

ORACLE

MySQL Contributor Summit

The MySQL Health Monitor

Christopher Powers

Lead Principal Software Engineer, MySQL Core

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MySQL Health Monitor

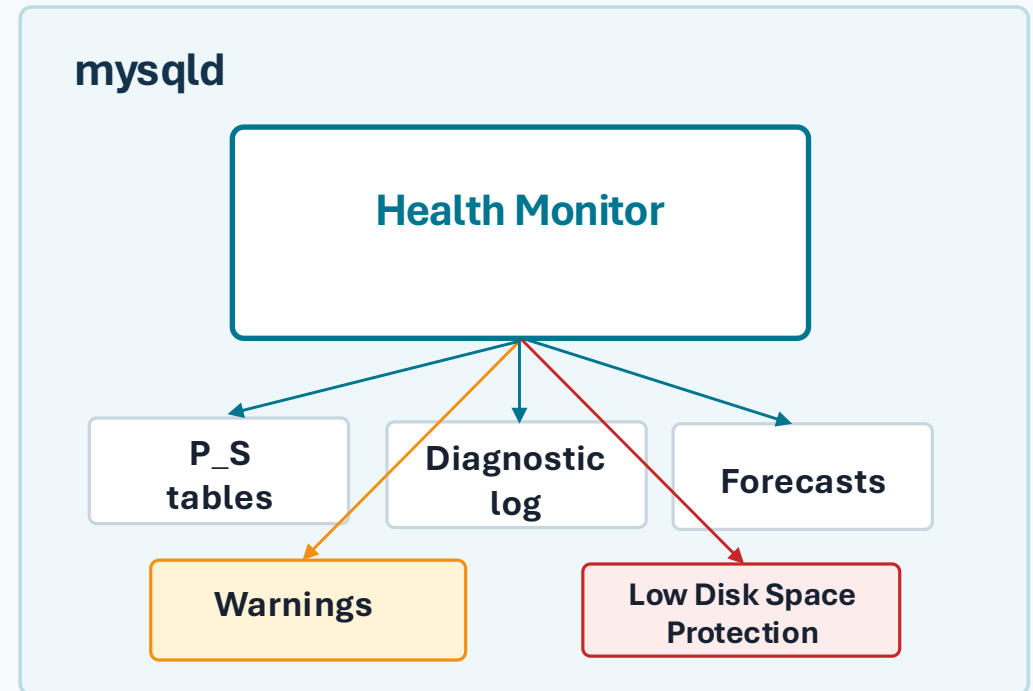
Server-side observability for resource health, forecasting, diagnostics, and protection

What is the Health Monitor?

The Health Monitor is a MySQL server component that collects runtime and host resource metrics, then exposes them through SQL tables.

It was originally created for the MySQL HeatWave Database Service to track disk usage.

Since then, it has grown into a server-side framework for monitoring, diagnostics, forecasting and protection.



Metrics

Forecasting

Diagnostics

Protection

What Does It Do?

A server-resident set of collectors, reporters, forecasters, and protective actions.

Collects resource data

Disk, memory, CPU, process, and I/O metrics sampled from the host and mysqld environment.

Makes it SQL-visible

Resource metrics and recent history are exposed through Performance Schema tables.

Reports periodically

Status goes to the error log, detailed reports go to the diagnostic log.

Forecasts disk usage

Uses recent disk metrics to project 1 hour, 1 day, and 1 week horizons.

Protects the server

When disk space is exhausted, the monitor can fence mysqld before complete disk exhaustion.

