



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



Zabbix performance tuning

Zabbix data flow

Notifications



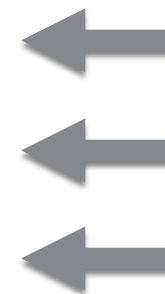
Visualization



Database



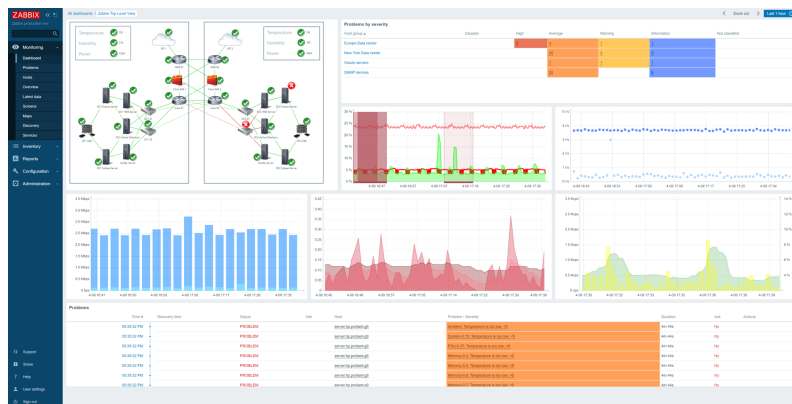
ZABBIX Server



History

Analysis

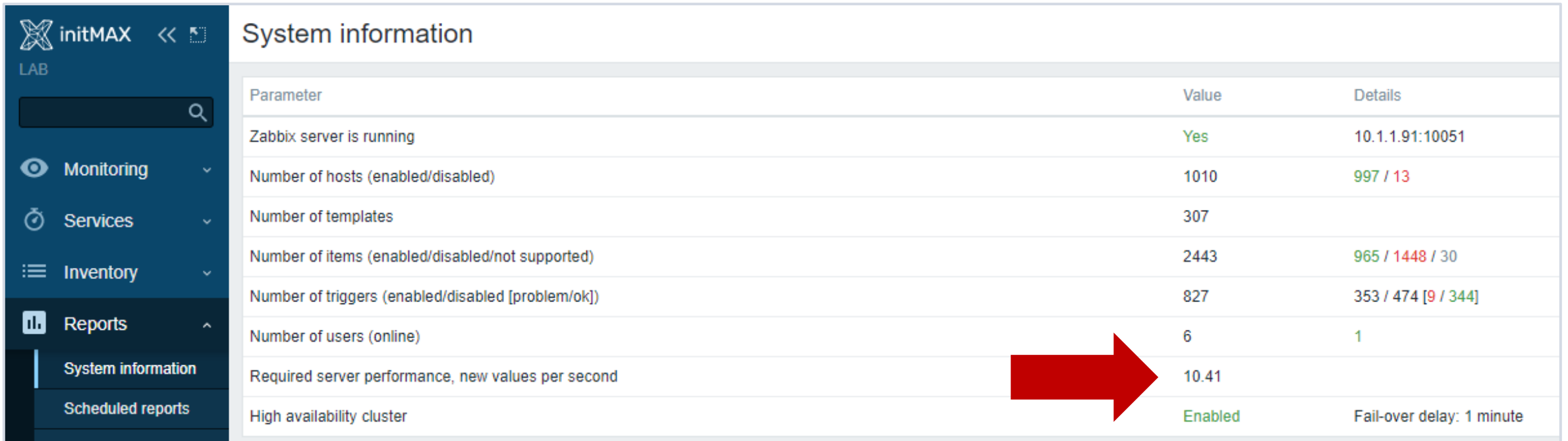
Data collection



How to measure performance

Number of values processed per second (NVPS)

