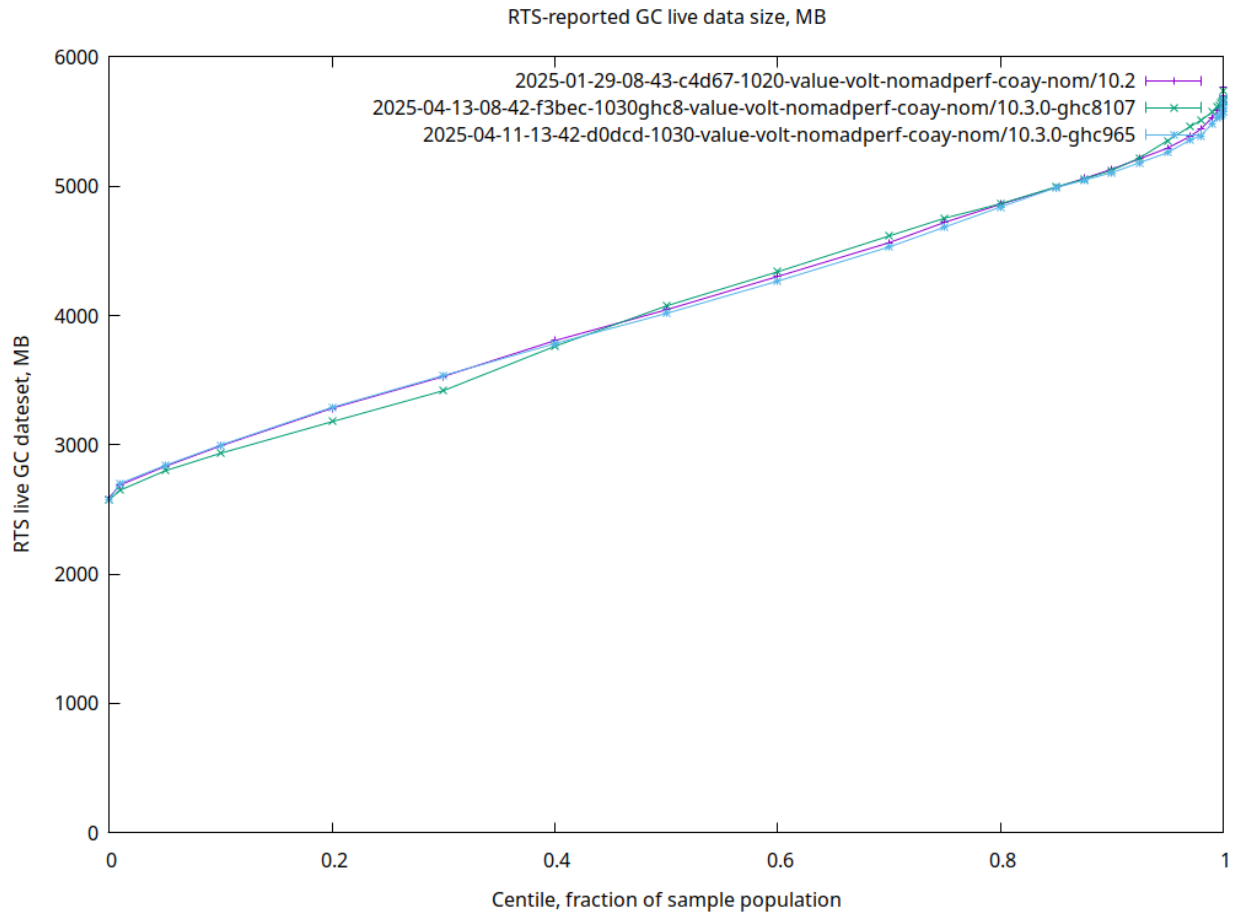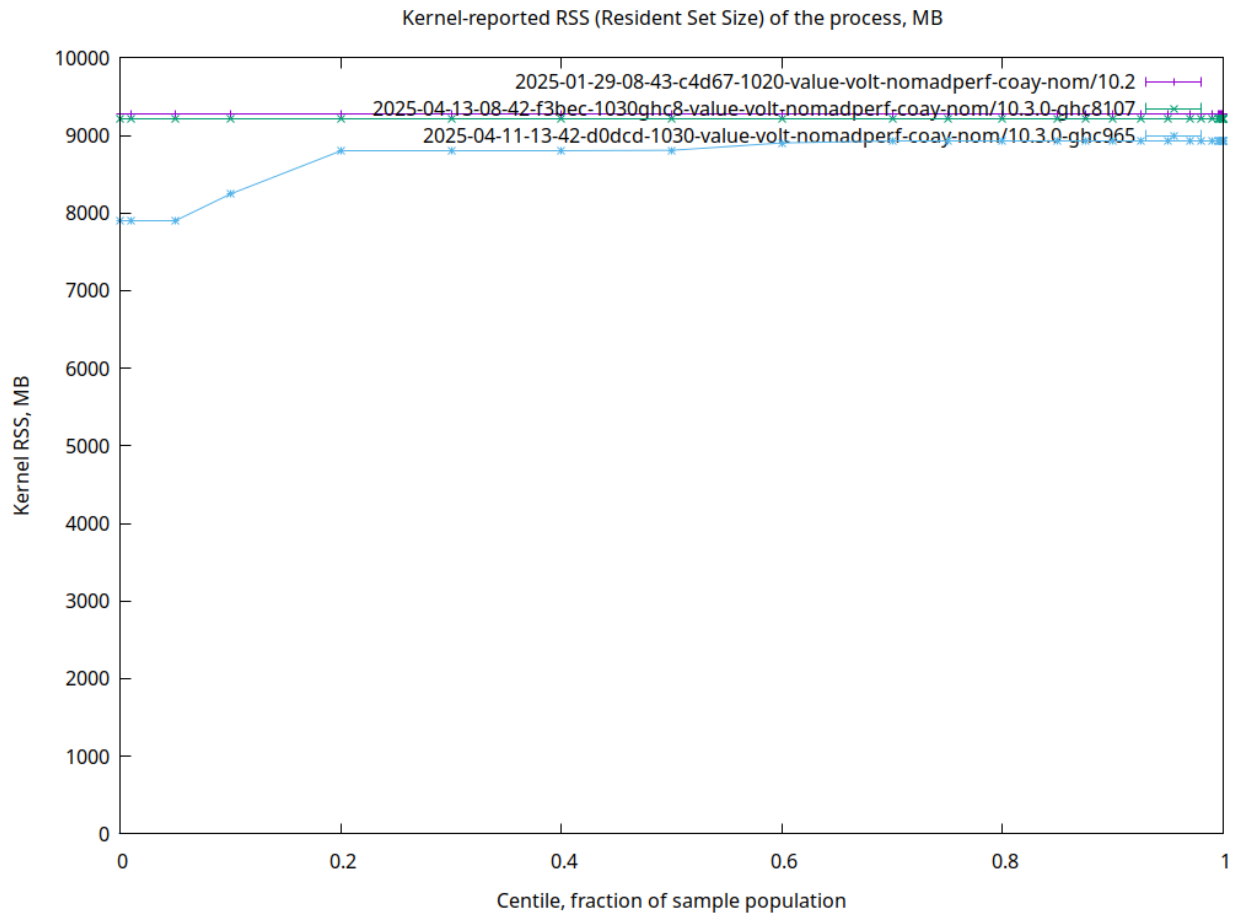
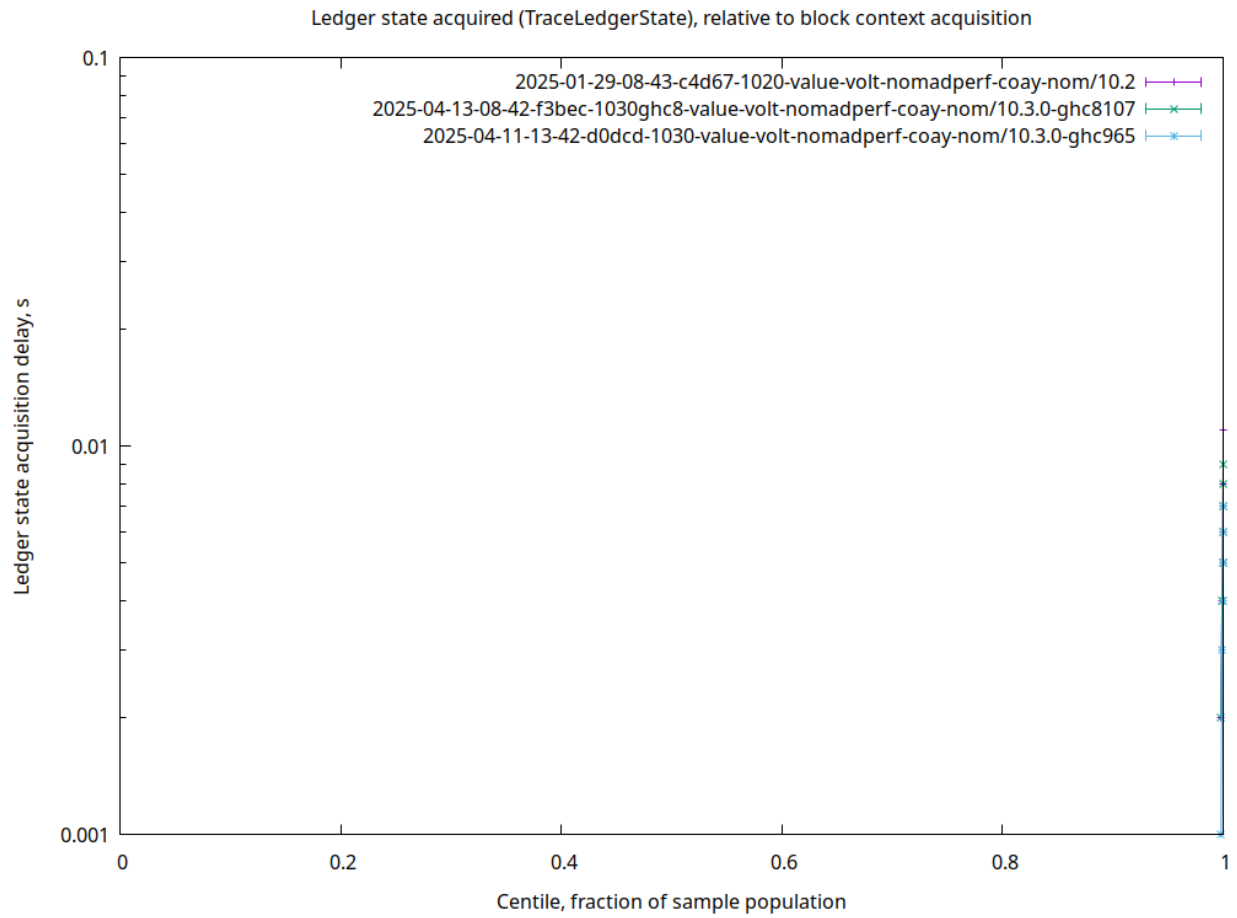
Kernel-reported RSS (Resident Set Size) of the process, MB

