initMAX

Webinar

Zabbix performance tuning

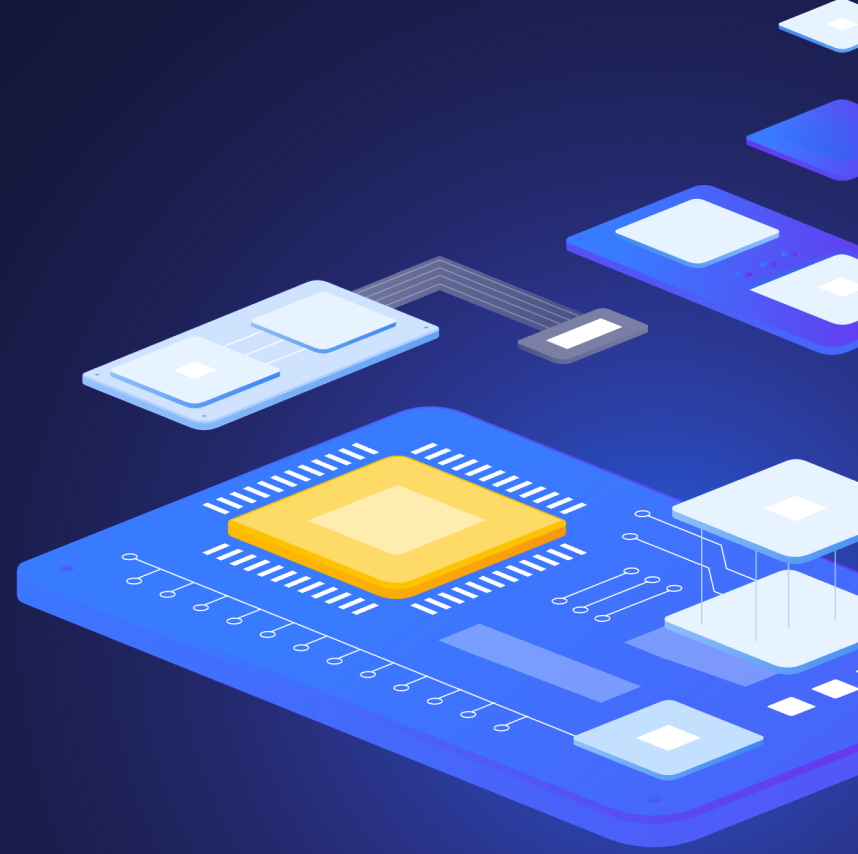
all our microphones are muted

ask your questions in Q&A, not in the Chat

use Chat for discussion, networking or applause

1

Performance tuning



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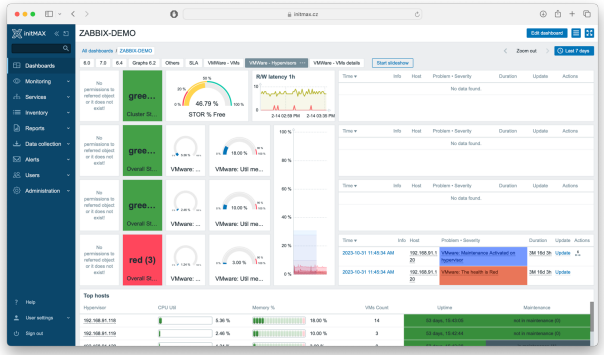
Zabbix data flow



Visualization

Notifications

Database

ZABBIX Server

Data collection

History

Analysis

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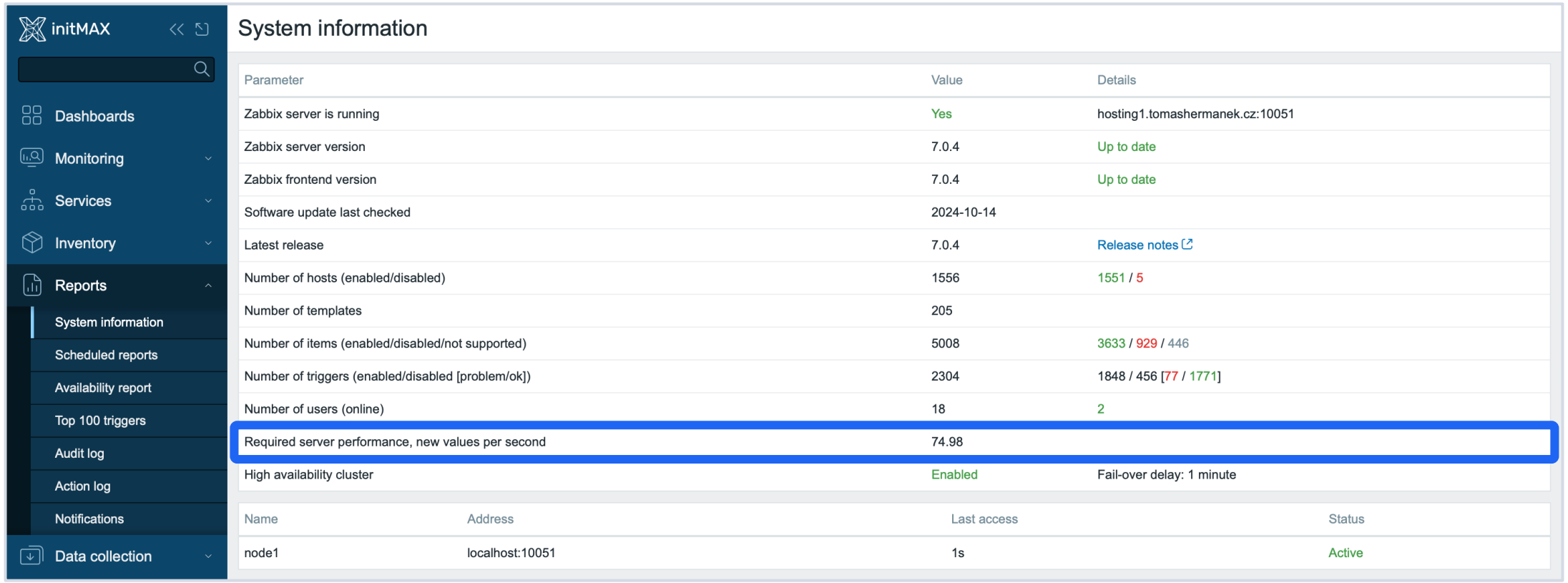
How to measure performance

Number of values processed per second (NVPS)

A rough estimate of NVPS is visible in Zabbix



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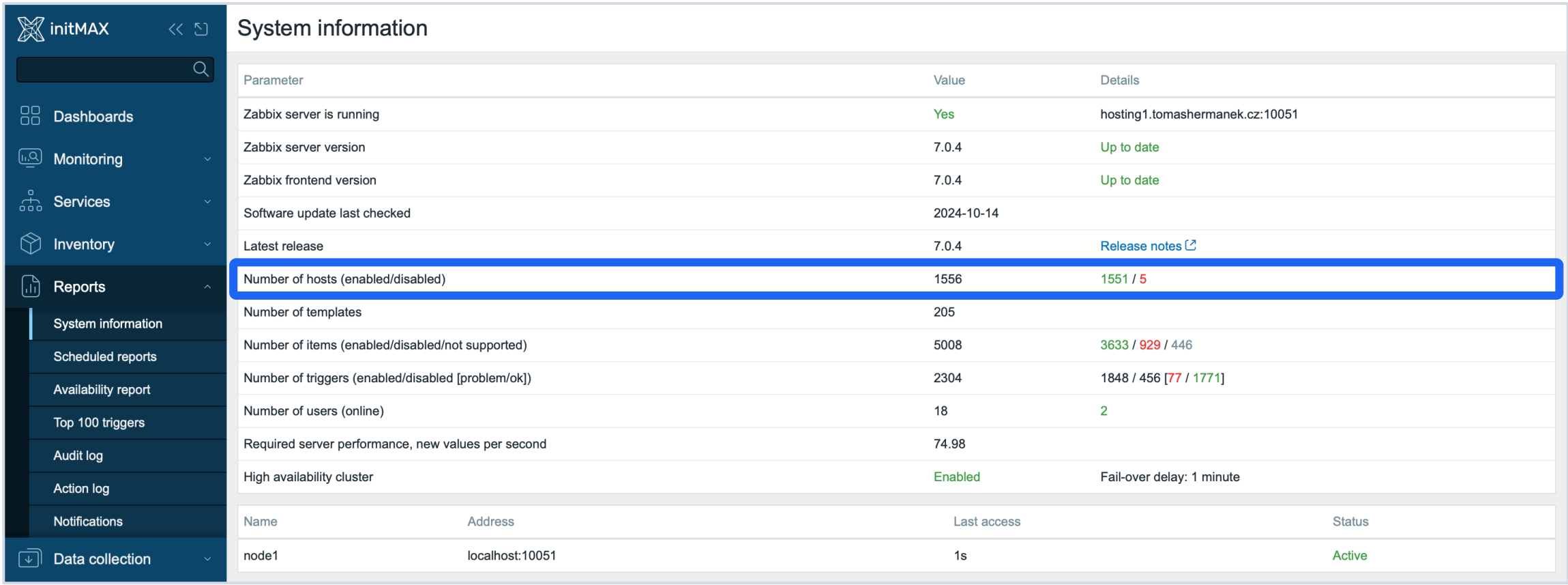
How to measure performance

Why the number of devices is not an indicator?