A rough estimate of NVPS is visible in Zabbix

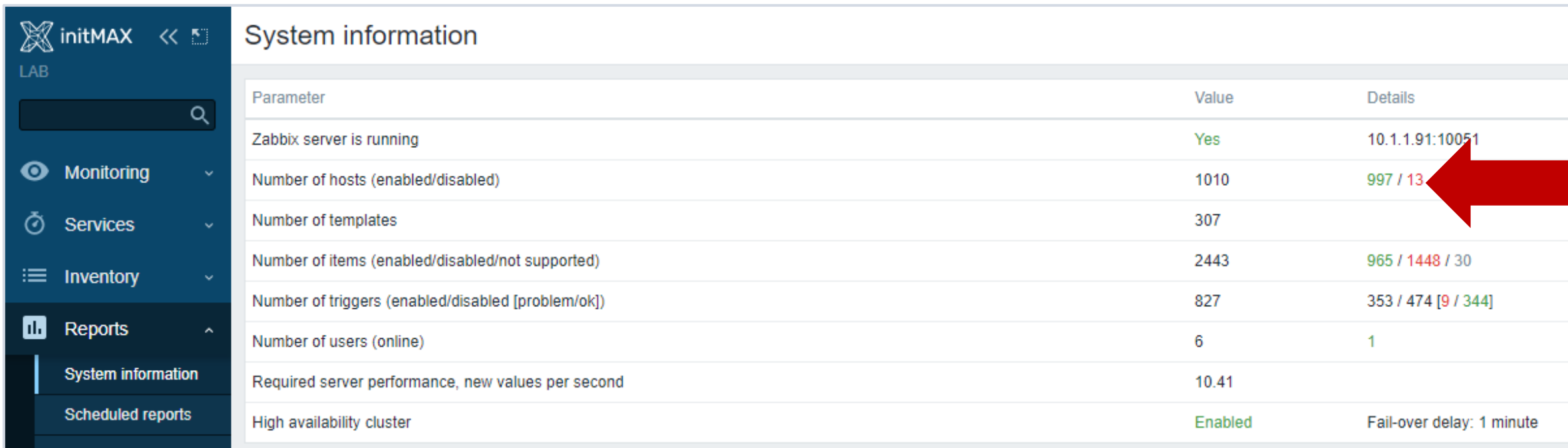


The screenshot shows the Zabbix web interface. On the left is a dark blue sidebar with the 'initMAX LAB' logo and a search bar. Below the search bar are menu items: 'Monitoring', 'Services', 'Inventory', 'Reports', 'System information', and 'Scheduled reports'. The 'System information' menu item is highlighted. The main content area is titled 'System information' and contains a table with three columns: 'Parameter', 'Value', and 'Details'. A large red arrow points to the row 'Required server performance, new values per second', which shows a value of 10.41.

Parameter	Value	Details
Zabbix server is running	Yes	10.1.1.91:10051
Number of hosts (enabled/disabled)	1010	997 / 13
Number of templates	307	
Number of items (enabled/disabled/not supported)	2443	965 / 1448 / 30
Number of triggers (enabled/disabled [problem/ok])	827	353 / 474 [9 / 344]
Number of users (online)	6	1
Required server performance, new values per second	10.41	
High availability cluster	Enabled	Fail-over delay: 1 minute

How to measure performance

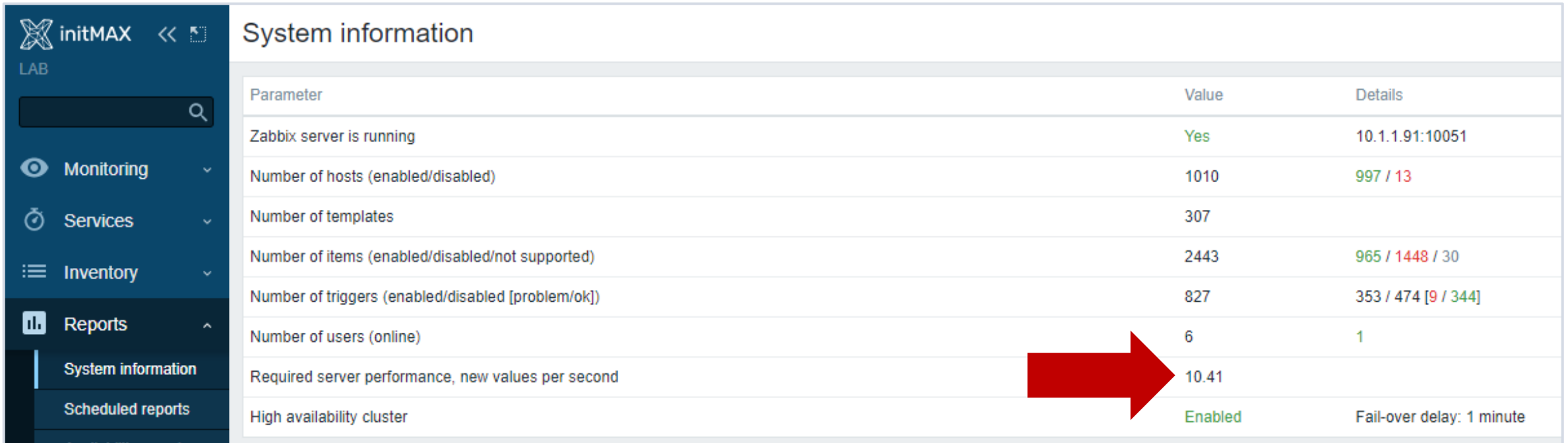
Why the number of devices is not an indicator?