Provides an extension point

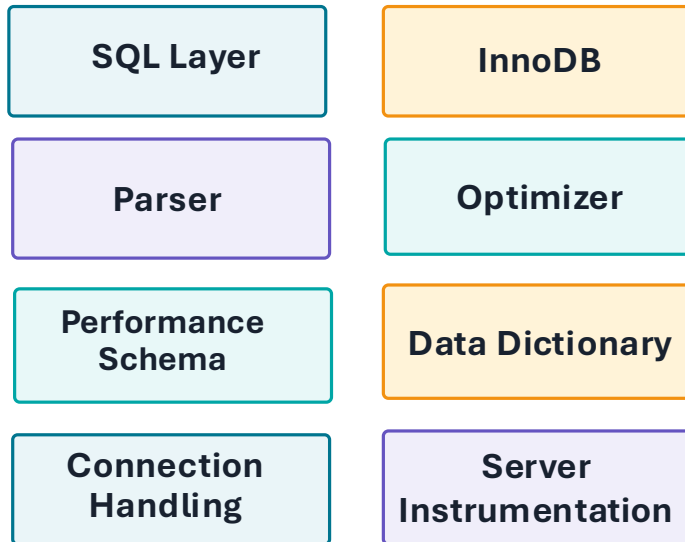
The Health Monitor framework can add new collectors, reports, decisions, and automated actions.

Inside mysql

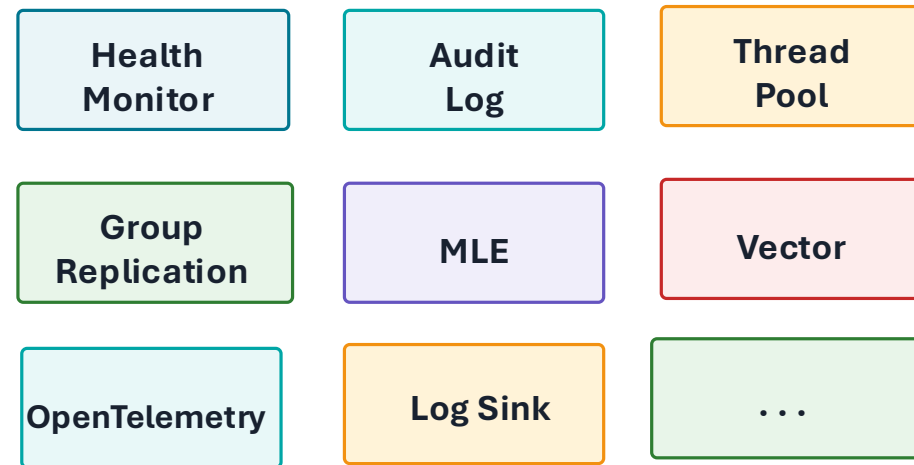
The Health Monitor is an extension of the MySQL server, not an external observer.