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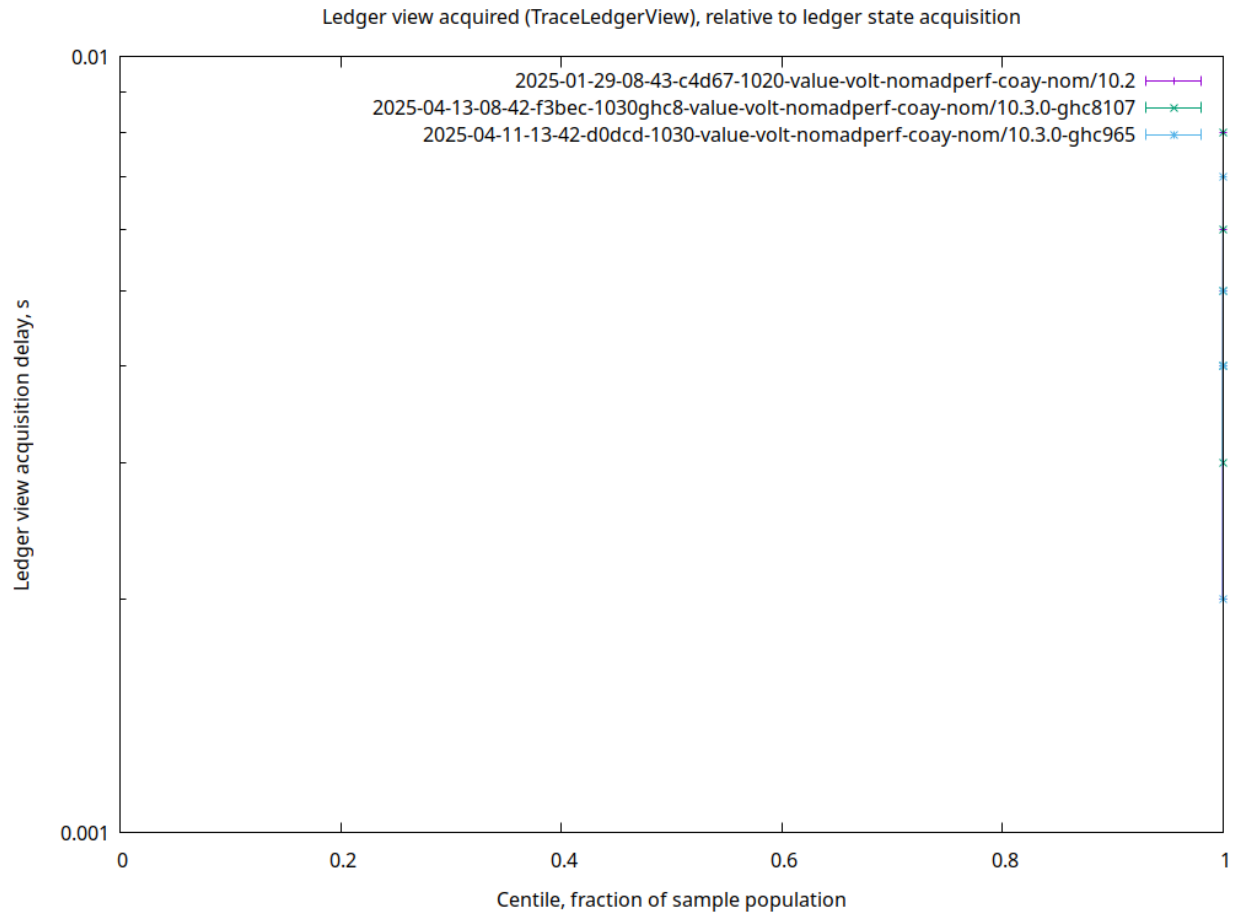
Forge loop iteration start delay (TraceStartLeadershipCheck), relative to slot start

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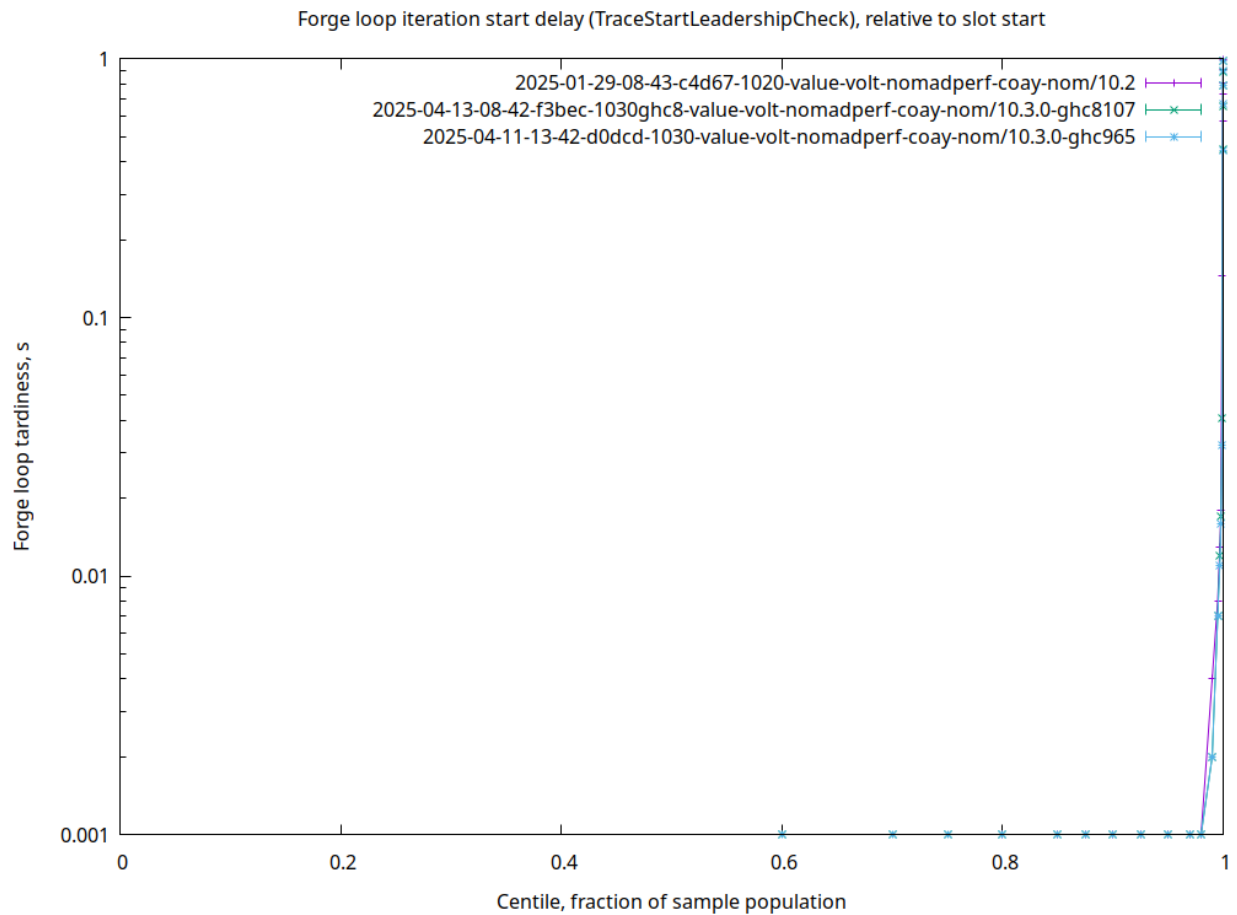
Block context acquired (TraceBlockContext), relative to forge loop beginning

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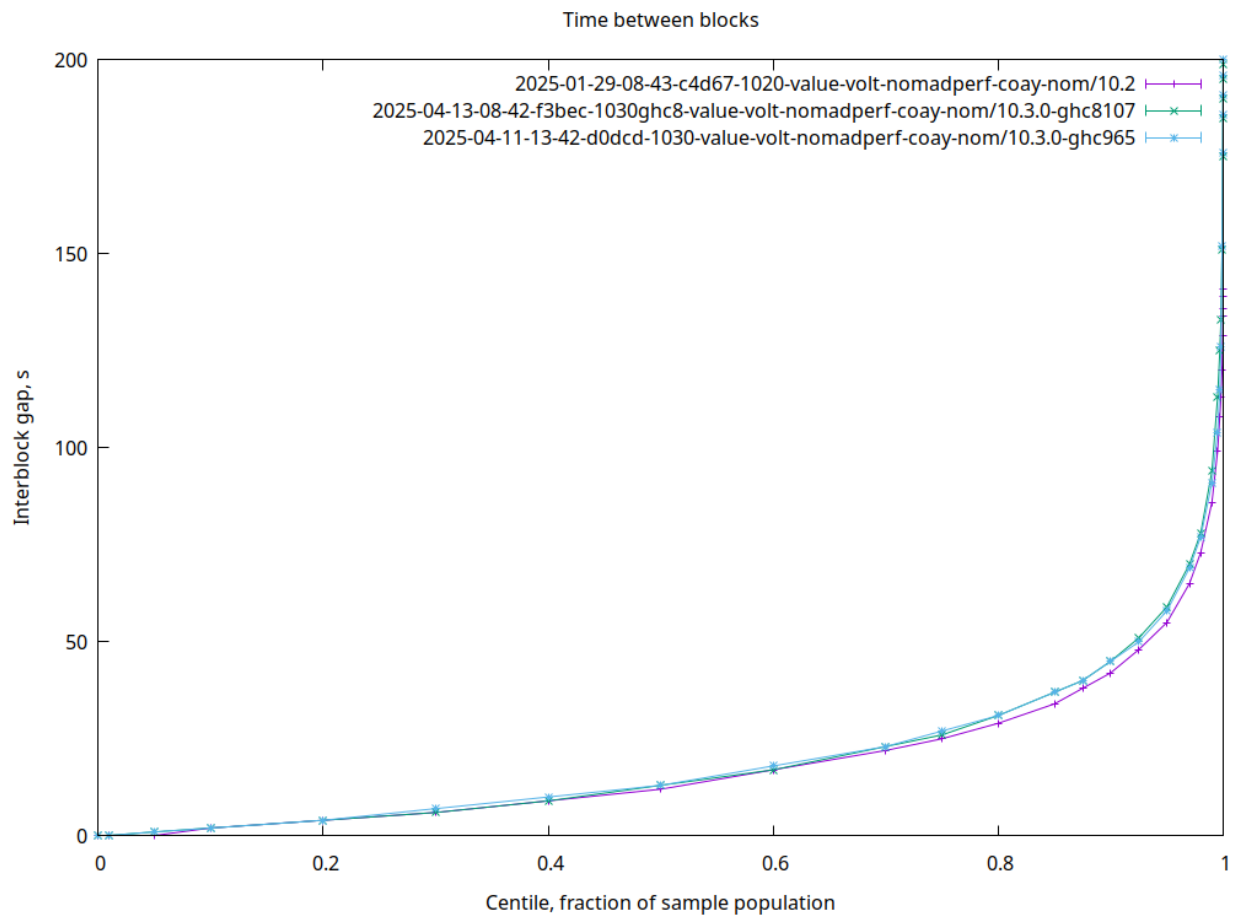
Ledger view acquired (TraceLedgerView), relative to ledger state acquisition