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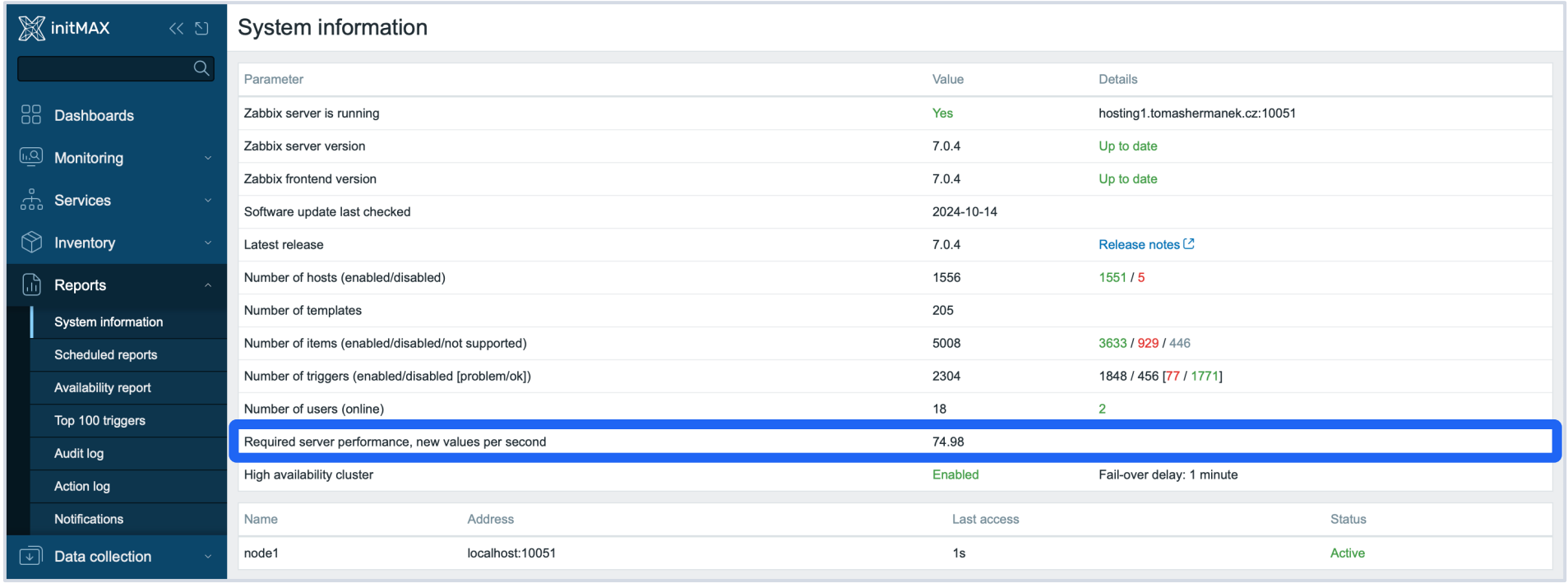
How to measure performance



- Update frequency greatly affects NVPS.
- The calculation takes into account data from the monitored devices.
- Data types “Zabbix trapper” or “SNMP trap” are not taken into account.

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How to measure performance

Parameter	Value	Details
Zabbix server is running	Yes	[redacted]:10051
Zabbix server version	7.0.4	Up to date
Zabbix frontend version	7.0.4	Up to date
Software update last checked	2024-10-14	
Latest release	7.0.4	Release notes
Number of hosts (enabled/disabled)	30820	24973 / 5847
Number of templates	1668	
Number of items (enabled/disabled/not supported)	3379343	2707388 / 542754 / 129201
Number of triggers (enabled/disabled [problem/ok])	1380469	1150804 / 229665 [30750 / 1120054]
Number of users (online)	10214	32
Required server performance, new values per second	38637.6	
High availability cluster	Enabled	Fail-over delay: 1 minute

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Performance

Hardware: 10 Core CPU, 64GB, 2x1TB NVMe SSD (RAID1), 2x1Gbps NIC
Budget: ~ 4K EUR

- Zabbix is able to deliver 2,7 million of values per minute or around 45.000 of values per second
- In real life performance would be worse. Why?!

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What affects performance?

- Type of items, value types, SNMPv3, number of triggers and complexity of triggers.
- Housekeeper settings and thus size of the database.
- Number of users working with the WEB interface.

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What affects performance?

60 items per host, update frequency once per minute

Number of hosts	Performance - NVPS
100	100
1 000	1 000
10 000	10 000

300 items per host, update frequency once per minute

Number of hosts	Performance - NVPS
100	500
1 000	5 000
10 000	50 000

- Choose update frequency and duration of storage carefully

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Performance

- History analysis affects performance of Zabbix. But not so much!

	Slow	Fast
Database size	Large	Fits into memory
Low-level detection	Update frequency 30s, 15m, 30m	Update frequency 1h, 1d, 7d
Errors in settings	nodata(5m) and mult. event generation, min(#3600)	nodata(5m), min(3600)
Trigger expressions	min(), max(), avg()	last(), nodata()
Data collection	Polling (SNMP, agent-less, passive agent)	Trapping (active agents)
Data types	Text, string	Numeric

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Performance

Different views on performance

“I just added 5 hosts and Zabbix died” :-(
“Zabbix is so slooooow, I have only 48 hosts” :-(

“Zabbix Milestone achieved - 1000 hosts and growing” :-)
“Our status update: 232623 hosts, 3878565 items, 591121 triggers, 19086 vps” :-)

What’s the difference?

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Performance

Common problems of initial setup

Default database settings

- Tune database for the best performance (https://github.com/hermanekt/Zabbix_MYSQL_tunned_for_40k)
- TimescaleDB tuner **timescaledb-tune** (https://docs.timescale.com/self-hosted/latest/configuration/timescaledb-tune/)

Not optimal configuration of Zabbix Server

- Tune Zabbix Server configuration (Monitoring > Dashboard > Zabbix server health)

Housekeeper settings do not match hardware spec

- (Use partitions in DB)

Use of default templates

- Make your own smarter templates

Use of older releases

- **Always use the latest one!**

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Performance

Visible symptoms of bad performance

- Zabbix queue has too many delayed items Administration->Queue
- Frequent gaps in graphs, no data for some of the items
- False positives for triggers having nodata() function
- Unresponsive WEB interface
- No alerts or thousands of alerts

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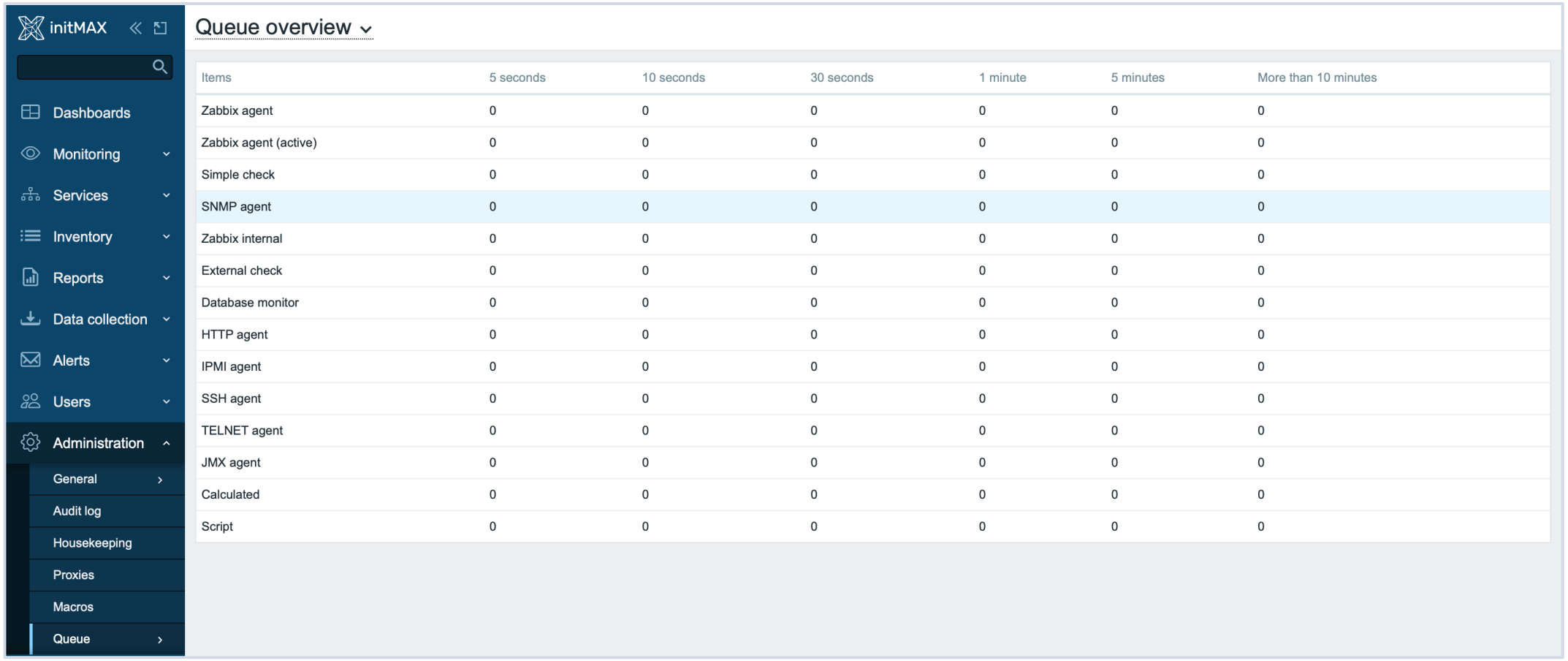
Performance

Nice view of queue of items



Items	5 seconds	10 seconds	30 seconds	1 minute	5 minutes	More than 10 minutes
Zabbix agent	0	0	0	0	0	0
Zabbix agent (active)	0	0	0	0	0	0
Simple check	0	0	0	0	0	0
SNMP agent	0	0	0	0	0	0
Zabbix internal	0	0	0	0	0	0
External check	0	0	0	0	0	0
Database monitor	0	0	0	0	0	0
HTTP agent	0	0	0	0	0	0
IPMI agent	0	0	0	0	0	0
SSH agent	0	0	0	0	0	0
TELNET agent	0	0	0	0	0	0
JMX agent	0	0	0	0	0	0
Calculated	0	0	0	0	0	0
Script	0	0	0	0	0	0