The screenshot shows the Zabbix web interface. On the left is a dark blue sidebar with the 'initMAX LAB' logo and a search bar. Below the search bar are menu items: 'Monitoring', 'Services', 'Inventory', 'Reports', 'System information' (highlighted), and 'Scheduled reports'. The main content area is titled 'System information' and contains a table with system metrics. A large red arrow points to the 'Number of hosts (enabled/disabled)' row, specifically to the '997 / 13' value in the 'Details' column.

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How to measure performance



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- › 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.

Performance



Hardware: 10 Core CPU, 32GB, RAID10 BBWC

Budget: ~ 4K EUR

- › Zabbix is able to deliver 2 million of values per minute or around 30.000 of values per second
- › In real life performance would be worse. Why?!

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.

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

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

Performance

Different views on performance



“I just added 5 hosts and Zabbix died” :-(
“Zabbix is so sloooooow, 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?

Performance

Common problems of initial setup

Default database settings

- ▶ Tune database for the best performance (https://github.com/hermanekt/Zabbix_MYSQL_tunned_for_40k)

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!

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

Zabbix performance tuning

Performance

Nice view of queue of items

Queue overview ▾						
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

Zabbix performance tuning

Performance

Nice view of queue of items during a problem state

Queue overview ▾						
Items	5 seconds	10 seconds	30 seconds	1 minute	5 minutes	More than 10 minutes
Zabbix agent	0	0	0	0	0	562498
Zabbix agent (active)	0	0	0	0	0	0
Simple check	0	0	0	0	0	30
SNMP agent	0	0	0	0	0	254198
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

Performance



Identify

Step 1



Tune

Step 2



Improve

Step 3

2

Identify

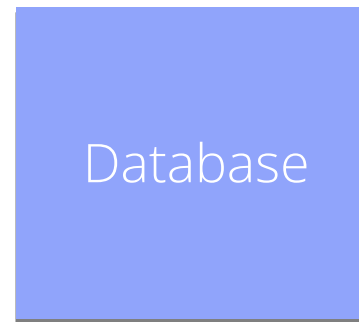
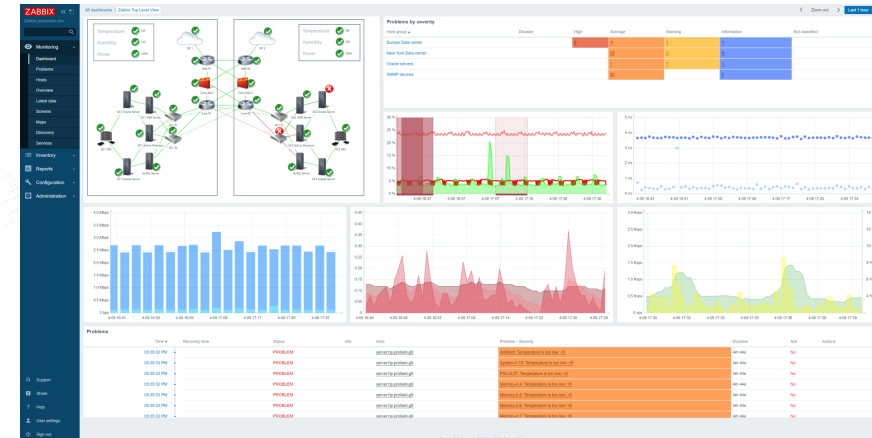