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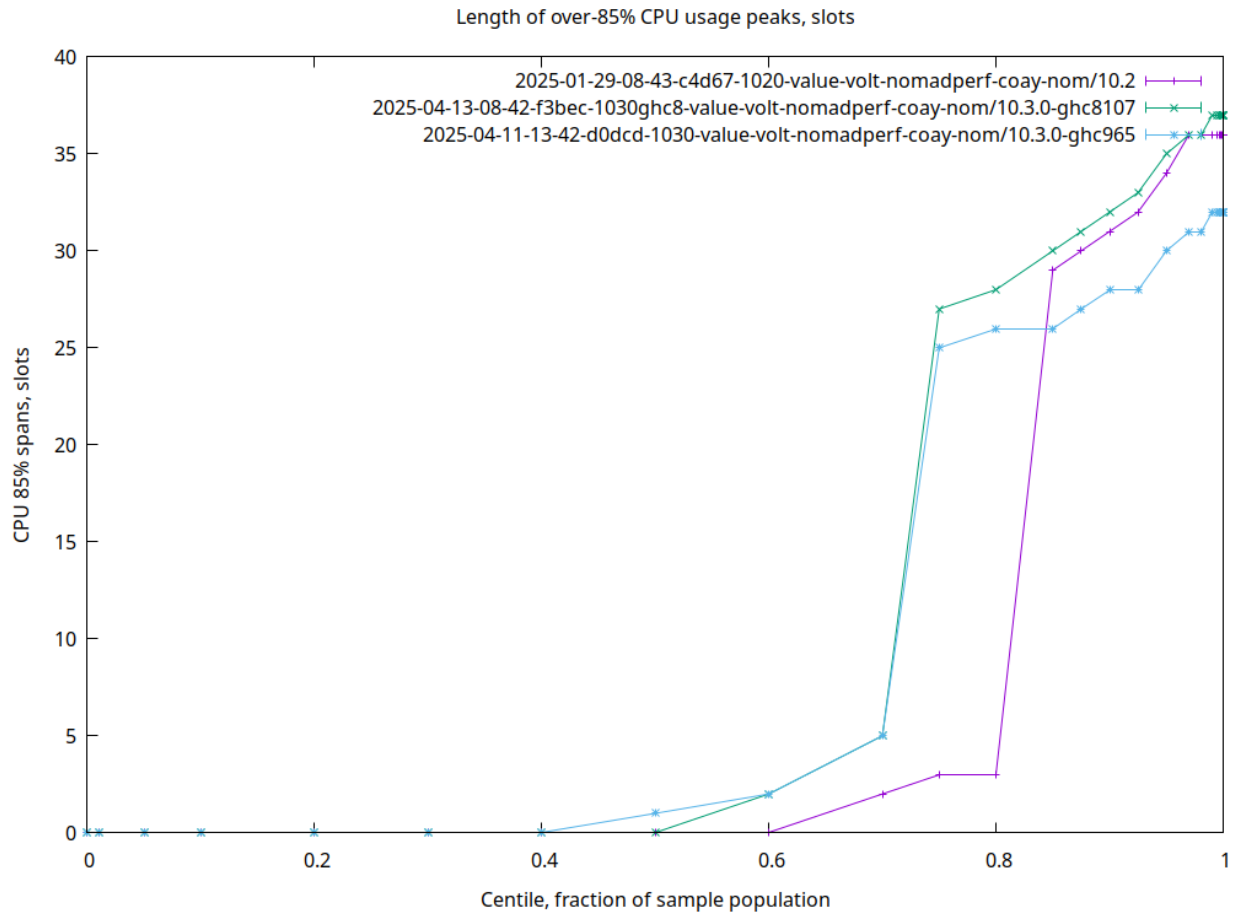

Leadership check duration (TraceNodeIsNotLeader, TraceNodeIsLeader), relative to ledger view acquisition

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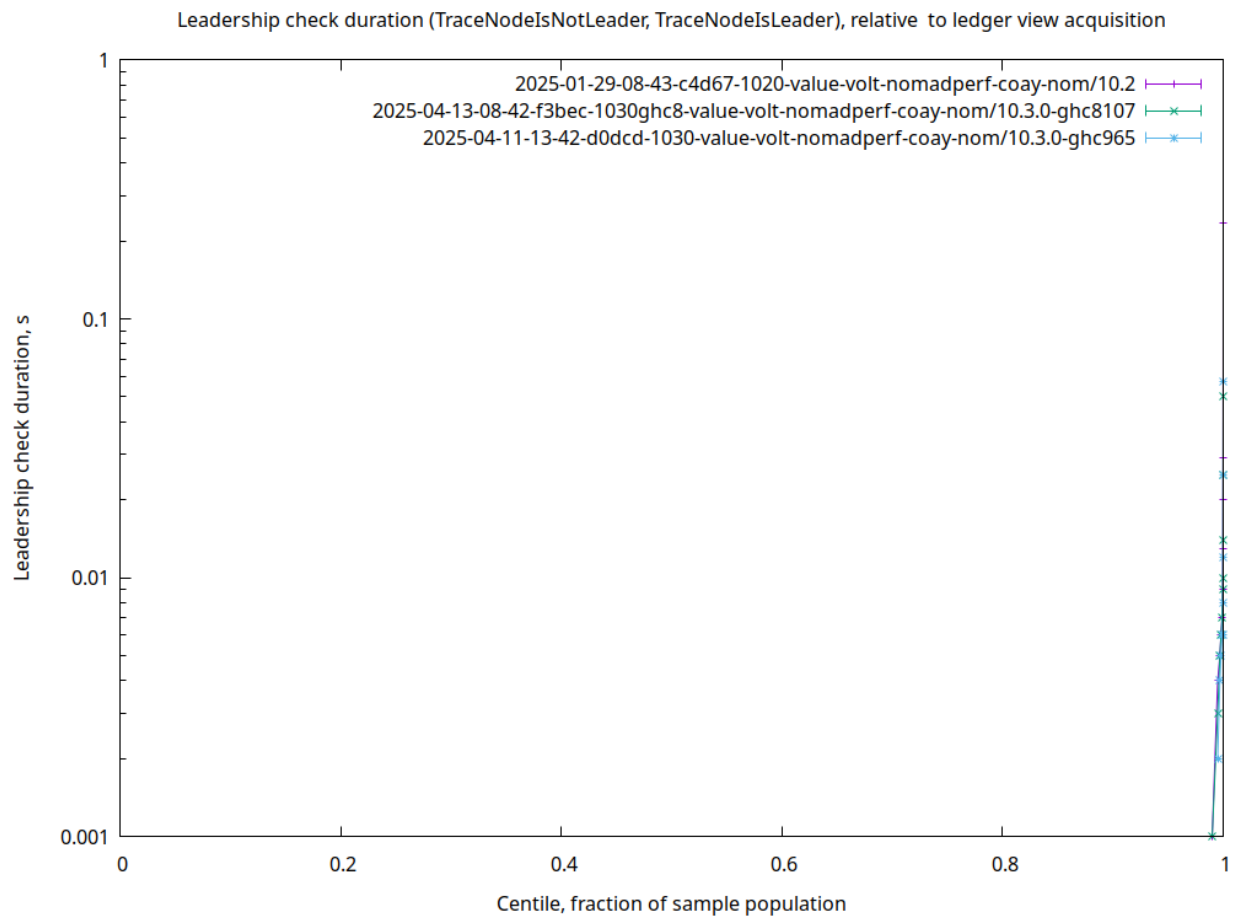
Block/slot ratio, for the last k slots