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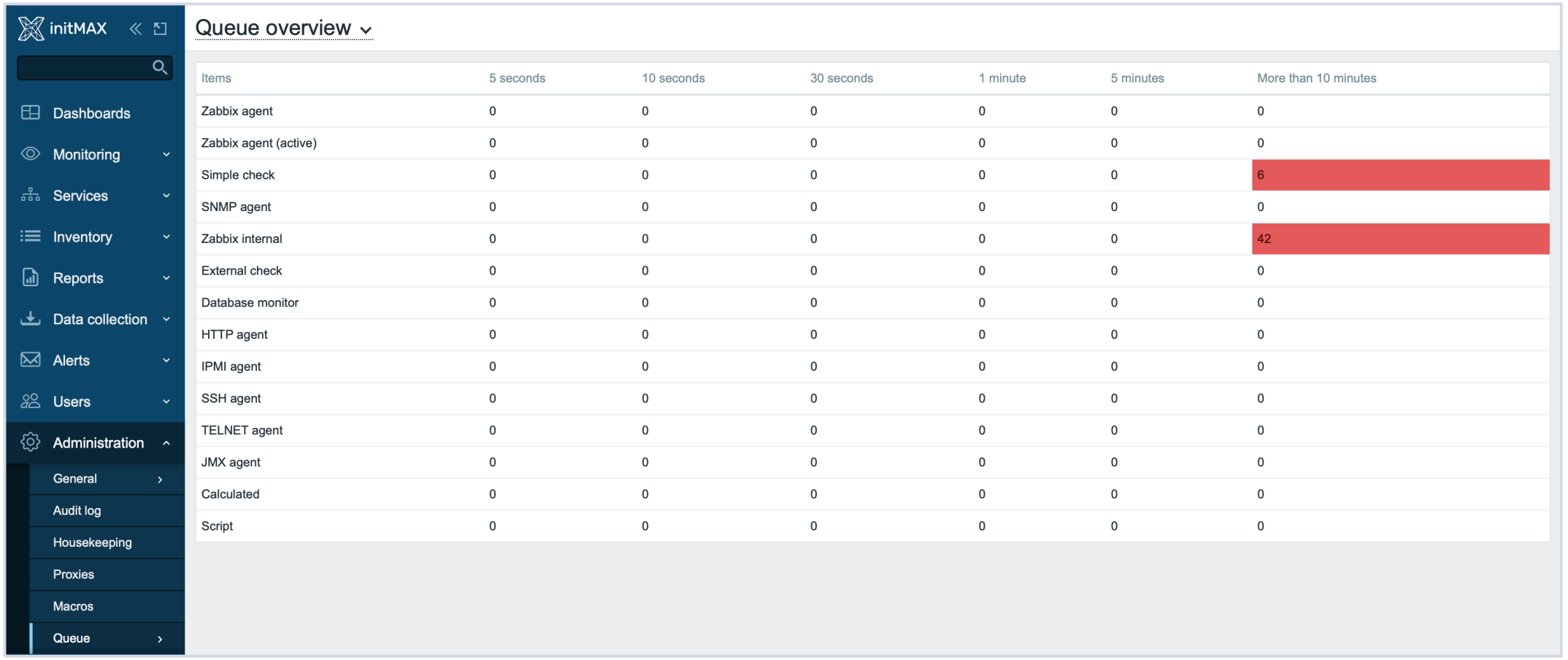
Performance

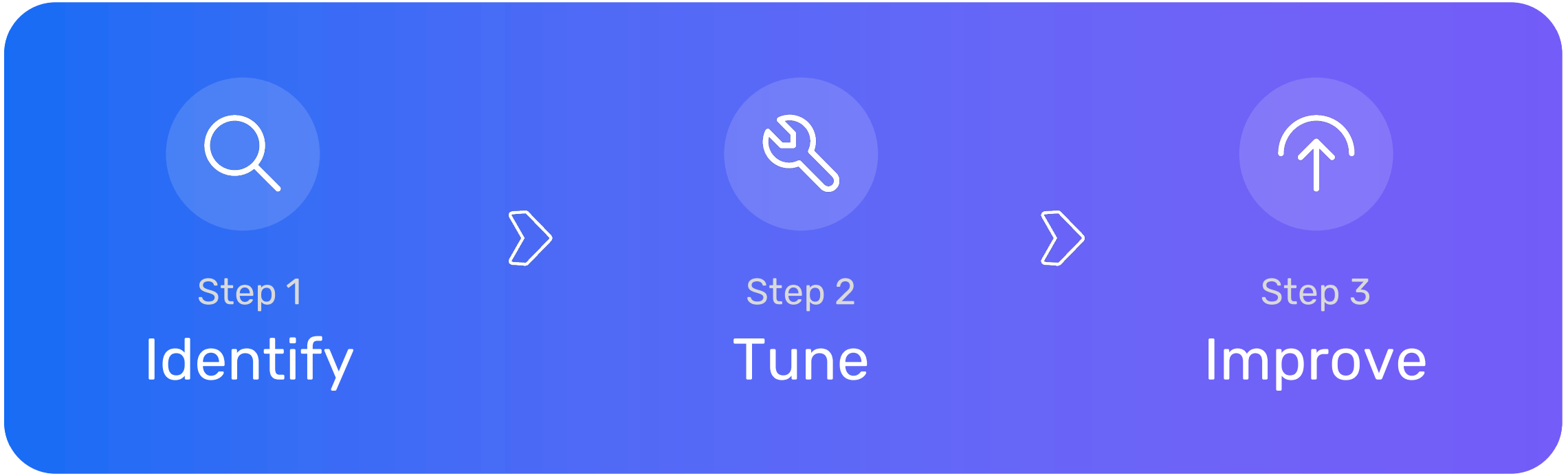
Nice view of queue of items during a problem state



Items	5 seconds	10 seconds	30 seconds	1 minute	5 minutes	More than 10 minutes
Zabbix agent	0	0	0	0	0	0
Zabbix agent (active)	0	0	0	0	0	0
Simple check	0	0	0	0	0	6
SNMP agent	0	0	0	0	0	0
Zabbix internal	0	0	0	0	0	42
External check	0	0	0	0	0	0
Database monitor	0	0	0	0	0	0
HTTP agent	0	0	0	0	0	0
IPMI agent	0	0	0	0	0	0
SSH agent	0	0	0	0	0	0
TELNET agent	0	0	0	0	0	0
JMX agent	0	0	0	0	0	0
Calculated	0	0	0	0	0	0
Script	0	0	0	0	0	0

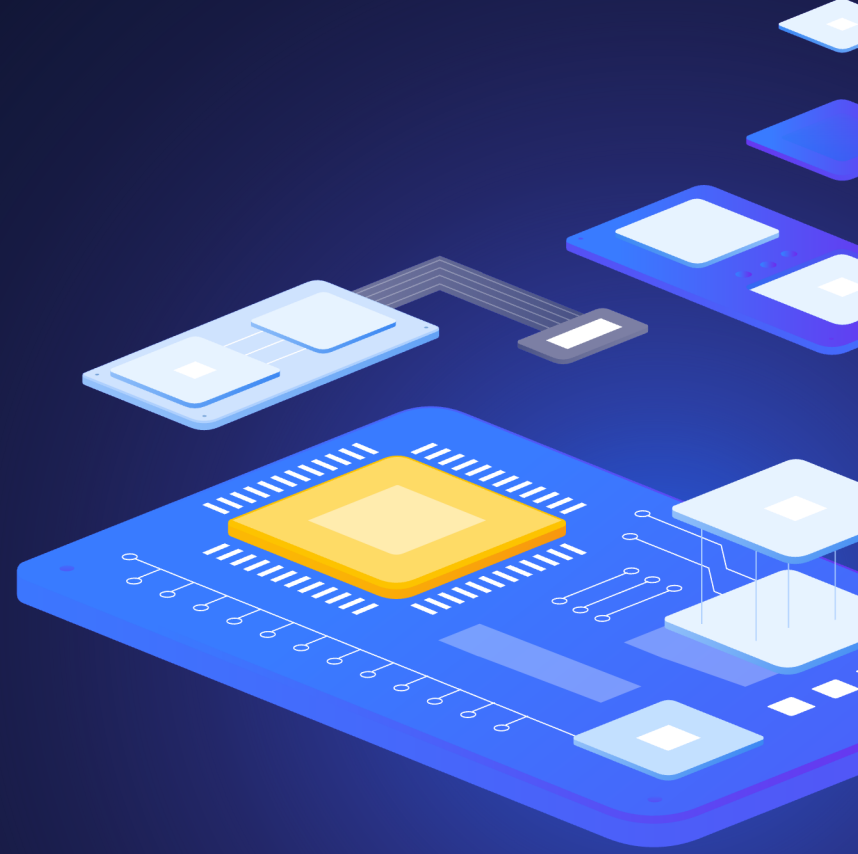
Zabbix performance tuning

Performance



2

Identify



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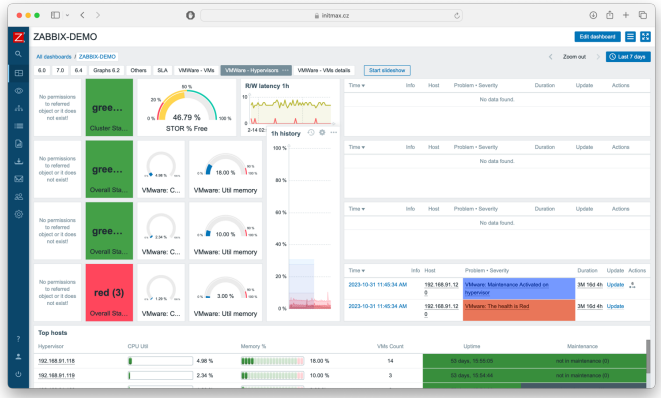
Identify

How to understand which one is the root cause of Zabbix slowdown?

Visualization



Database

ZABBIX Server

History

Analysis

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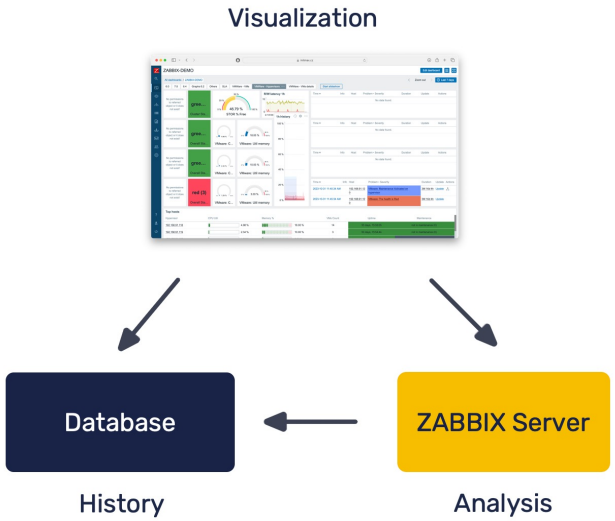
Identify



Main utilities

- top, ntop, iostat, vmstat, sar
- Zabbix itself
- strace or log file with debugging mode enabled
- ps aux | grep zabbix_server

```
# ps ax | grep sync
zabbix_server: history syncer #1 [synced 1845 items in 0.257111 sec, syncing history]
zabbix_server: history syncer #2 [synced 24 items in 0.060314 sec, idle 4 sec]
zabbix_server: history syncer #3 [synced 0 items in 0.000018 sec, idle 4 sec]
zabbix_server: history syncer #4 [synced 0 items in 0.000009 sec, syncing history]
```

Values change?

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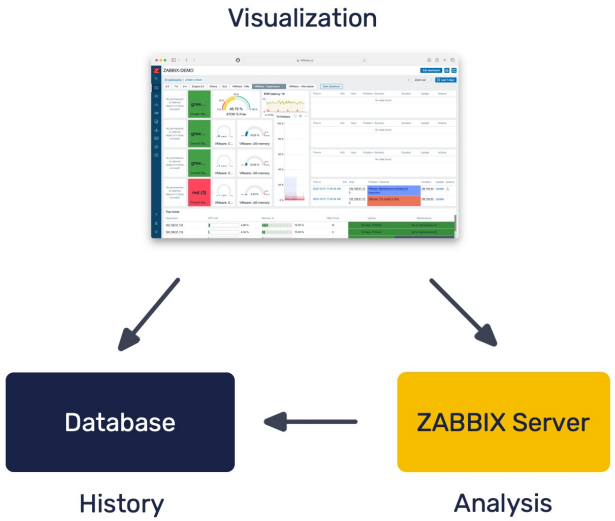
Identify



Main utilities

- top, ntop, iostat, vmstat, sar
- Zabbix itself
- strace or log file with debugging mode enabled
- ps aux | grep zabbix_server

```
# ps ax | grep sync
history syncer #1 [synced 1020 items in 285.198752 sec, syncing history]
history syncer #2 [synced 915 items in 285.177799 sec, syncing history]
history syncer #3 [synced 3401 items in 284.936376 sec, syncing history]
history syncer #4 [synced 1194 items in 285.280719 sec, syncing history]
```

During the problem?