Zabbix performance tuning

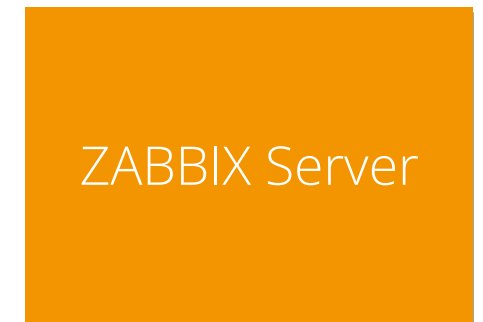
Identify

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

Visualization

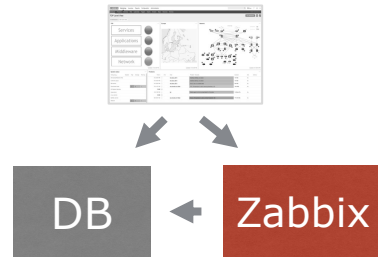


History



Analysis

Identify



Main utilities

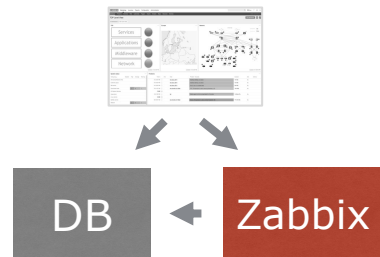
- › top, ntop, iostat, vmstat, sar
- › Zabbix itself
- › strace or log file with debugging mode enabled
- › ps aux | grep zabbix_server

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

Values change?



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?



Zabbix performance tuning

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.