mysqld process boundary

Core server services



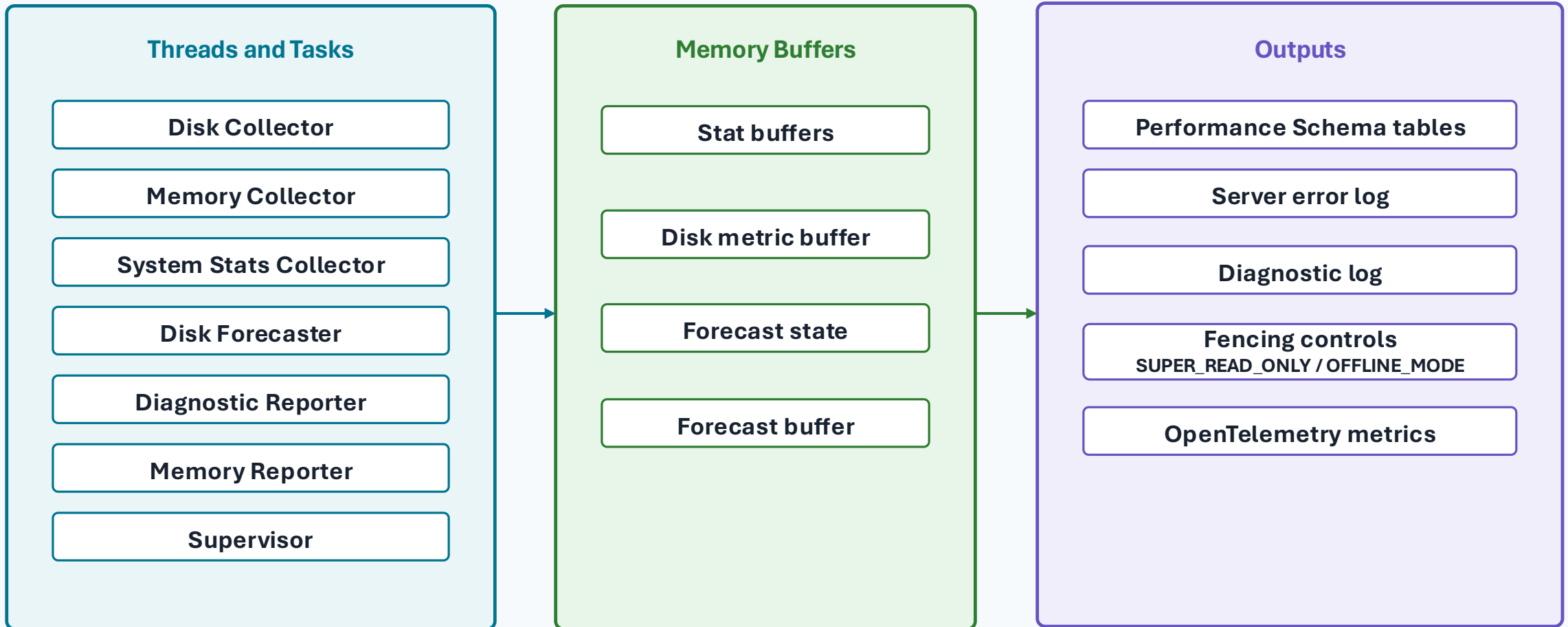
Components and plugins



Runs close to server metadata, runtime state, and instrumentation.

Inside the Health Monitor

Collectors and task threads turn resource samples into tables, reports and actions.



Health Monitor Tables

Grouped by resource

Disk monitoring and forecasting

health_block_device
disk_metric
disk_forecast
disk_forecast_summary

Memory monitoring

health_process_memory
health_system_memory

CPU stats

system_cpu_stats
system_cpu_stats_history

Memory stats

system_memory_stats
system_memory_stats_history

Disk stats

system_disk_stats
system_disk_stats_history

Process stats

system_process_stats
system_process_stats_history

Health Monitor tables can store up to 10 days of metrics.

Disk Collector

Block-device samples showing disk capacity, availability, usage percent, and mount point.

health_block_device

DEVICE	TIME	TOTAL_GB	AVAIL_GB	USED_%	MOUNT_POINT
/dev/sdb1	20:08:36	4998.0	1224.8	75.49	/db
/dev/sdb1	20:07:36	4998.0	1224.8	75.49	/db
/dev/sdb1	20:06:36	4998.0	1224.8	75.49	/db
/dev/sdb1	20:05:36	4998.0	1224.8	75.49	/db
/dev/sdb1	20:04:36	4998.0	1224.8	75.49	/db

Error Log Status and Warnings

2026-05-22T07:23:37 [Note] [Health] Disk: Normal Level: volume='/db', avail=1.09T, total=4.88T, used=77.6%, reserve=4.9G, critical=2.0G, recovery=254.5G, warnings=1003.5G/504.2G/254.5G

2026-05-24T17:28:47 [Warning] [Health] Disk: Warning Level 2 (4.39T): volume='/db', avail=1.02T, total=4.88T, used=79.2%, reserve=4.9G, critical=2.0G, recovery=254.5G, warnings=1003.5G/4.39T/254.5G

Disk Collector - Low Disk Space Protection

The monitor can move mysql into a protected state before exhausted storage destabilizes the server.



Why Do This?

Our experience in OCI showed that disk exhaustion can turn destructive very quickly. The Health Monitor can both report the condition and take action while mysql can still protect itself.