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Identify

Get internal statistics

The actual VPS value

- zabbix[wcache, values, all]
- zabbix[queue,1m] amount of items with a delay of more than 1 minute

Zabbix server components

- Alerter, Configuration syncer, DB watchdog, discoverer, escalator, history syncer, http poller, housekeeper, icmp pinger, ipmi poller, poller, trapper, etc.

Zabbix server cache

- history write cache, value cache, trend write cache, vmware cache, etc.

Ready templates:

- Template App Zabbix Server
- Template App Zabbix Proxy
- Template App Zabbix Agent

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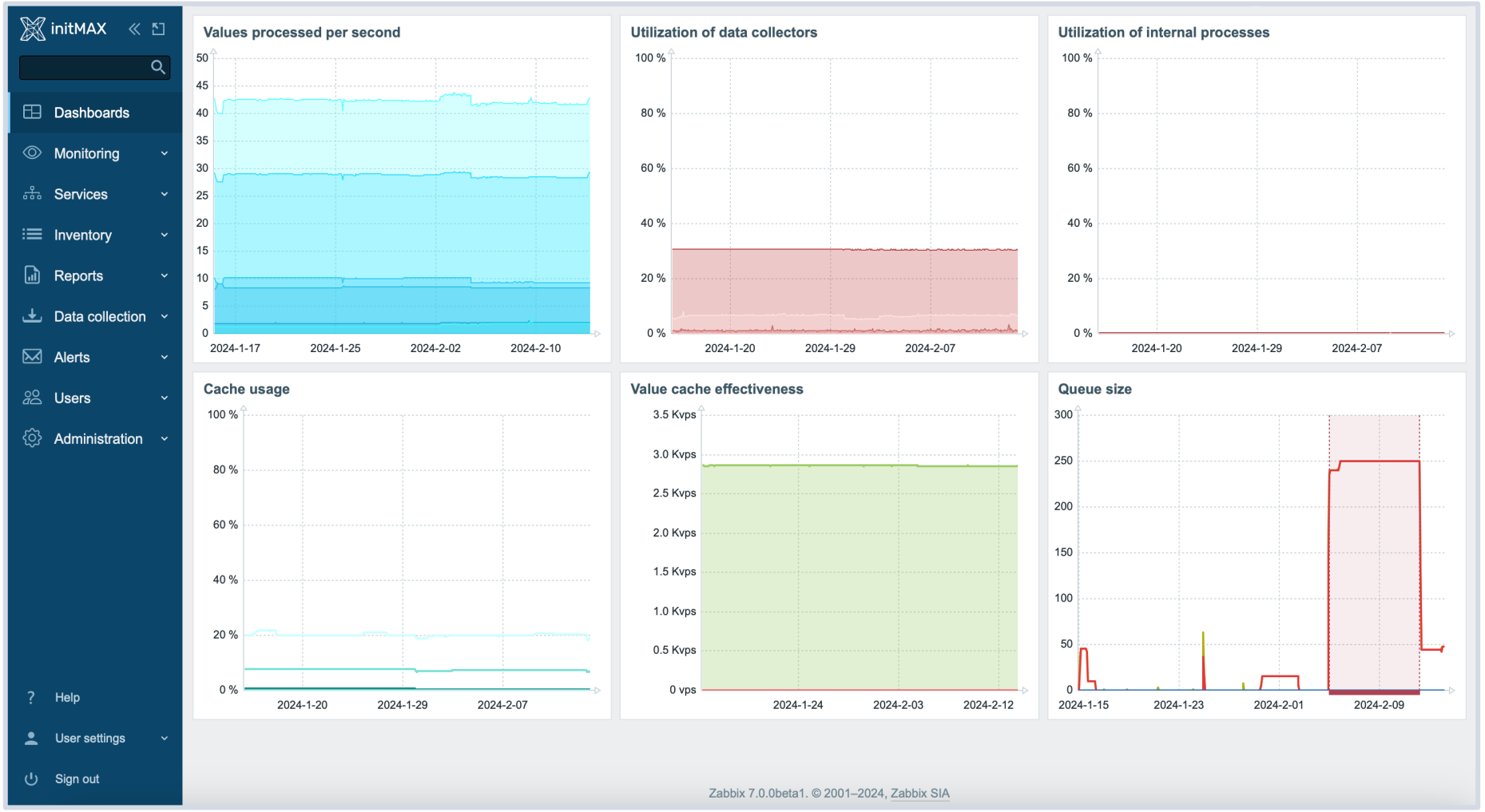
Identify



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Identify

Debug mode

- There is a problem, but it is not clear what kind of problem?
- Enable debugging mode for the process:

  # zabbix_server -R log_level_increase=alerter
- Search in the log for information about the problem (grep, etc.):

  /var/log/zabbix/zabbix_server.log

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Identify

How to know that the performance of the DB is bad?

- Zabbix server configuration file, zabbix_server.conf

```
LogSlowQueries=3000
```

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Identify

Main utilities

- top, ntop, iostat, vmstat, sar
- DB statistics, innotop, **pg_top**

```
last pid: 4161158;  load av  0.53,  0.27,  0.26;       up 102+22:02:42
102 processes: 102 sleeping
CPU states:  2.5% user,  0.0% nice,  1.9% system, 95.6% idle,  0.1% iowait
Memory: 15G used, 140M free, 16K buffers, 10G cached
DB activity:  91 tps,  0 rollbs/s,  27 buffer r/s, 99 hit%,    496 row r/s, 1402 row w/s
DB I/O:    20 reads/s,  1102 KB/s,    25 writes/s,  2866 KB/s
DB disk: 490.3 GB total, 260.6 GB free (46% used)
Swap: 73M used, 7987M free, 2708K cached

  PID USERNAME PRI NICE  SIZE   RES STATE   TIME   WCPU    CPU COMMAND
3581700 postgres  20    0 3363M   31M sleep  43:23  0.25%  0.80% postgres: zabbixdb: zabbix_server zabbix [redacted] (41916) idle
3581704 postgres  20    0 3363M   31M sleep  42:48  0.25%  0.80% postgres: zabbixdb: zabbix_server zabbix [redacted] (41946) idle
3581701 postgres  20    0 3363M   34M sleep  42:36  0.19%  0.80% postgres: zabbixdb: zabbix_server zabbix [redacted] (41912) idle
3581698 postgres  20    0 3363M   31M sleep  42:22  0.24%  0.80% postgres: zabbixdb: zabbix_server zabbix [redacted] (41904) idle
 1860 postgres  20    0 3340M 8436K sleep 343:49  0.14%  0.60% postgres: zabbixdb: checkpointer
4158428 postgres  20    0 3346M   20M sleep   0:02  0.07%  0.40% postgres: zabbixdb: zabbix_web zabbix [redacted] (41080) idle
3385676 postgres  20    0 3337M 8408K sleep  78:12  0.05%  0.20% postgres: zabbixdb: walsender repl [redacted] (62544) streaming 110D/2DA0AC98
3400490 postgres  20    0 3337M 8144K sleep  76:03  0.05%  0.20% postgres: zabbixdb: walsender repl [redacted] (46496) streaming 110D/2DA0AC98
3581719 postgres  20    0 3344M   18M sleep   1:28  0.02%  0.20% postgres: zabbixdb: zabbix_server zabbix [redacted] (42084) idle
3581729 postgres  20    0 3344M   18M sleep   1:25  0.02%  0.20% postgres: zabbixdb: zabbix_server zabbix [redacted] (42176) idle
3581718 postgres  20    0 3344M   18M sleep   1:25  0.02%  0.20% postgres: zabbixdb: zabbix_server zabbix [redacted] (42070) idle
3581654 postgres  20    0 3342M   17M sleep   0:50  0.02%  0.20% postgres: zabbixdb: zabbix_server zabbix [redacted] (54664) idle
3385664 postgres  20    0 3340M 7680K sleep   0:44  0.02%  0.20% postgres: zabbixdb: pg_cron launcher
3581745 postgres  20    0 3344M   18M sleep   0:44  0.02%  0.20% postgres: zabbixdb: zabbix_server zabbix [redacted] (42340) idle
3581742 postgres  20    0 3344M   18M sleep   0:43  0.02%  0.20% postgres: zabbixdb: zabbix_server zabbix [redacted] (42302) idle
3581762 postgres  20    0 3344M   18M sleep   0:43  0.02%  0.20% postgres: zabbixdb: zabbix_server zabbix [redacted] (42506) idle
4157855 postgres  20    0 3346M   20M sleep   0:02  0.09%  0.20% postgres: zabbixdb: zabbix_web zabbix [redacted] (55444) idle in transaction
```