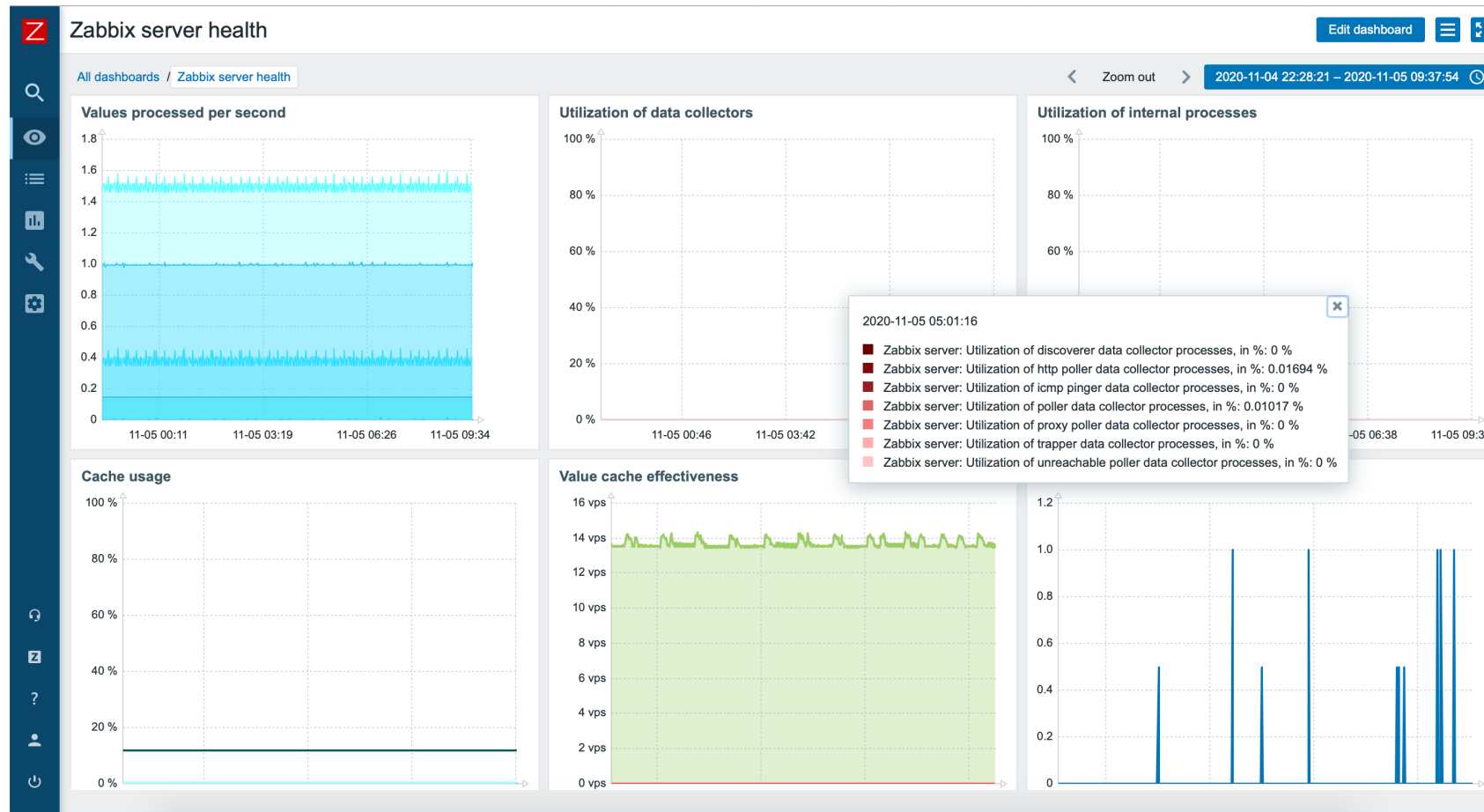
Zabbix server cache

- ▶ 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

Identify



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`

Identify

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

- › Zabbix server configuration file, `zabbix_server.conf`

LogSlowQueries=3000

Zabbix performance tuning

Identify

Main utilities

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

When	Load	Cxns	QPS	Slow	Se/In/Up/De%	QCacheHit	KCacheHit	BpsIn	BpsOut
Now	0.00	218	2.04k	4	93/ 0/ 0/ 0	0.00%	100.00%	274.71k	2.35M
Total	0.00	2.00k	1.60k	173.93k	81/ 2/ 3/ 0	0.00%	100.00%	372.98k	4.11M