Error Log Warnings

```
2026-05-24T17:14:17 [Warning] [Health] Disk: Critical Level (1.91T): Fallback: volume='/db', avail=1.02T, total=4.88T, used=79.2%, reserve=4.9G, critical=1.91T, recovery=254.5G, warnings=1003.5G/504.2G/254.5G
...
2026-05-24T17:14:17 [Warning] [Health] Disk: Critical Level (1.91T): Setting OFFLINE_MODE = ON
2026-05-24T17:14:17 [Warning] [Health] Disk: Critical Level (1.91T): Setting SUPER_READ_ONLY = ON
...
2026-05-24T18:25:37 [Warning] [Health] Disk: Critical Level (1.91T): Recovery: Available space (1.02T) is above recovery level (254.5G)
2026-05-24T18:25:40 [Warning] [Health] Disk: Critical Level (1.91T): Recovery: Timer 1: Running: 300 seconds until OFFLINE_MODE = OFF
```

Disk Forecaster

Hourly, daily, and weekly forecast with confidence bounds.



observed 24h cycle + trend

forecast

confidence interval

Visualization based on forecast horizons.

Disk Forecaster Tables

disk_metric – Time series used by the forecasting model.

TIMESTAMP	VOLUME_GB	USED_MB	USED_%
2026-05-21 20:03:36	4998.0	3863782	75.49
2026-05-21 20:02:36	4998.0	3863781	75.49
2026-05-21 20:01:36	4998.0	3875463	75.72

disk_forecast – Disk space projections for 1 hour, 1 day, 1 week.

GENERATED	TARGET	HORIZON	FORECAST_GB	CI_LOW_GB	CI_HIGH_GB
2026-05-21 20:10	2026-05-21 21:10	1h	3776.7	3769.8	3783.6
2026-05-21 20:10	2026-05-22 20:10	1d	3782.9	3758.0	3807.5
2026-05-21 20:10	2026-05-28 20:10	1w	3826.4	3722.6	3930.1

Disk Forecaster Summary Table

A compact summary for status, trend, and ETA decisions.

disk_forecast_summary

TIME	USED_GB	USED_PCT	TREND_MB_D	USAGE_PCT_D	HAS_ETA	ETA_DAYS	STATUS
2026-05-21 20:10	3863.8	75.49	6.8	0.13	YES	167.4	NORMAL
2026-05-21 16:10	3862.9	75.47	7.1	0.14	YES	160.6	NORMAL
2026-05-21 12:10	3862.4	75.46	6.5	0.13	YES	174.1	NORMAL
2026-05-21 08:10	3861.8	75.45	-60.6	-1.13	YES	171.5	NORMAL
2026-05-20 04:10	4116.0	80.03	223.7	5.13	YES	6.9	WARNING
2026-05-20 00:10	4375.6	85.82	310.4	15.02	YES	3.8	WARNING

Memory Collector

Process and system memory stats collected every minute, stored for 24 hours.

health_process_memory

TIME	PROCESS	PID	RSS_MB	DATA_MB	SWAP_MB	FAULTS
01:53:36	mysqld	165508	767652.0	1410900.0	0.0	65
01:52:36	mysqld	165508	767652.0	1410900.0	0.0	65
01:51:36	mysqld	165508	767652.0	1410900.0	0.0	65
01:50:36	mysqld	165508	767652.0	1410900.0	0.0	65
01:49:36	mysqld	165508	767652.0	1410900.0	0.0	65
01:48:36	mysqld	165508	767652.0	1410900.0	0.0	65

health_system_memory

TIME	TOTAL_GB	AVAIL_GB	USED_%	FREE_GB	SWAP_GB	SWAP_FREE
01:53:36	377.2	344.9	8.56	162.5	4.0	25.3
01:52:36	377.2	344.9	8.56	162.5	4.0	25.3
01:51:36	377.2	344.9	8.56	162.5	4.0	25.3
01:50:36	377.2	344.9	8.56	162.5	4.0	25.3
01:49:36	377.2	344.9	8.56	162.5	4.0	25.3
01:48:36	377.2	344.9	8.56	162.5	4.0	25.3