Interblock gap (cdfBlockGap) Time between blocks
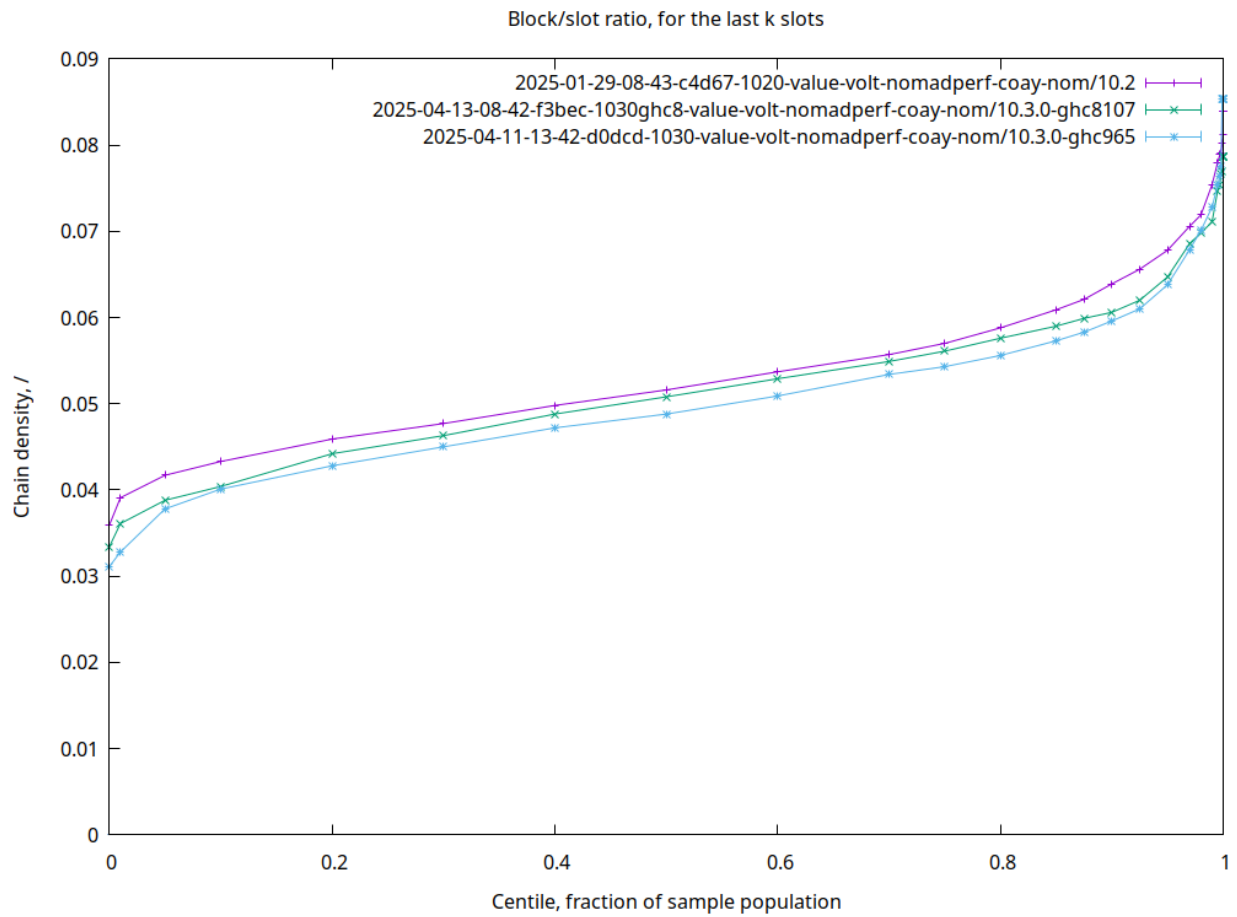
Time between blocks

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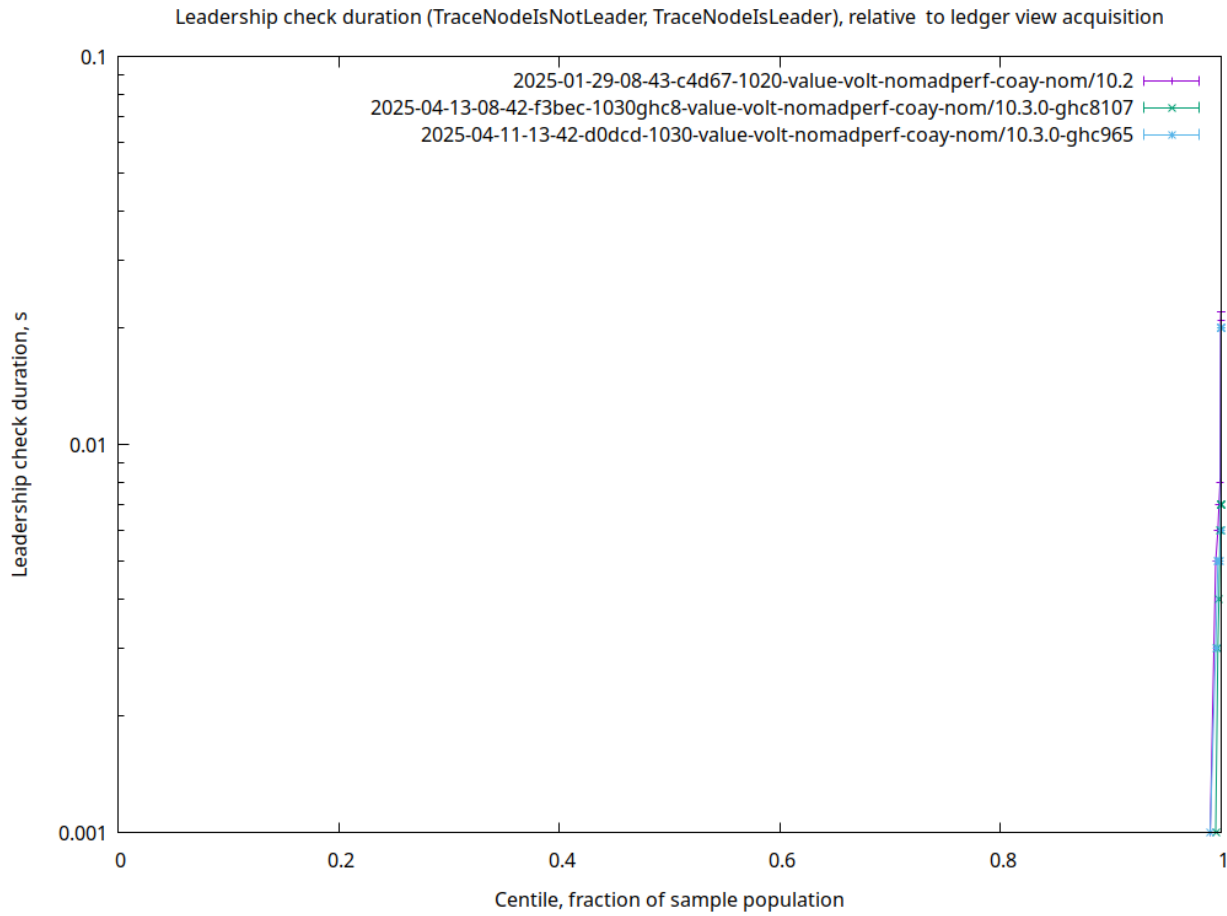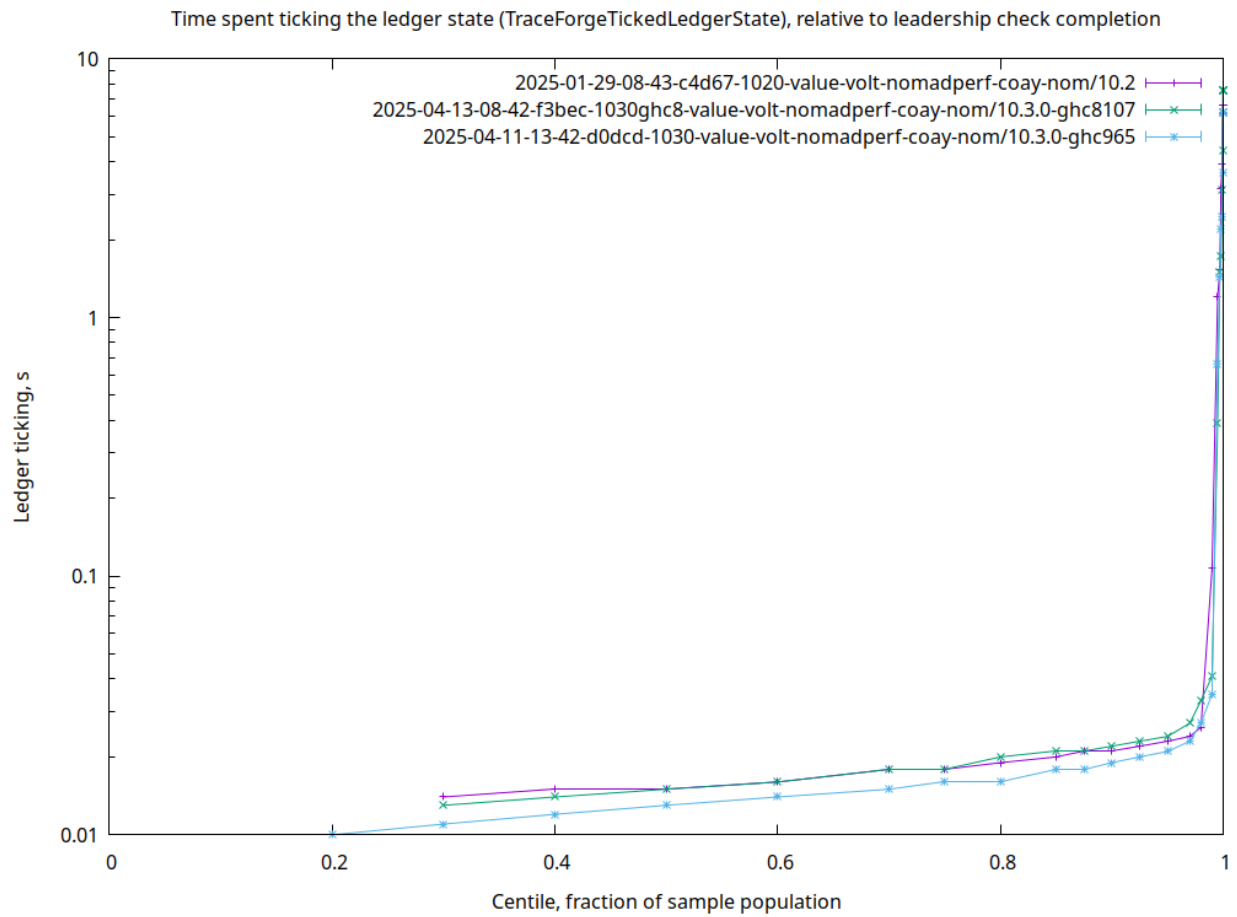
Length of over-85% CPU usage peaks, slots