Cmd	ID	State	User	Host	DB	Time	Query
Daemon	1	Waiting on empty q	event_ac	localhost		5+21:18:05	
Query	3879265	Sending data	root		zabbix	05:12	SELECT DISTINCT t.triggerid,t.priority,h.name AS hostname,h.host,h.hostid FROM triggers t,functions f,items
Query	3879583	Sending data	root		zabbix	04:40	SELECT DISTINCT t.triggerid,t.state,t.error,t.url,t.expression,t.description,t.priority,t.lastchange FROM tr
Query	3879654	Sending data	root		zabbix	04:30	SELECT DISTINCT t.triggerid,t.state,t.error,t.url,t.expression,t.description,t.priority,t.lastchange FROM tr
Query	3879818	Sending data	root		zabbix	04:29	SELECT DISTINCT t.triggerid,t.priority,h.name AS hostname,h.host,h.hostid FROM triggers t,functions f,items
Query	3879915	Sending data	root		zabbix	04:29	SELECT DISTINCT t.triggerid,t.state,t.error,t.url,t.expression,t.description,t.priority,t.lastchange FROM tr
Query	3879931	Sending data	root		zabbix	04:29	SELECT DISTINCT t.triggerid,t.state,t.error,t.url,t.expression,t.description,t.priority,t.lastchange FROM tr
Query	3879934	Sending data	root		zabbix	04:28	SELECT DISTINCT t.triggerid,t.priority,h.name AS hostname,h.host,h.hostid FROM triggers t,functions f,items
Query	3879940	Sending data	root		zabbix	04:28	SELECT DISTINCT t.triggerid,t.state,t.error,t.url,t.expression,t.description,t.priority,t.lastchange FROM tr
Query	3879970	Sending data	root		zabbix	04:27	SELECT DISTINCT t.triggerid,t.state,t.error,t.url,t.expression,t.description,t.priority,t.lastchange FROM tr
Query	3880048	Sending data	root		zabbix	04:15	SELECT DISTINCT t.triggerid,t.state,t.error,t.url,t.expression,t.description,t.priority,t.lastchange FROM tr
Query	3880122	Sending data	root		zabbix	03:38	SELECT DISTINCT t.triggerid,t.priority,h.name AS hostname,h.host,h.hostid FROM triggers t,functions f,items
Query	3878927	Sending data	root		zabbix	03:28	SELECT DISTINCT COUNT(DISTINCT t.triggerid) AS rowcount FROM triggers t,functions f,items i,hosts_groups hg
Query	3880276	Sending data	root		zabbix	03:25	SELECT DISTINCT t.triggerid,t.priority,h.name AS hostname,h.host,h.hostid FROM triggers t,functions f,items
Query	3880041	Sending data	root		zabbix	02:05	SELECT DISTINCT COUNT(DISTINCT t.triggerid) AS rowcount FROM triggers t,functions f,items i,hosts_groups hg
Query	3880848	Sending data	root		zabbix	02:00	SELECT DISTINCT t.triggerid,t.state,t.error,t.url,t.expression,t.description,t.priority,t.lastchange FROM tr
Query	3880722	Sending data	root		zabbix	01:59	SELECT DISTINCT t.triggerid,t.state,t.error,t.url,t.expression,t.description,t.priority,t.lastchange FROM tr
Query	3879118	Sending data	root		zabbix	01:47	SELECT DISTINCT COUNT(DISTINCT t.triggerid) AS rowcount FROM triggers t,functions f,items i,hosts_groups hg
Query	3881015	Sending data	root		zabbix	01:37	SELECT DISTINCT t.triggerid,t.state,t.error,t.url,t.expression,t.description,t.priority,t.lastchange FROM tr
Query	3880981	Sending data	root		zabbix	01:31	SELECT DISTINCT t.triggerid,t.priority,h.name AS hostname,h.host,h.hostid FROM triggers t,functions f,items
Query	3879535	Sending data	root		zabbix	01:29	SELECT DISTINCT COUNT(DISTINCT t.triggerid) AS rowcount FROM triggers t,functions f,items i,hosts_groups hg
Query	3880240	Sending data	root		zabbix	01:28	SELECT DISTINCT t.triggerid,t.priority,h.name AS hostname,h.host,h.hostid FROM triggers t,functions f,items
Query	3881198	Sending data	root		zabbix	01:23	SELECT DISTINCT t.triggerid,t.state,t.error,t.url,t.expression,t.description,t.priority,t.lastchange FROM tr
Query	3881267	Sending data	root		zabbix	01:20	SELECT DISTINCT t.triggerid,t.state,t.error,t.url,t.expression,t.description,t.priority,t.lastchange FROM tr
Query	3881352	Sending data	root		zabbix	01:11	SELECT COUNT(DISTINCT t.triggerid) AS rowcount FROM triggers t WHERE NOT EXISTS (SELECT NULL FROM functions
Query	3881468	Sending data	root		zabbix	00:47	SELECT DISTINCT t.triggerid,t.priority,h.name AS hostname,h.host,h.hostid FROM triggers t,functions f,items
Query	3881593	Sending data	root		zabbix	00:46	SELECT DISTINCT h.hostid,h.name FROM hosts h,hosts_groups hg WHERE h.flags IN (0,4) AND EXISTS (SELECT NULL