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Identify

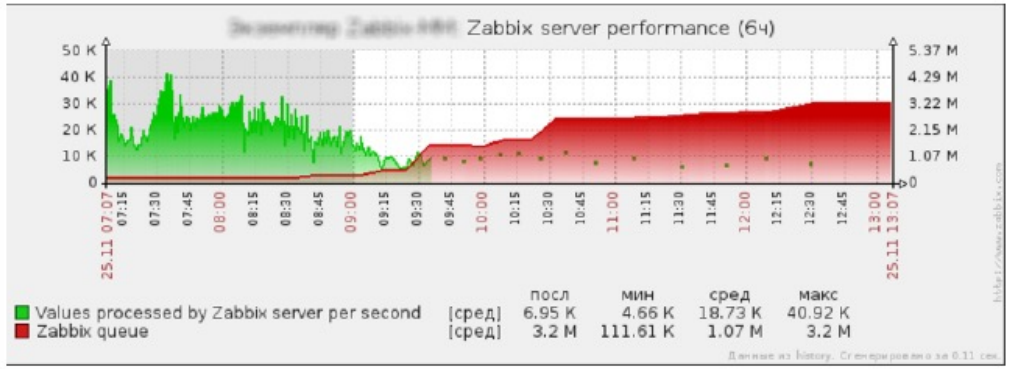
Main utilities

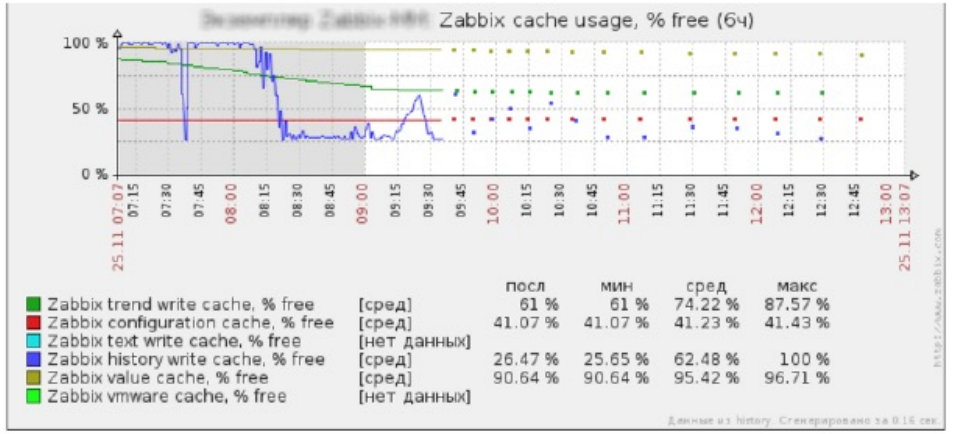
- top, ntop, iostat, vmstat, sar
- DB statistics, innotop

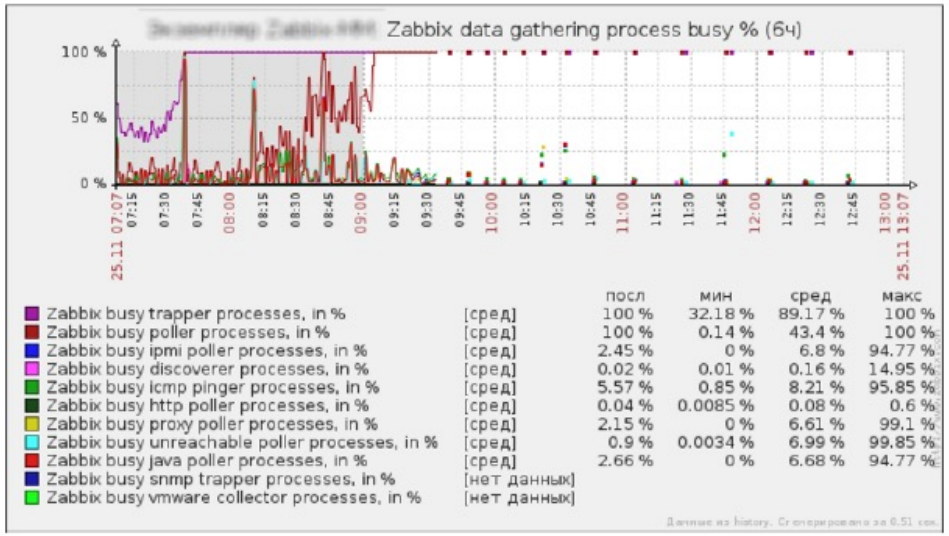
```
# grep slow /var/log/zabbix/zabbix_server.log
slow query: 9.054528 sec, "insert into events (eventid, source, object, objectid,
clock...
slow query: 8.501505 sec, "update hosts set lastaccess=1421211815 where hostid...
slow query: 6.754405 sec, "insert into history (itemid,clock,ns,value) values...
slow query: 37.949541 sec, "select i.itemid, i.hostid, h.proxy_hostid, i.type,
i.data_type...
slow query: 70.877295 sec, "select distinct t.triggerid, t.description, t.expression,
t.error...
```

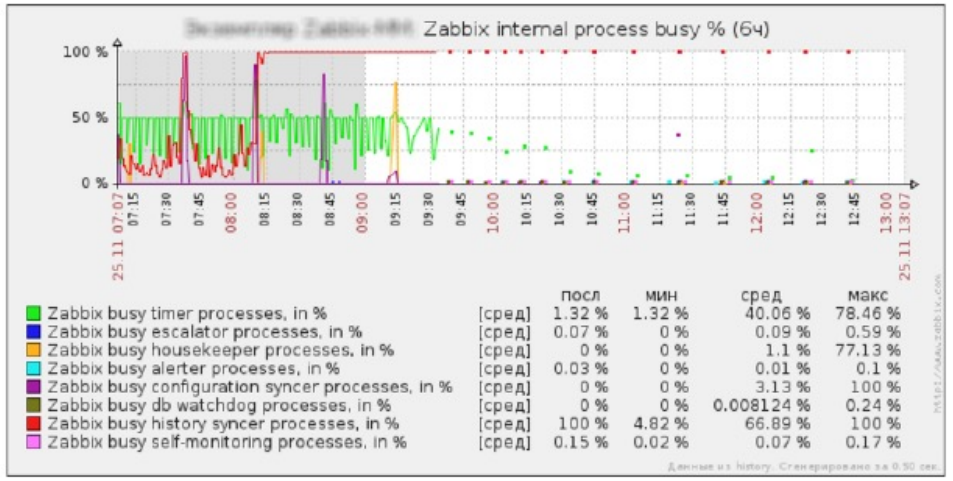
Identify

Slow DB?





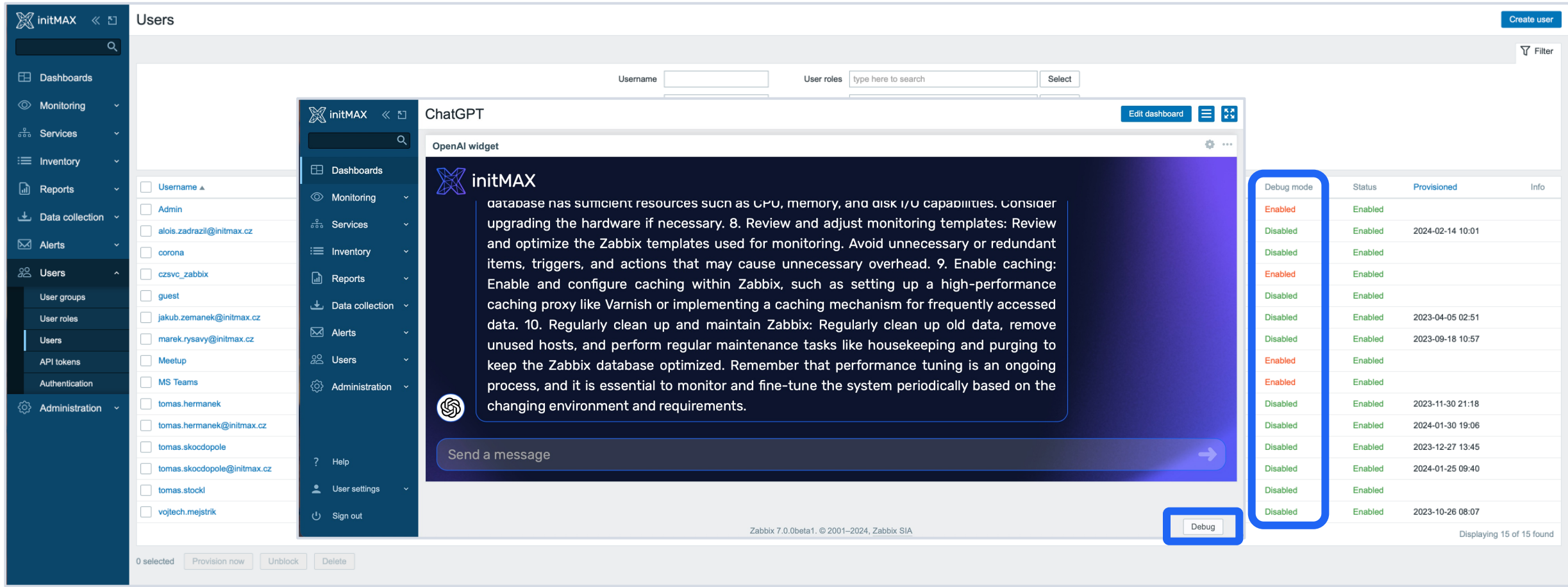




Zabbix performance tuning

Identify

Debug mode



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Identify

Debug mode

Load speed less than a second

```
******************** Script profiler ********************
Total time: 0.960905
Total SQL time: 0.749027
SQL count: 5636 (selects: 4065 | executes: 1571)
Peak memory usage: 180.5M
Memory limit: 2G
```

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Identify

Debug mode

Problem with web server

```
******************** Script profiler ********************
Total time: 10.960905
Total SQL time: 0.749027
SQL count: 5636 (selects: 4065 | executes: 1571)
Peak memory usage: 180.5M
Memory limit: 2G
```

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Identify

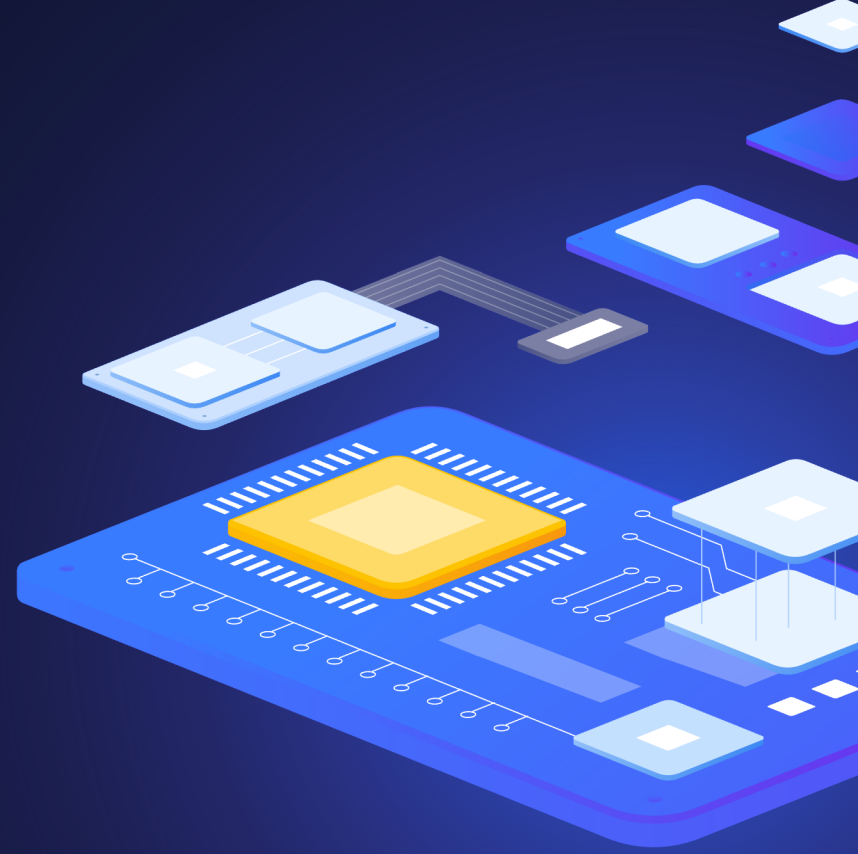
Debug mode

Problem with DB

```
******************** Script profiler ********************
Total time: 10.960905
Total SQL time: 10.749027
SQL count: 5636 (selects: 4065 | executes: 1571)
Peak memory usage: 180.5M
Memory limit: 2G
```