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

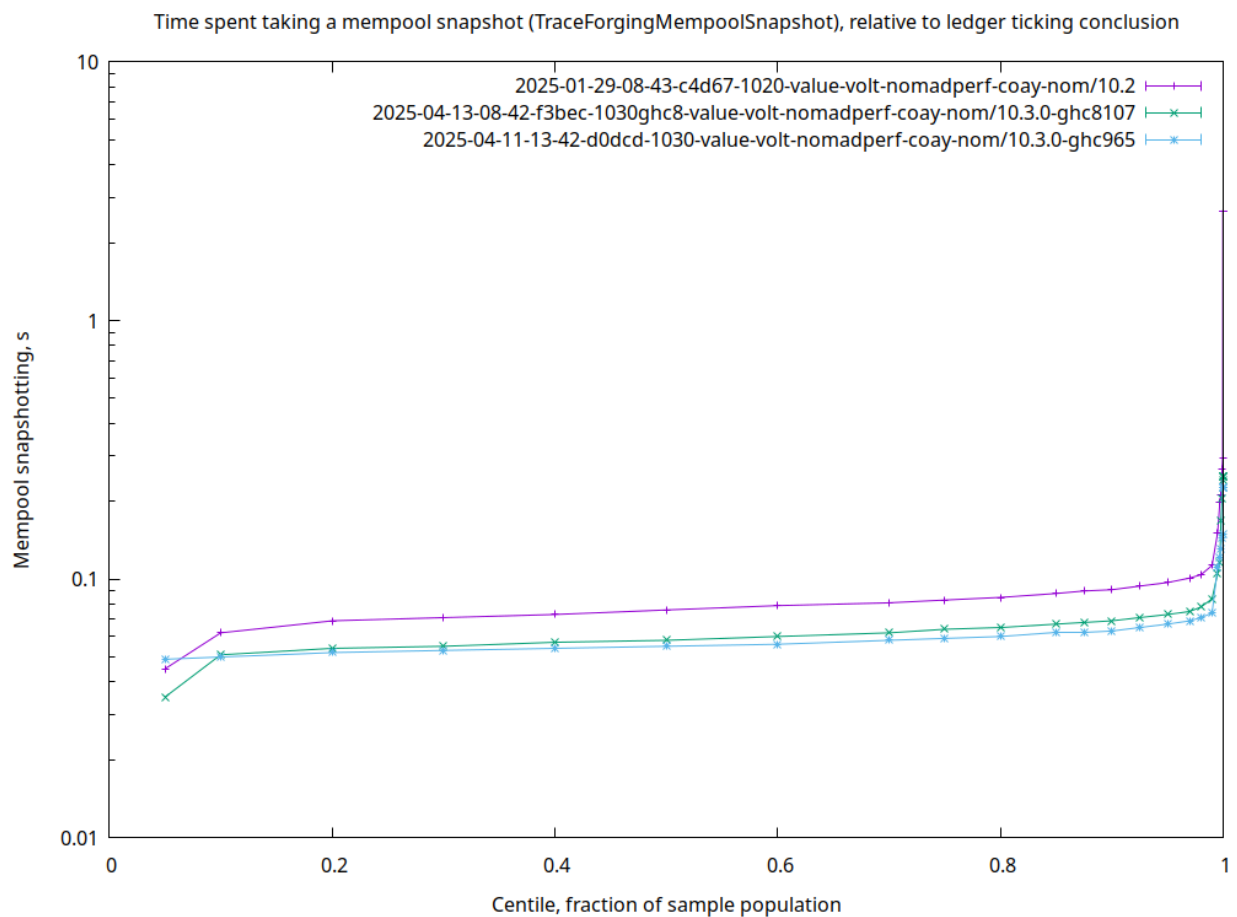Length of over-85% CPU usage peaks, starting at epoch boundary, slots

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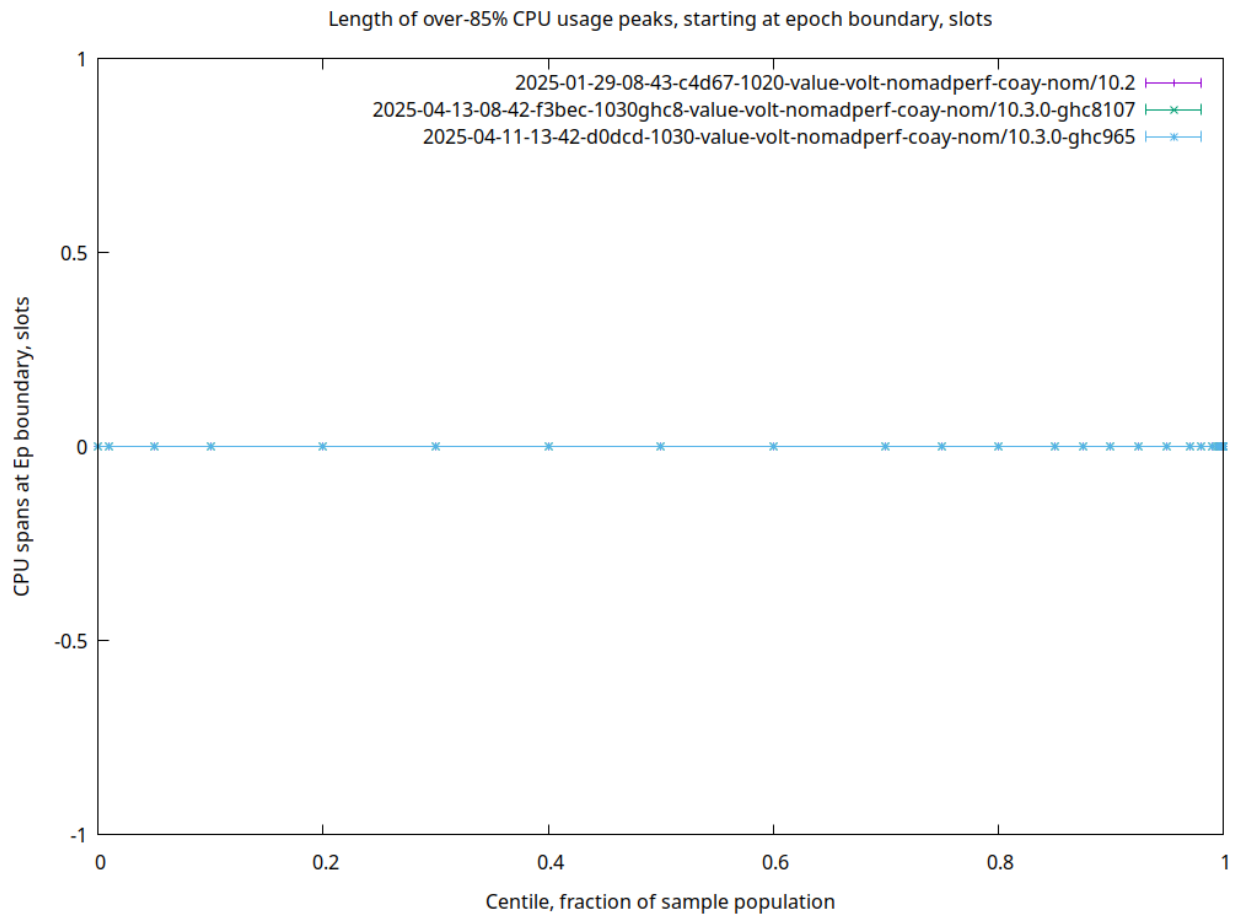
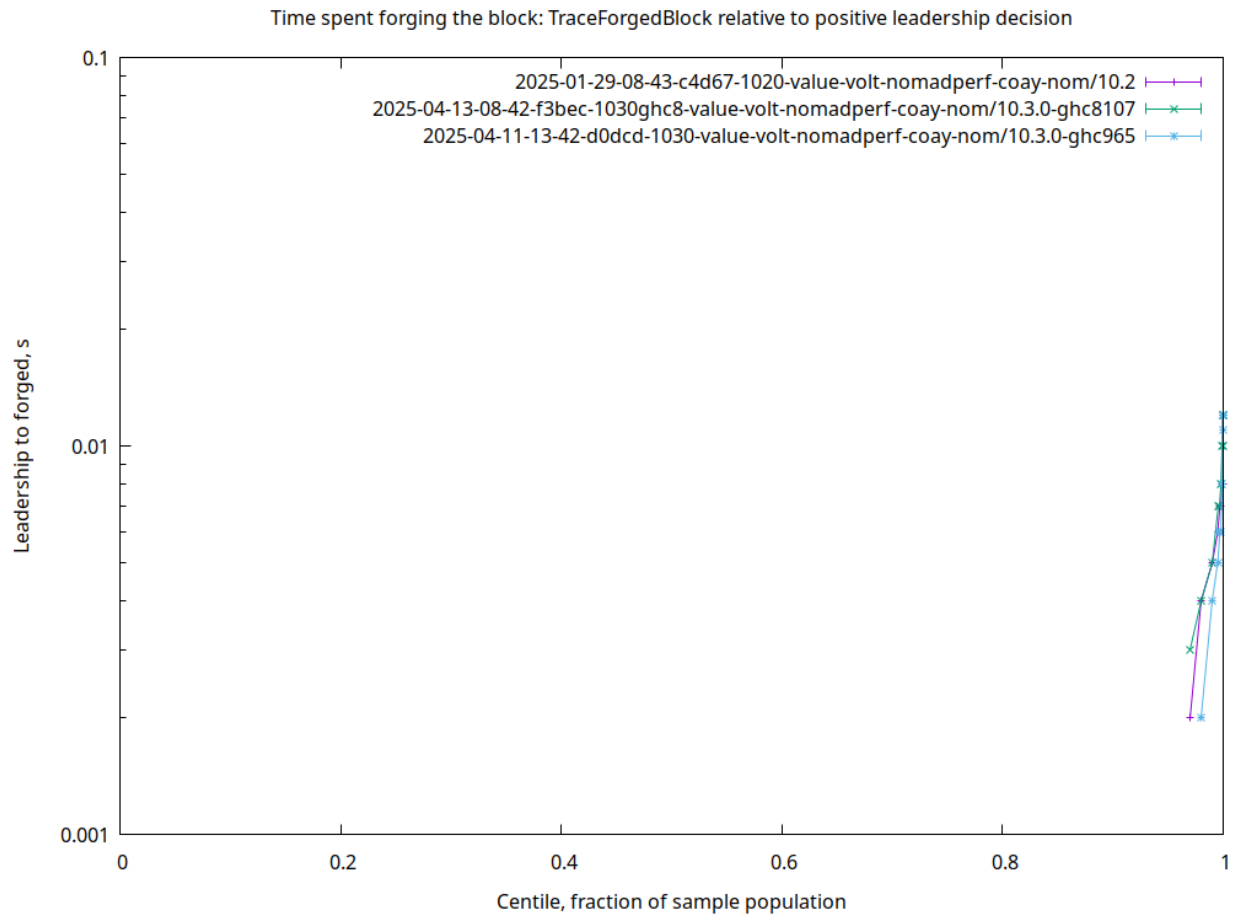Leadership check duration (TraceNodeIsNotLeader, TraceNodeIsLeader), relative to ledger view acquisition