Identify

Main utilities

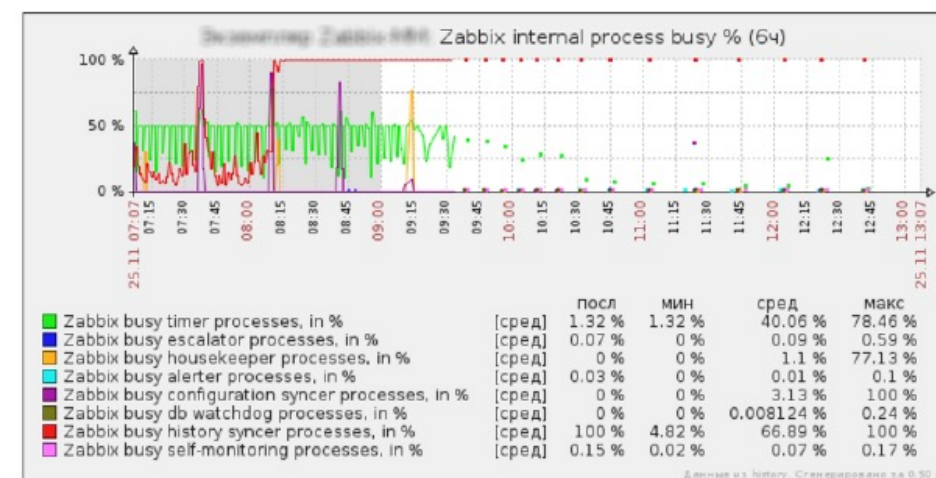
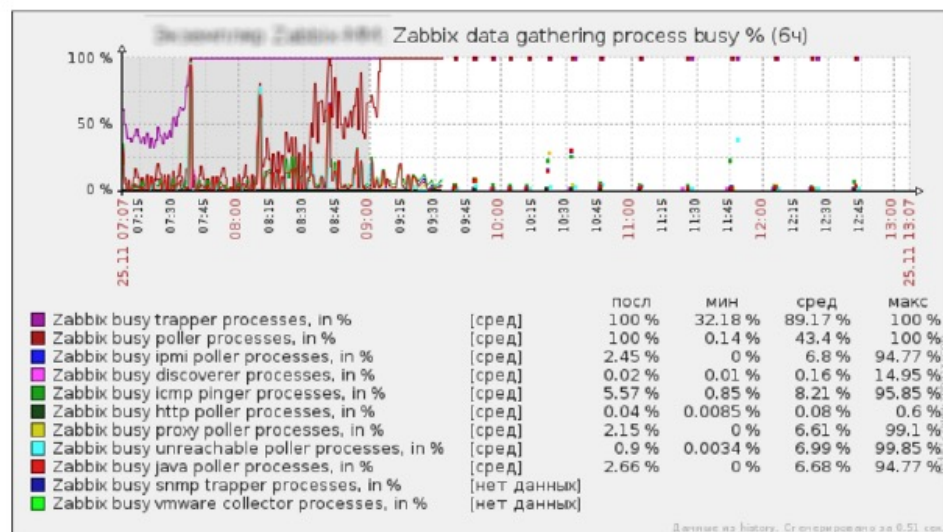
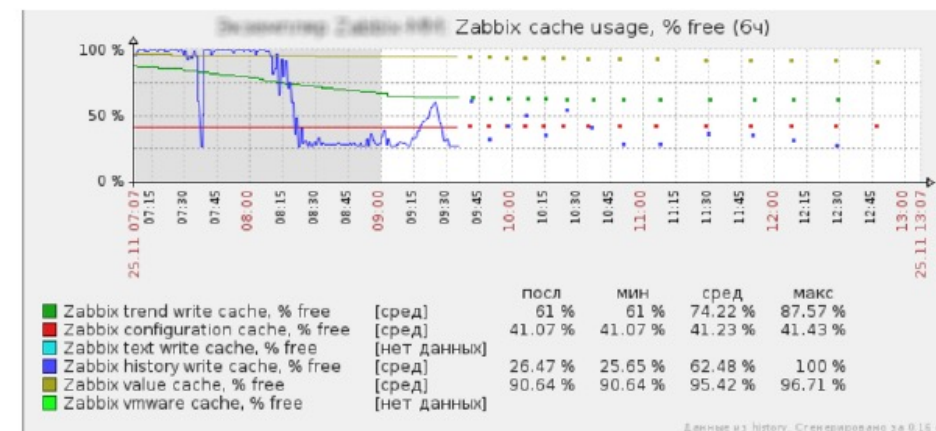
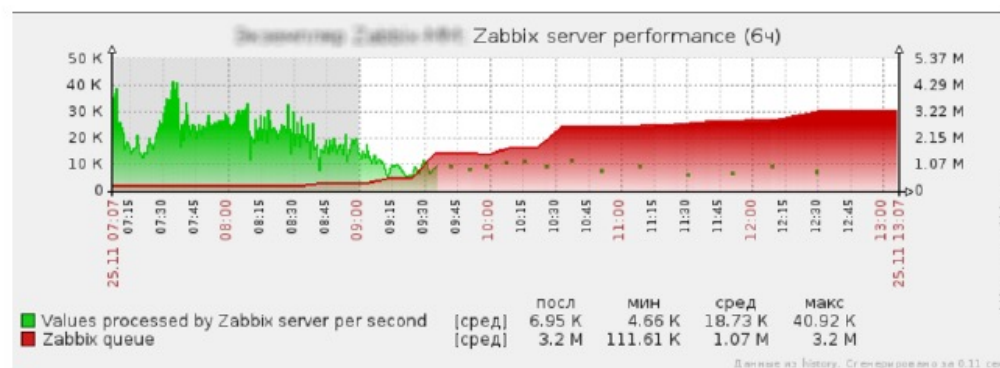
- › top, ntop, iostat, vmstat, sar
- › DB statistics, innotop

```
# 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...
```