3

Tune



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Tune

Tune number of processes (example)

- Zabbix server configuration file, zabbix_server.conf:

```
StartPollers=80
StartPingers=10
StartPollersUnreachable=80
StartIPMIPollers=10
StartTrappers=20
StartDBSyncers=6
```

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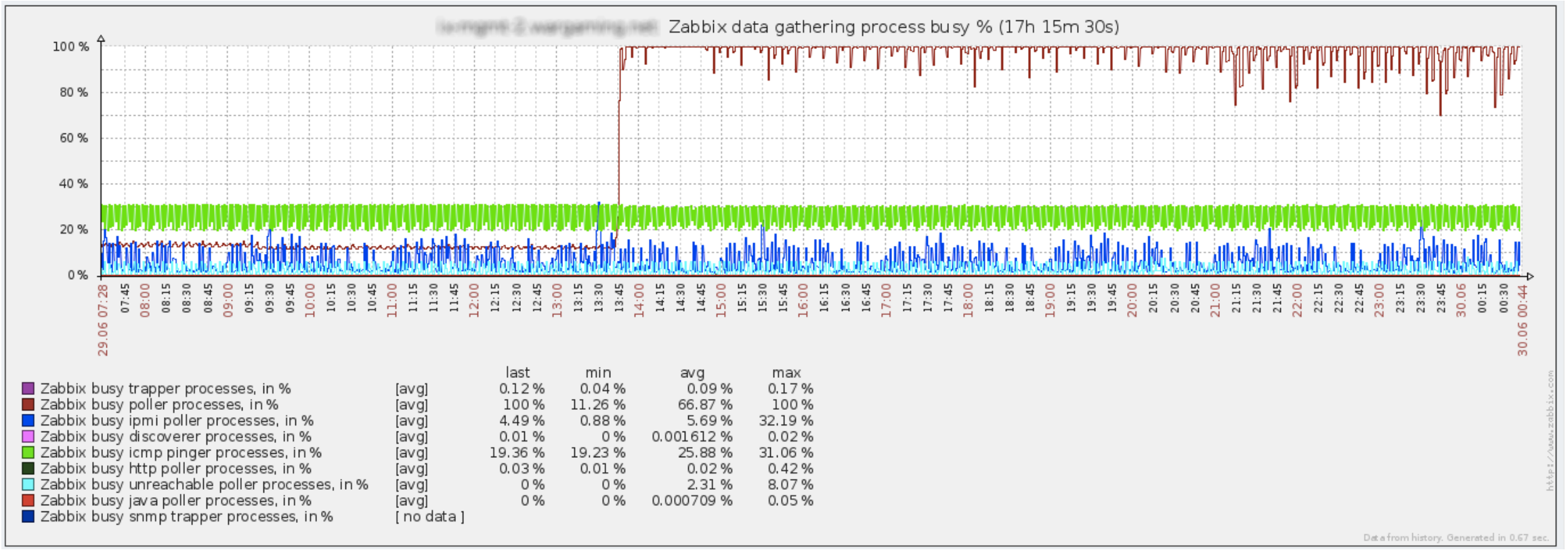
Tune

How to know when it is time to tune Zabbix configuration?

- Failures in graphs or 100% load



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Tune

InnoDB is better than MyISAM

- Look at the data
  - mysqladmin status / variables (or innotop)
- InnoDB
  - innodb_file_per_table = 1
  - innodb_buffer_pool_size=<large> (~75% of total RAM)
  - innodb_buffer_pool_instances = 8
  - innodb_flush_log_at_trx_commit = 2
  - innodb_flush_method = O_DIRECT
  - innodb_log_file_size = 256M
- Do not use
  - Query history

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Tune

Problem with Web server

```
******************** Script profiler ********************
Total time: 10.960905
Total SQL time: 0.749027
SQL count: 5636 (selects: 4065 | executes: 1571)
Peak memory usage: 180.5M
Memory limit: 2G
```

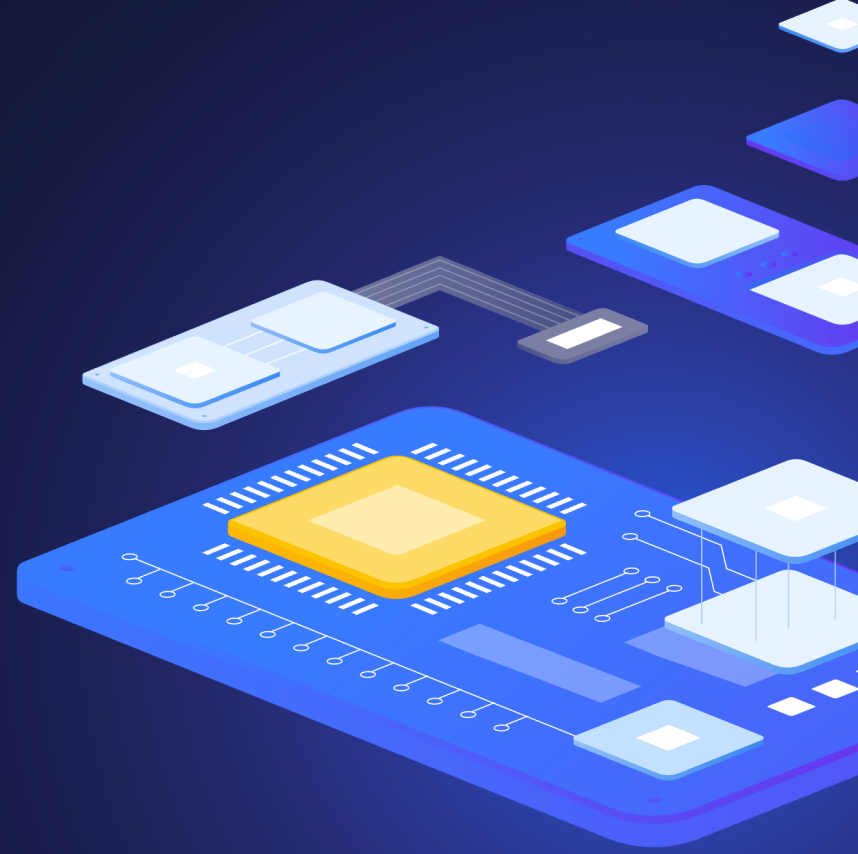
Problem with web server

- Optimize configuration
- Try nginx

Apache	nginx
Total time: 6.47	Total time: 1.02

4

Improve



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Improve

Table partitioning

- It is a way to split large tables into smaller partitions.
- Make sense for historical tables:

  history_* and trends*
- Benefits:

  Easy to remove older data

  Significantly better performance

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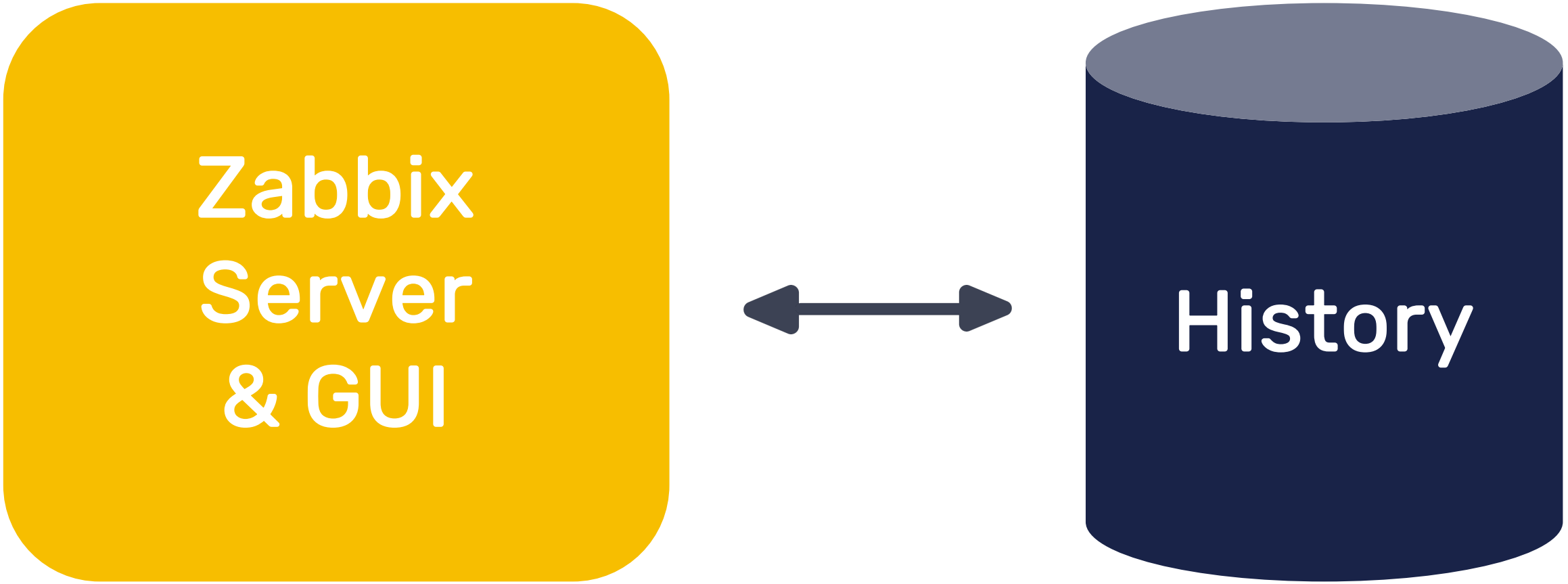
Improve