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

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

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

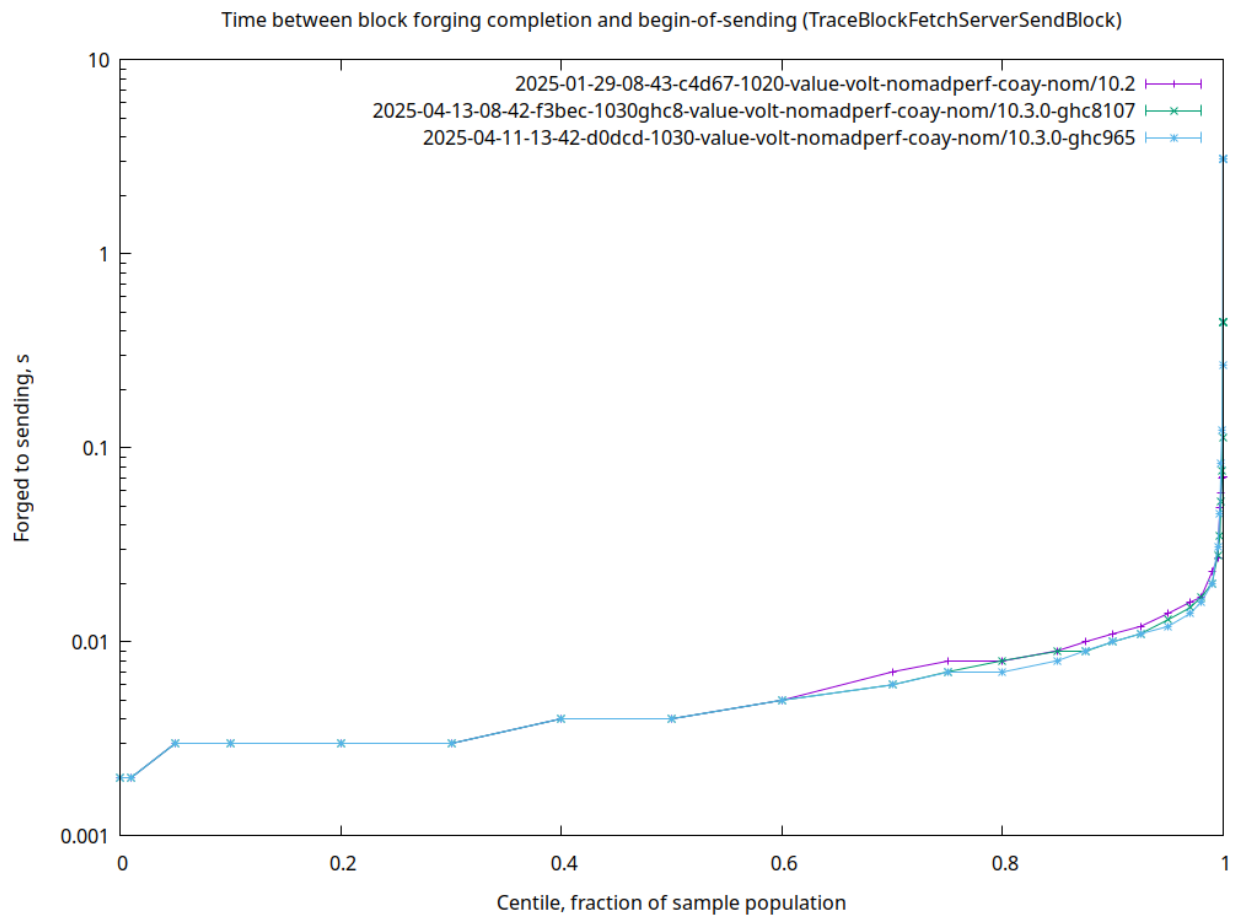**Leadership to forged (cdfForgerForge)** Time spent forging the block: TraceForgedBlock relative to positive leadership decision

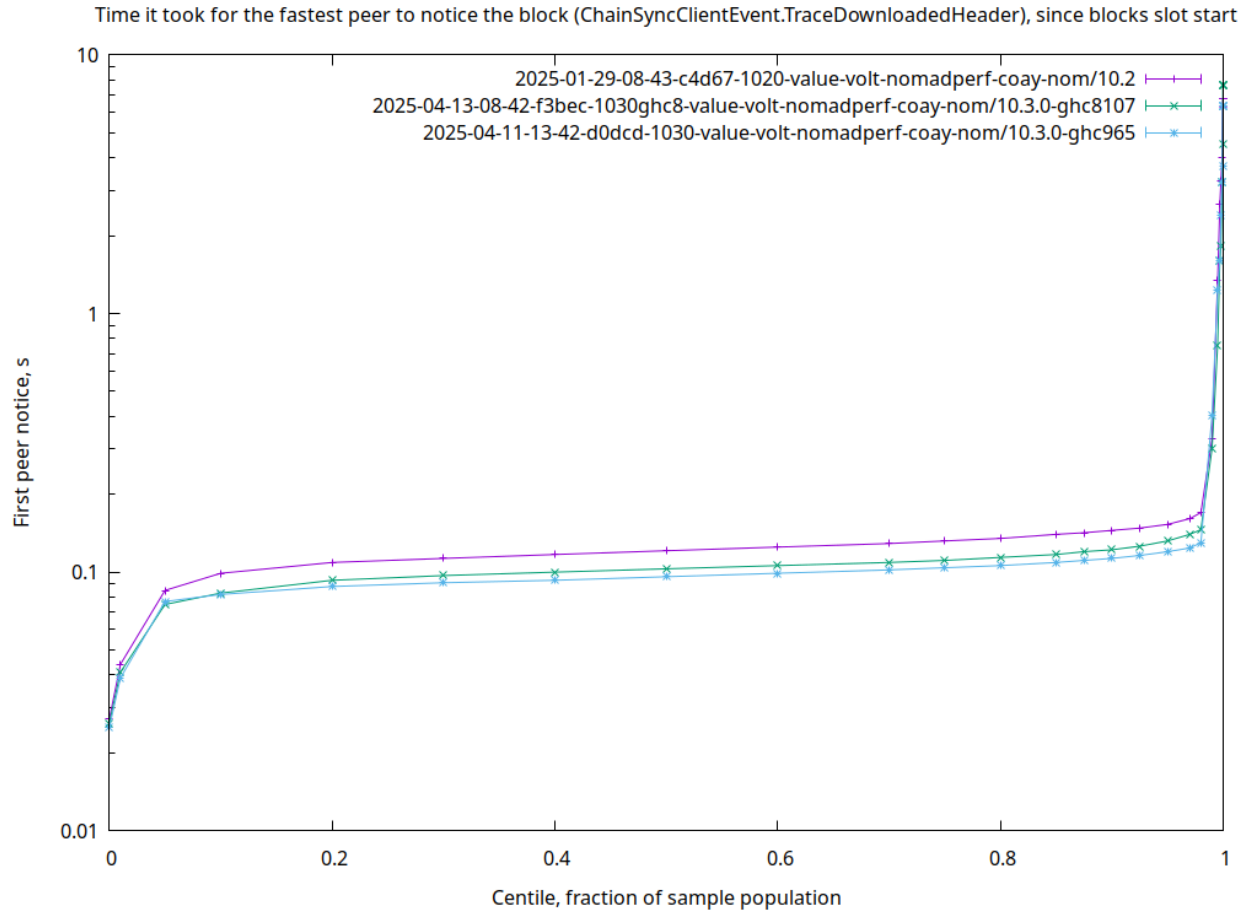Time spent forging the block: TraceForgedBlock relative to positive leadership decision

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

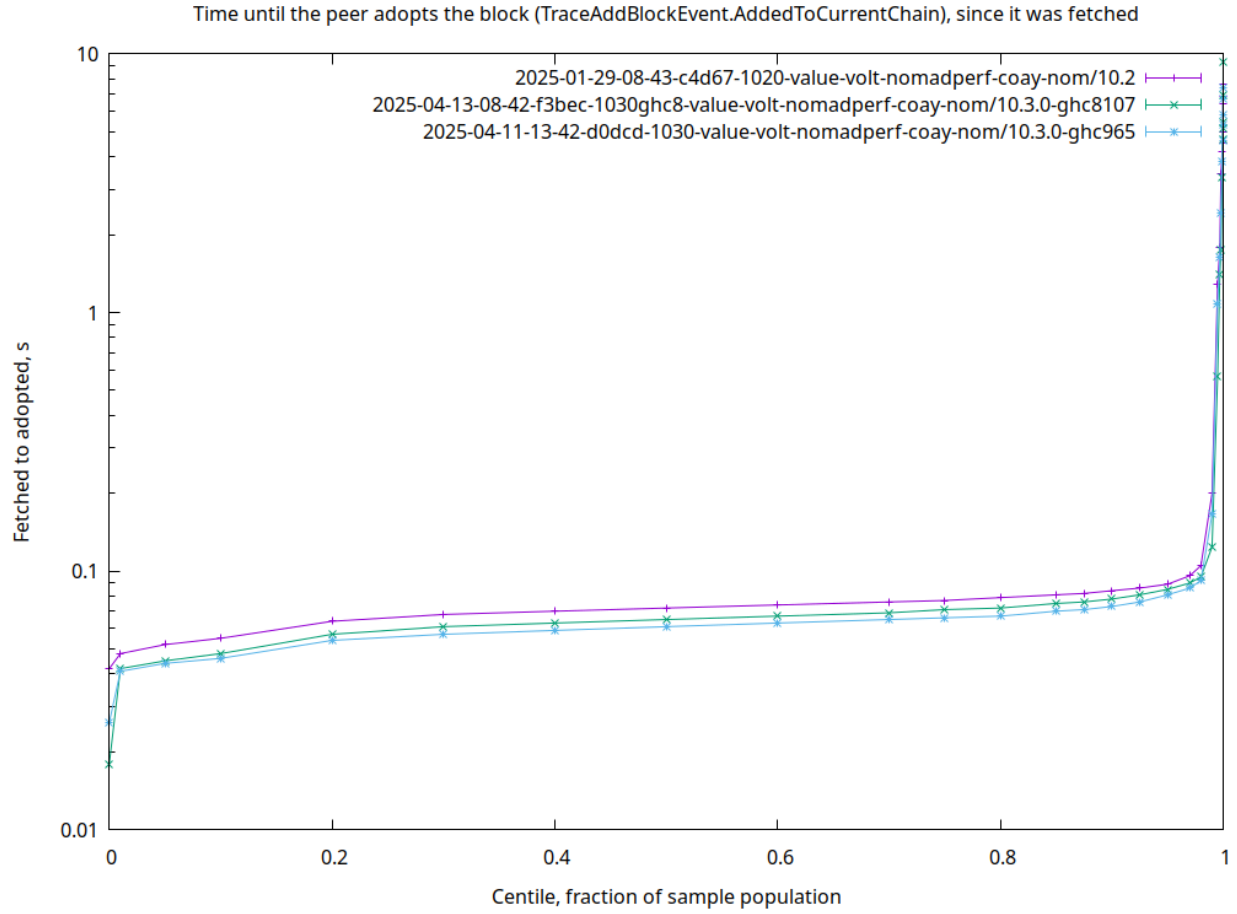Time between block forging completion and header announcement (ChainSyncServerEvent.TraceChainSyncServerRead.AddBloc