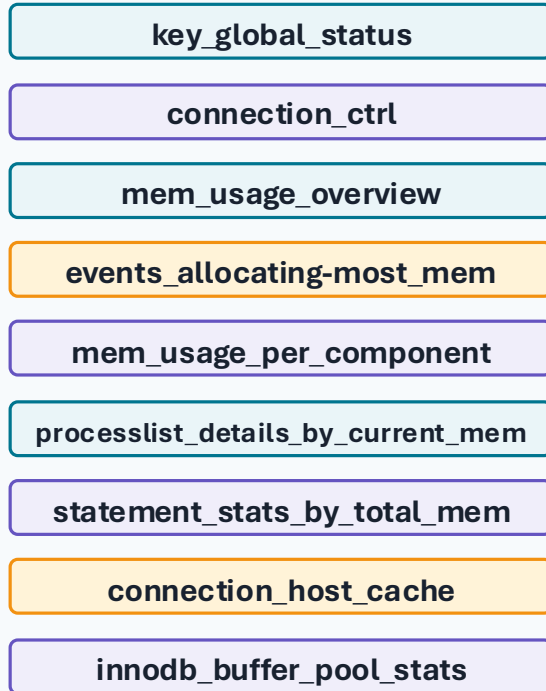
Error Log Status and Warnings

```
2026-05-22T07:23:37 [Note] [Health] Memory: avail=339.3G, total=377.2G, used=10.0%, mysqld=749M, warnings=1.0G/500M/100M
...
2026-05-24T17:23:42 [Warning] [Health] Memory: Warning Level 1 (931M): avail=905.4M, total=377.2G, used=99.7%, mysqld=753M,
warnings=1.0G/500M/100M
```

Memory Collector – Low Memory Report

Triggered by low memory, written to the diagnostic log.

Diagnostic Reports



Example JSON report

```
{
  "time": "2026-05-24 07:04:01.000000",
  "hm_events_allocating_most_mem": [
    {
      "count_free": 0,
      "event_name": "memory/innodb/log_buffer_memory",
      "count_alloc": 1,
      "curr_count_used": 1,
      "high_count_used": 1,
      "curr_number_of_bytes_used": 67109872,
      "high_number_of_bytes_used": 67109872
    },
    ...
  ]
  {
    "time": "2026-05-24 07:03:01.000000",
    "hm_mem_usage_per_component": [
      {
        "component": "memory/mysqld_openssl",
        "max_alloc": "1522658",
        "min_alloc": "0",
        "current_alloc": 205756,
        "current_count": "1015"
      },
      {
        "component": "memory/performance_schema",
        "max_alloc": "138435248",
        "min_alloc": "0",
        "current_alloc": 138435248,
        "current_count": "669"
      }
    ],
    ...
  ]
}
```

System Stats Collector

Host-level stats are sampled into Performance Schema and exported as telemetry metrics.

CPU

system_cpu_stats
system_cpu_stats_history

Memory

system_memory_stats
system_memory_stats_history

Disk I/O

system_disk_stats
system_disk_stats_history

Process

system_process_stats
system_process_stats_history

OpenTelemetry

The same system statistics can also be exported as metrics through the OpenTelemetry component.

System Stats Tables

CPU, memory and disk stats.

system_cpu_stats

TIME	CPU	USER_MS	SYSTEM_MS	IDLE_MS	IOWAIT_MS	IRQ_MS	SOFTIRQ_MS
20:08:38	cpu	1948684750	274045050	49015382700	338404840	45931380	7882950
20:08:38	cpu0	28475660	4494080	765773890	5844780	827390	1312810
20:08:38	cpu1	34725160	3961150	762789060	4181940	634500	456980
20:08:38	cpu10	33614800	5031240	760376060	6512950	927750	117920

system_memory_stats

TIME	TOTAL_GB	USED_GB	AVAIL_GB	CACHED_GB	SLAB_GB
20:08:36	377.2	24.7	333.2	190.4	5.8
20:07:36	377.2	24.7	333.2	190.4	5.8
20:06:36	377.2	24.7	333.2	190.4	5.8
20:05:36	377.2	24.7	333.2	190.4	5.8

system_disk_stats

TIME	DEV	READ_CNT	READ_MB	WRITE_CNT	WRITE_MB
20:08:38	dm-0	1168223	39814.1	6777557	147635.4
20:08:38	dm-1	192	4.1	0	0.0
20:08:38	sda	1007880	42893.1	3024561	147638.5
20:08:38	sda1	293	20.1	47	0.0