No table partitioning



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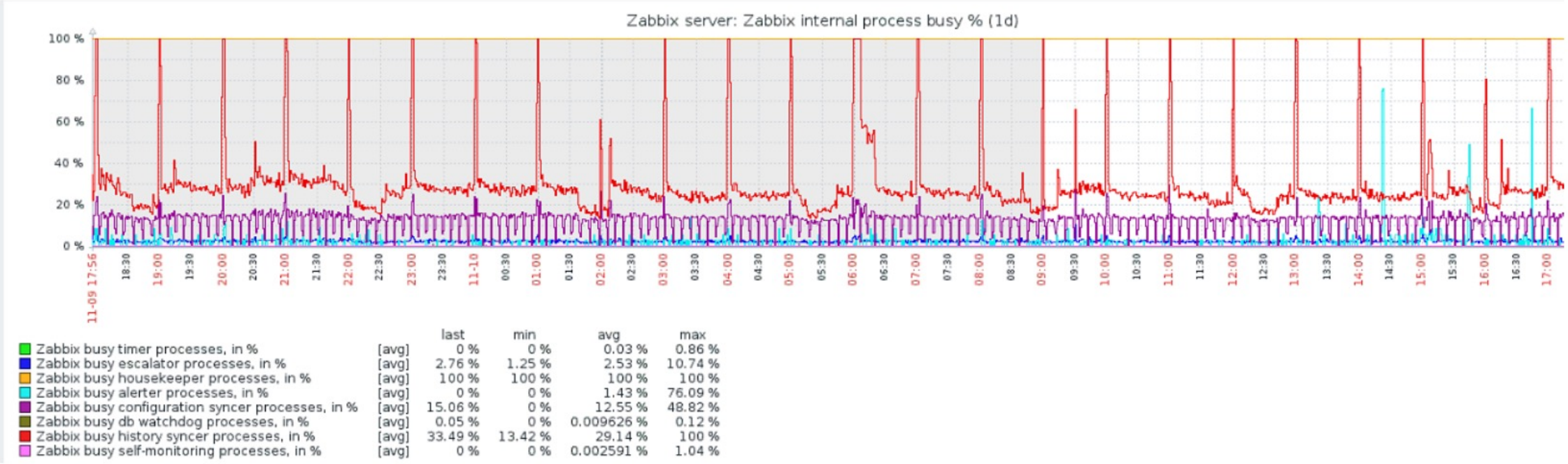
Improve

How to know when it is time to apply partitioning?

- Trigger “Zabbix housekeeper processes more than 75% busy” is in problem state for hours or days
- The performance of housekeeper is dropping



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Improve

I still need better performance

- Run Zabbix components on separate servers!

Zabbix server & Web-interface
8 core CPU
8GB RAM

Database
16 core CPU
64GB RAM
Fast repository

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Improve

I still need better performance

- Run Zabbix components on separate servers!

Zabbix server
8 core CPU
4GB RAM

Web-interface
2 core CPU
4GB RAM

Database
16 core CPU
64GB RAM
Fast repository

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Improve

I still need better performance

- All data collection is done using a proxy

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Improve

Why to use proxy?

- Zabbix Proxy "converts" passive checks into active
- The load is distributed between the proxies
- If one proxy is overloaded, network nodes can be moved to another proxy
- Easy maintenance
- Caching data when Zabbix server is not available

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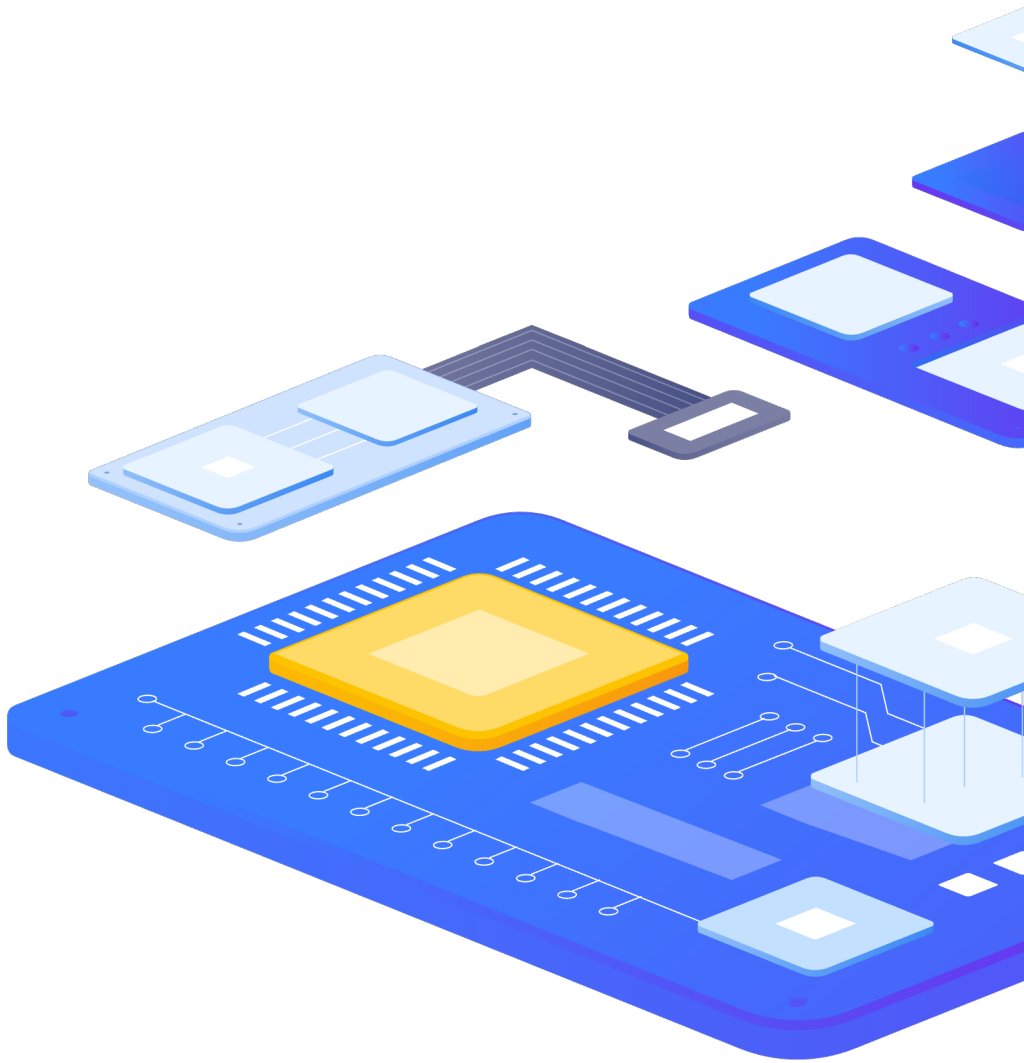
Improve

Checklist

- Zabbix internal checks are done
  - Otherwise, you don't know anything about Zabbix health!
- Zabbix configuration is tuned
- Database performance is tuned
- Removing history is not used for history tables



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Improve

Additional reading

Performance Optimization Guide:

- Mysql: https://www.percona.com/blog/2014/11/14/optimizing-mysql-zabbix/
- PostgreSQL: https://wiki.postgresql.org/wiki/Tuning_Your_PostgreSQL_Server
- PostgreSQL: https://pgtune.leopard.in.ua/

Partitioning tables in Zabbix:

- MySQL: http://zabbix.org/wiki/Docs/howto/mysql_partitioning
- PostgreSQL: https://www.zabbix.org/wiki/Docs/howto/zabbix2_postgresql_partitioning (OLD)
- **PostgreSQL: https://www.zabbix.com/documentation/current/manual/appendix/install/timescaledb**

Zabbix internal checks

- http://blog.zabbix.com/monitoring-how-busy-zabbix-processes-are
- https://www.zabbix.com/documentation/current/manual/config/items/itemtypes/internal

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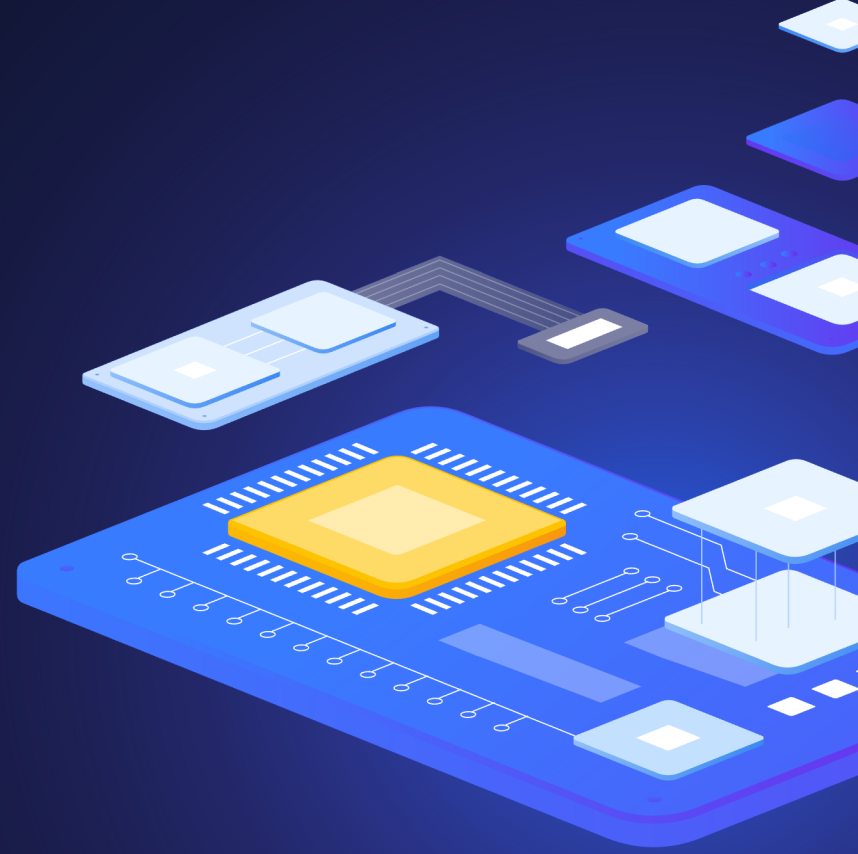
Highlighting of latest versions



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Highlighting of latest versions

Zabbix 6.0

- High availability cluster for Zabbix server
- **Primary keys**
- Bulk processing for Prometheus metrics
- **Separate processing for ODBC checks**
- **Drop unsupported versions of DBs**
- Configuration syncer 6.0.1
- **DB schema update 6.0.11**
- **Improved performance of history syncers 6.0.12**
- Limits for JavaScript objects in preprocessing 6.0.14
- Proxy history housekeeping 6.0.18
- **Autoregistration table cleared from orphaned records 6.0.22**
- **Simplified trend synchronization queries to improve performance 6.0.23**
- **Improved trend recalculation performance by performing trend updates in own transaction 6.0.27**

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Highlighting of latest versions

Zabbix 6.2

- User macro cache
- Reload proxy configuration in frontend or in linux console
- **Optimized server configuration update**
- **Improved performance of history syncers 6.2.6**
- Limits for JavaScript objects in preprocessing 6.2.8

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Highlighting of latest versions

Zabbix 6.4

- Streaming to external systems
- Value cache optimization
- **Optimized proxy configuration update**
- **Thread-based preprocessing workers**
- Instant refresh of active checks
- **Optimized SNMP discovery and collection**
- Zabbix server support for older proxies
- Automated database upgrade on proxies with SQLite
- Proxy history housekeeping 6.4.3

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Highlighting of latest versions

Zabbix 7.0

- **Asynchronous pollers**

  agent poller

  http agent poller

  snmp poller (for walk[OID] and get[OID] items) – do not forget to change old SNMP items

- **Proxy memory buffer**

  A memory buffer has been developed for Zabbix proxy. The memory buffer allows to store new data (item values, network discovery, host autoregistration) in the buffer and upload to Zabbix server without accessing the database.