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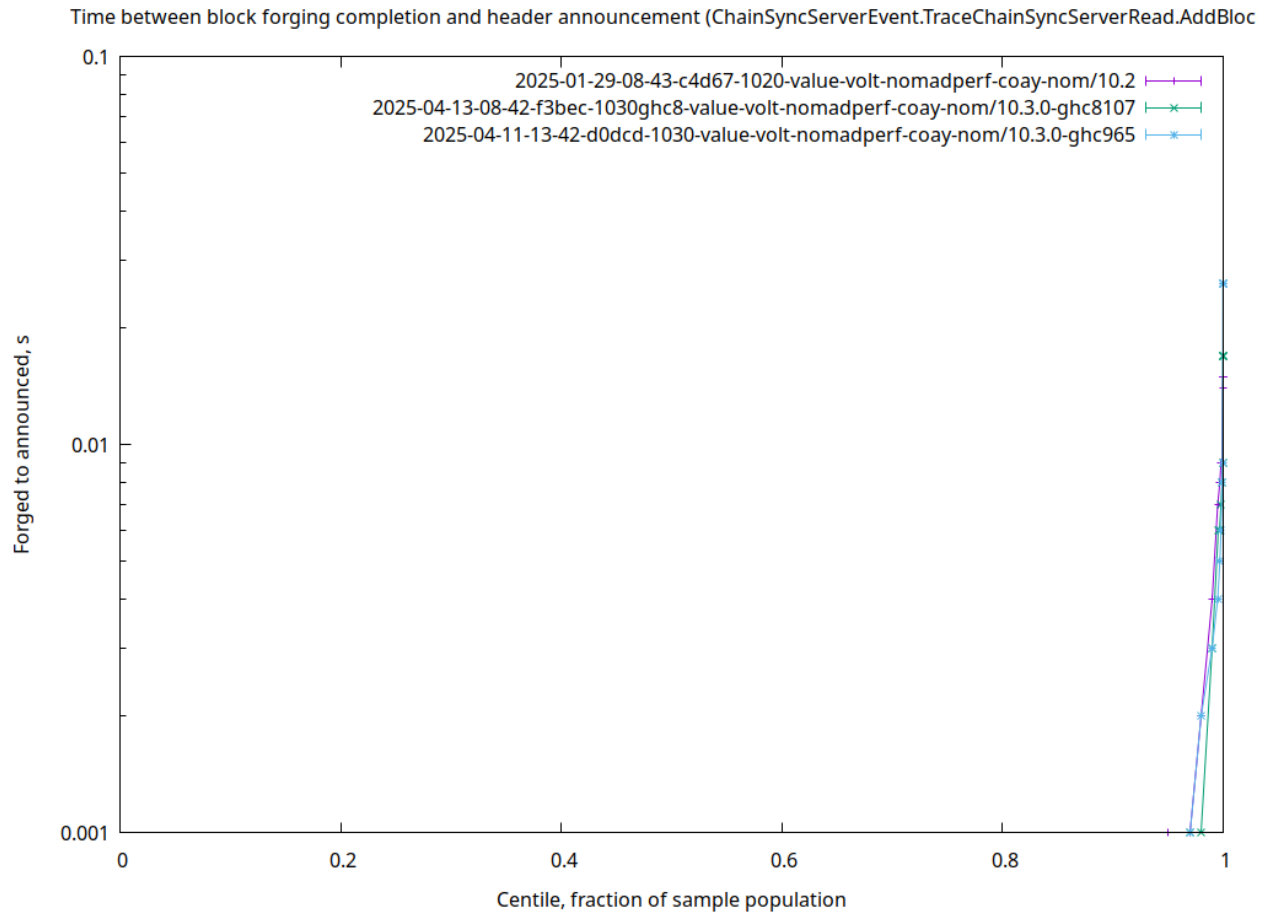
Time between block forging completion and begin-of-sending (TraceBlockFetchServerSendBlock)

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


Time it took for the fastest peer to notice the block (ChainSyncClientEvent.TraceDownloadedHeader), since blocks slot start

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

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.
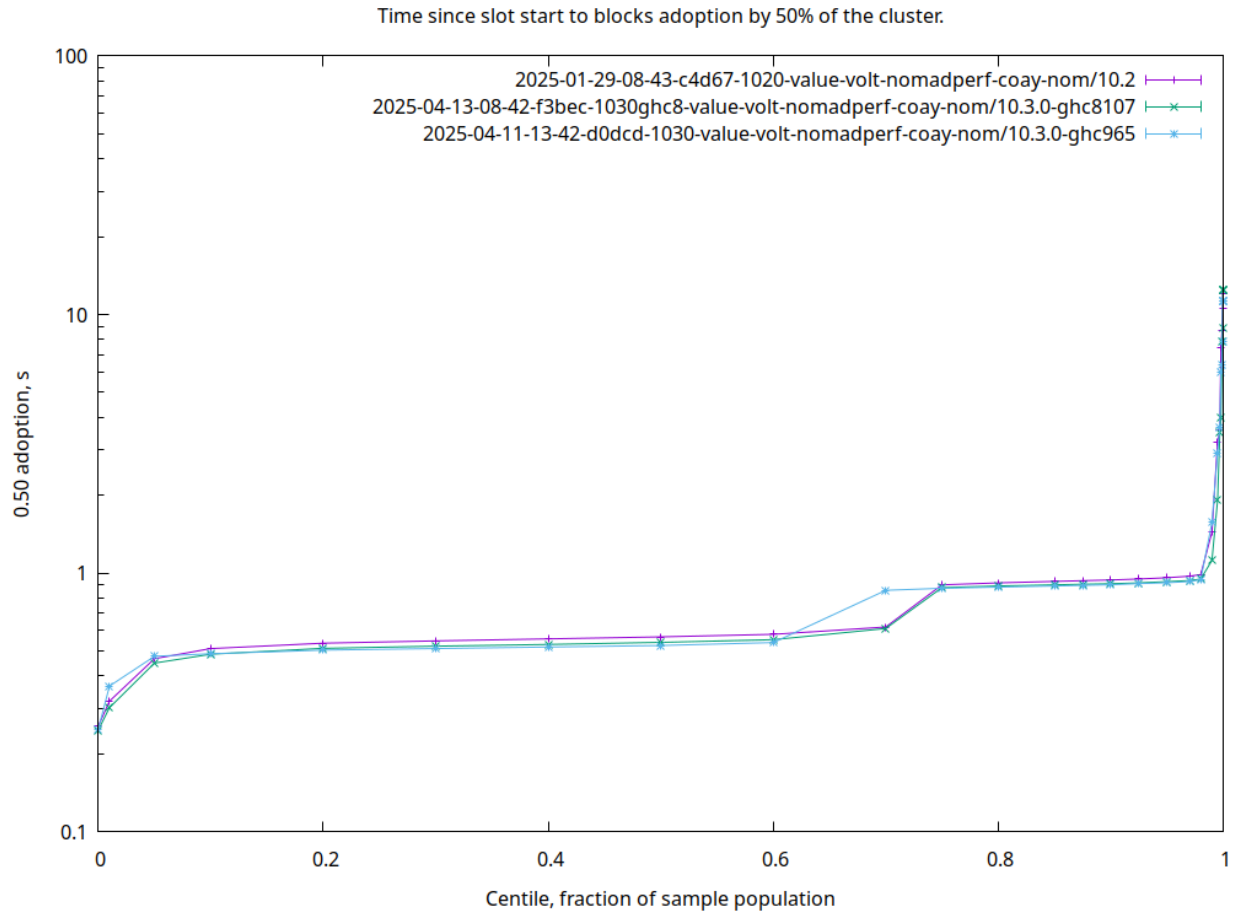
Time since slot start to blocks adoption by 50% of the cluster.

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

Time since slot start to blocks adoption by 80% of the cluster.