System Stats Process Table

Process and thread-level host stats.

system_process_stats

TIME	PID	PROC	TID	THREAD	ST	NTHR	VSZ_MB	RSS_MB	CPU
20:08:38	165508	mysqld	165508	(mysqld)	S	125	9500.5	686.7	49
20:08:38	165508	mysqld	165656	(tp_worker)	S	0	0.0	0.0	50
20:08:38	165508	mysqld	165670	(tp_worker)	S	0	0.0	0.0	4
20:08:38	165508	mysqld	165657	(tp_worker)	S	0	0.0	0.0	17
20:08:38	165508	mysqld	165658	(ib_srv_purge)	S	0	0.0	0.0	20
20:08:38	165508	mysqld	165659	(ib_srv_wkr-1)	S	0	0.0	0.0	14
20:08:38	165508	mysqld	165660	(ib_srv_wkr-2)	S	0	0.0	0.0	18
20:08:38	165508	mysqld	165661	(health_disk)	S	0	0.0	0.0	36
20:08:38	165508	mysqld	165662	(health_dfx)	S	0	0.0	0.0	23
20:08:38	165508	mysqld	165669	(sig_handler)	S	0	0.0	0.0	2

Diagnostic Reporter

The Health Monitor writes structured reports on scheduled intervals to the diagnostic log.

Diagnostic Reports

15 min

key_global_status
connection_ctrl
connection_host_cache
mem_usage_per_component
mem_usage_overview
tp_group_stats
tp_group_state

120 min

basic_global_status
data_type_usage_count
data_volume
key_usage

60 min

binlog_compression_stats
tmp_table_space
error_codes_emitted
full_table_scans
innodb_buffer_pool_stats
innodb_lock_waits
innodb_metrics
long_lasting_trx
rpl_group_member_stats
rpl_applier_status
statement_stats_by_total_mem

24 hr

global_variables
instance_metadata

Example JSON report

```
{
  "time": "2026-05-21 19:24:48.000000",
  "hm_tmp_table_space": [
    {
      "high": 1048608,
      "event": "memory/temptable/physical_ram",
      "current": 0,
      "sum_free": 1048608,
      "sum_alloc": 1048608
    }
  ]
},
{
  "time": "2026-05-21 19:24:47.000000",
  "hm_mem_usage_overview": [
    { "key": "mysql_version", "val": "10.0.0-debug" },
    { "key": "total_allocated", "val": "322090038" },
    { "key": "innodb_buffer_pool_size", "val": "25165824" },
    { "key": "join_buffer_size", "val": "262144" }
  ]
},
{
  "time": "2026-05-21 23:24:48.000000",
  "hm_data_volume": [
    { "key": "Number of schemas", "val": 4 },
    { "key": "Number of system tables", "val": 223 },
    { "key": "Number of user tables", "val": 1 },
    { "key": "Estimated total data volume", "val": 32669 }
  ]
},
}
```

Future - What Else Could It Do?

Turn health signals into automated action.

More predictors

Forecast

- Memory usage
- Temporary file space
- Redo/binary log growth

Recommended actions

Turn resource state into actionable guidance.

Automatic evidence packs

Capture table snapshots and diagnostic subreports around incidents.

Resource simulator

Replay disk and memory scenarios using actual production metrics to dial in forecast models and collector state machines.

Adaptive thresholds

Learn baselines and classify anomalies for different workloads.

Multiple forecast engines

Pluggable forecasting models for different usage patterns and prediction horizons.

Takeaway

The Health Monitor is more than a metrics collector.

**It gives MySQL awareness
of its environment.**

Resource signals become visible and actionable
from *inside the server*.

Observe

Explain

Forecast

Protect



Questions?