- **Enhanced item timeout configuration possibilities**

  Timeout configuration is now available for more item types (see supported item types). In addition to setting the timeout values on the item level, it is possible to define global and proxy timeouts for various item types.

- **Enhanced preprocessing**

  Each script written in JavaScript has a 512-megabyte heap limit. Preprocessing has been adjusted so that it no longer waits for the completion of write operations from previous steps, which previously caused delays when the first preprocessing step was not finished, but others were.

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Highlighting of latest versions

Zabbix 7.0

- **7.0.1**

  New index on auditlog table

- **7.0.2**

  Binary data history converted to hypertable on TimescaleDB

- **7.0.3**

  An **optional database patch** has been added for removing a redundant userdirectory_usrgrp_3 index during the upgrade

- **7.0.4**

  A new index has been added to the auditlog table to improve database and frontend response times when filtering records by IP in the Audit log

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Highlighting of latest versions

Zabbix 7.0

- **Faster permission checks**

  Permission checks have been made much faster by introducing several intermediary tables for checking non-privileged user permissions.

- **Auditlog converted to hypertable on TimescaleDB**
- **New binary type also in hypertable on TimescaleDB**
- **Separate database table for proxies**
- **The default period of storing audit log records before those are deleted by the housekeeper has been changed from 365 days to 31 days.**
- **https://support.zabbix.com/browse/ZBXNEXT-5878 (Enhance permission checking/handling)**
- **https://support.zabbix.com/browse/ZBX-23064 (select distinct)**
- **https://support.zabbix.com/browse/ZBX-23979 (Trends recalculation)**
- **https://support.zabbix.com/browse/ZBX-23973 (Avoid retrieving trends from database for new items)**

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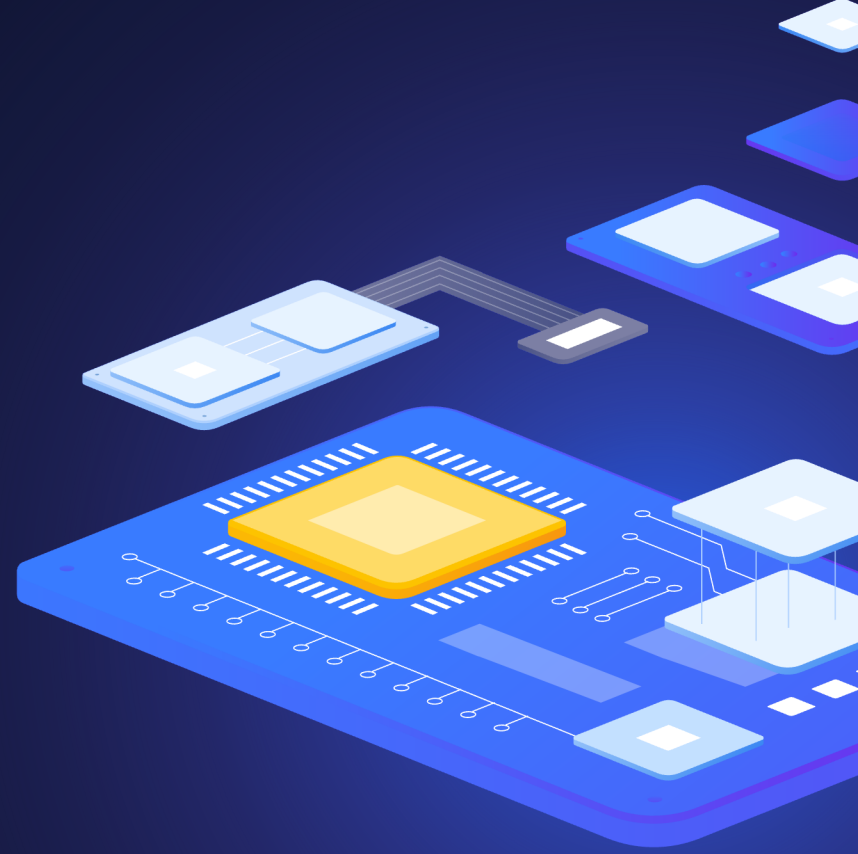
Tips and tricks



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Tips and tricks

From time to time check our wiki or social networks

- Throtling, PosgreSQL tune,..

CZ

- https://www.initmax.cz/wiki/throttling-a-ochrana-pred-falesnymi-alerty-pomoci-min-max-avg/
- https://www.initmax.cz/wiki/zabbix-7-0-instalace-v-5-minutach/
- https://www.initmax.cz/wiki/implementace-timescaledb-v-zabbixu/
- https://www.initmax.cz/wiki/zabbix-7-0-a-navyseni-systemovych-limitu/
- https://www.initmax.cz/wiki/zabbix-migrace-z-mysql-do-postgresql/

EN

- https://www.initmax.com/wiki/throttling-and-false-positives-protection-using-min-max-avg/
- https://www.initmax.com/wiki/zabbix-7-0-instructions-for-installation-in-5-minutes/
- https://www.initmax.com/wiki/implementation-of-timescaledb-in-zabbix/
- https://www.initmax.com/wiki/zabbix-7-0-and-increasing-system-limits/
- https://www.initmax.com/wiki/zabbix-migration-from-mysql-to-postgresql/

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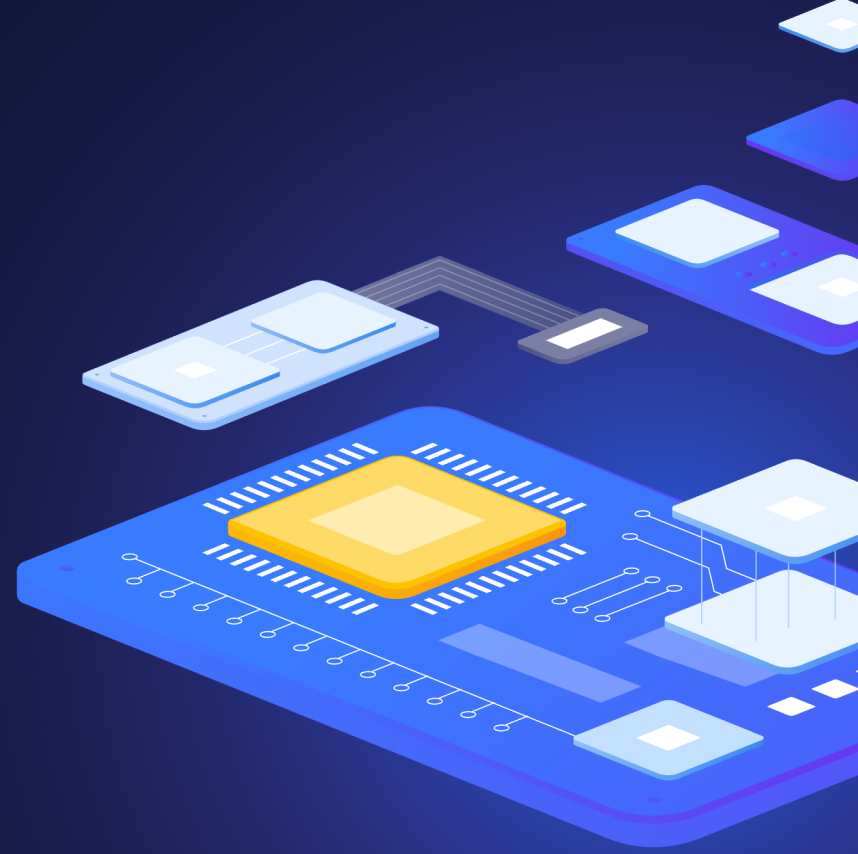
Demo



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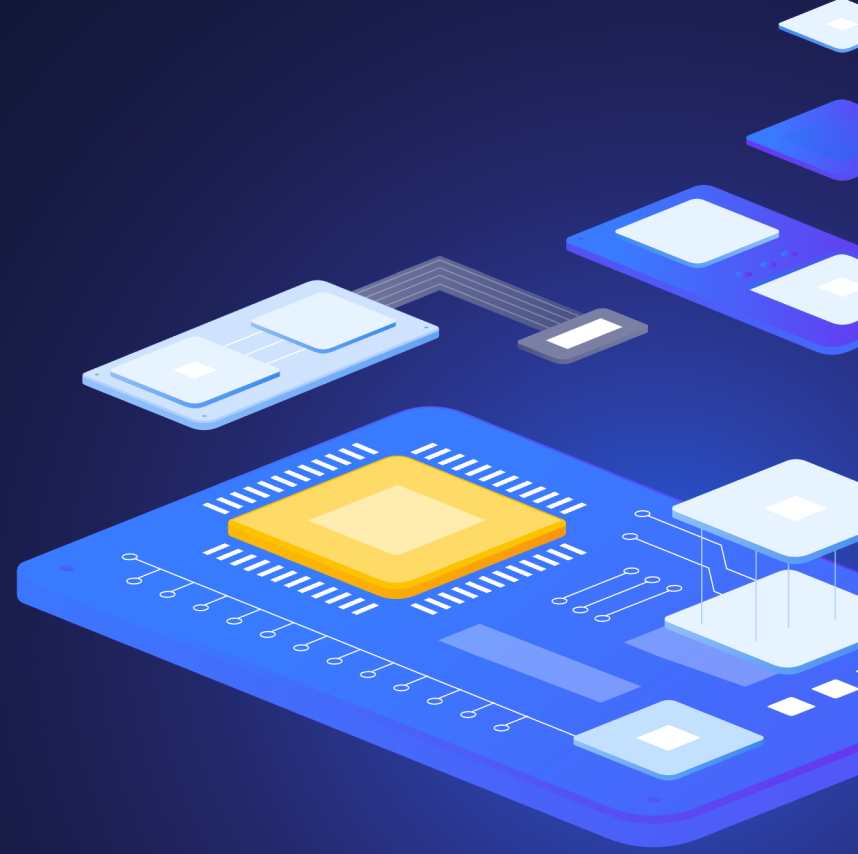
Questions?



Zabbix performance tuning

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