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

Time since slot start to blocks adoption by 90% of the cluster.
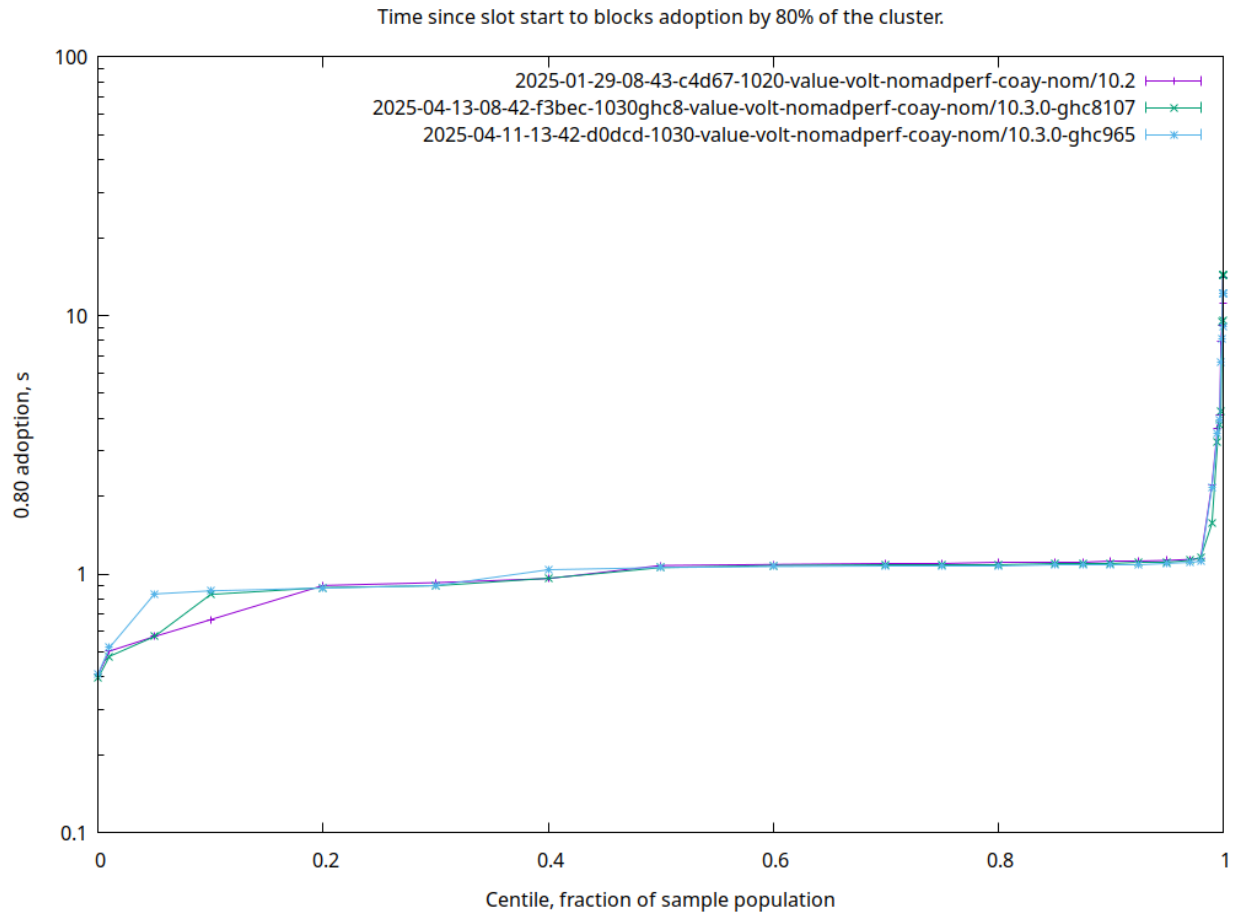
0.96 adoption (cdf0.96) Time since slot start to block's adoption by 96% of the cluster.

Time since slot start to blocks adoption by 96% of the cluster.

Part II

Appendix B: data dictionary

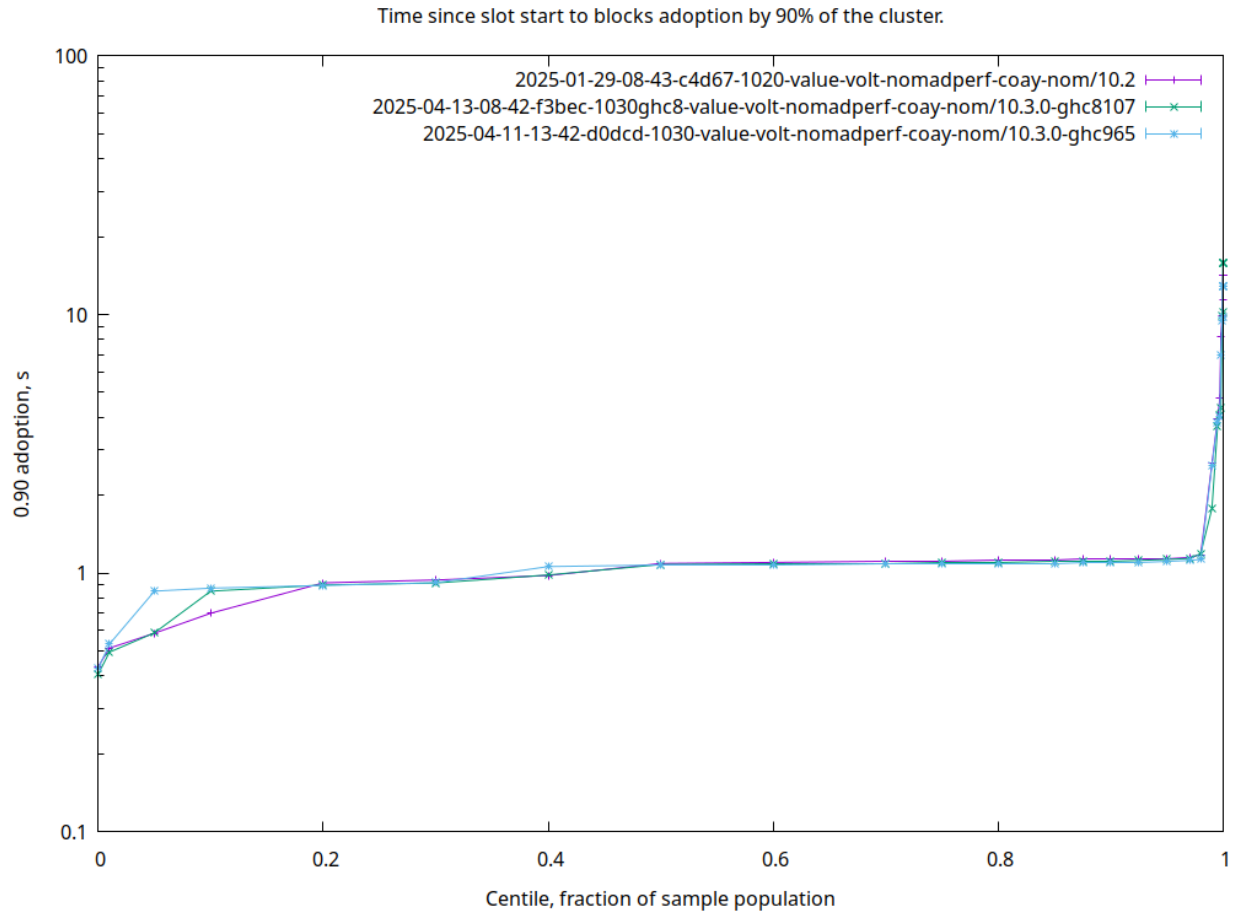# Chapter 4

Block propagation metrics

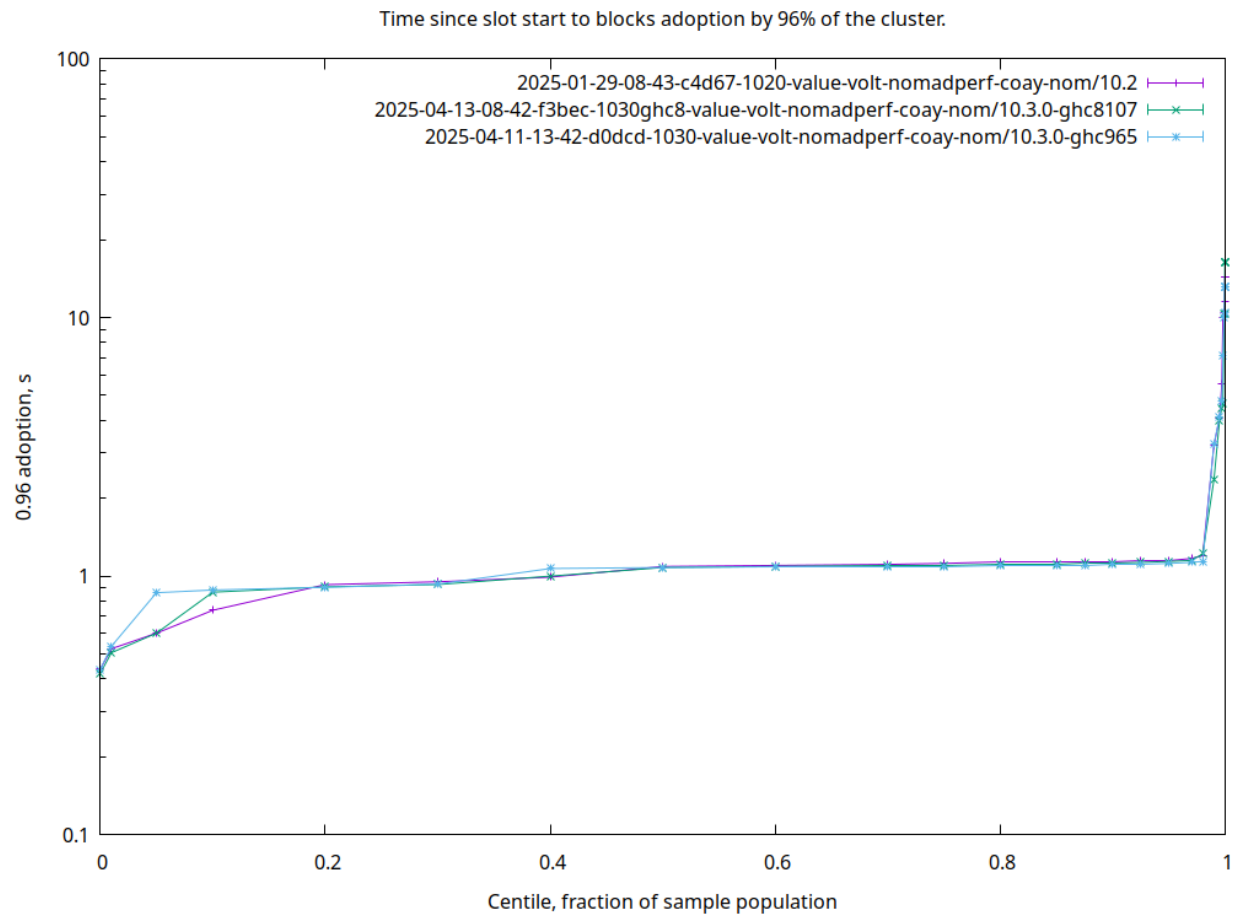**0.50 adoption (cdf0.50)** Time since slot start to block's adoption by 50% of the cluster.

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

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

Fetched to announced (cdfPeerAnnounce) Time it took a peer to announce the block (ChainSyncServerEvent.TraceChainSy... 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.CompletedBlockFe... 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.SendFetchRequ... after it have seen its header

Fetched 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 dateset (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