Zabbix performance tuning

Identify

Slow DB?



Identify

Debug mode

[illegible]

Identify

Debug mode

```
***** 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
```



Load speed
less than a
second

Identify

Debug mode

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Total time: 10.960905  
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```



Problem
with web
server

Identify

Debug mode

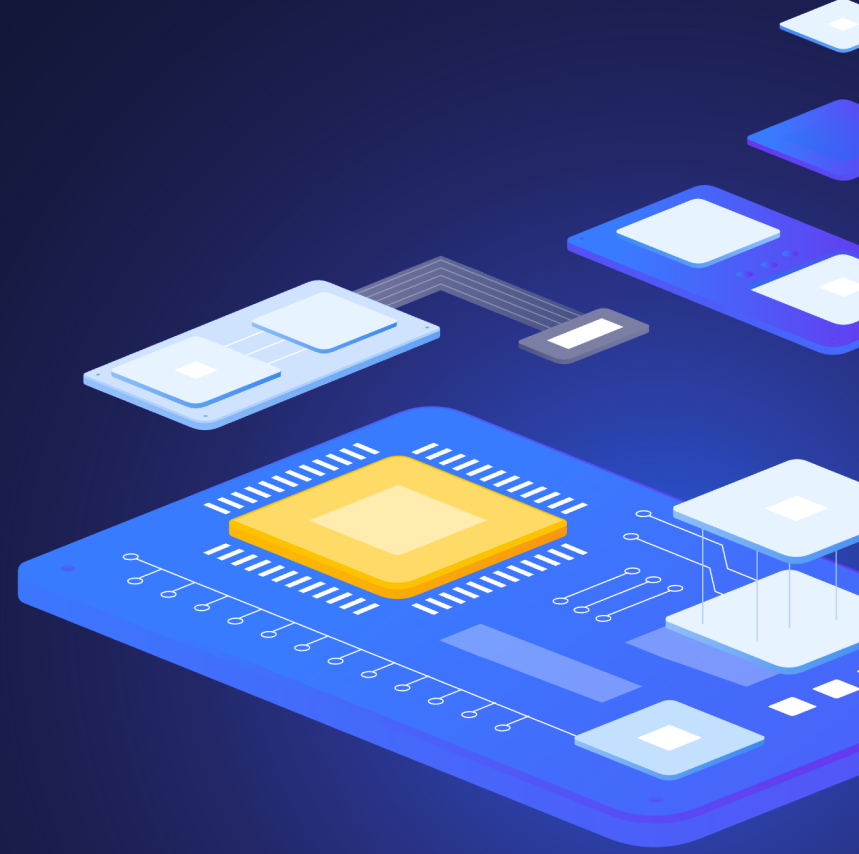
```
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Peak memory usage: 180.5M  
Memory limit: 2G
```



Problem
with DB

3

Tune



Tune

Tune number of processes (example)

- ▶ Zabbix server configuration file, `zabbix_server.conf`:

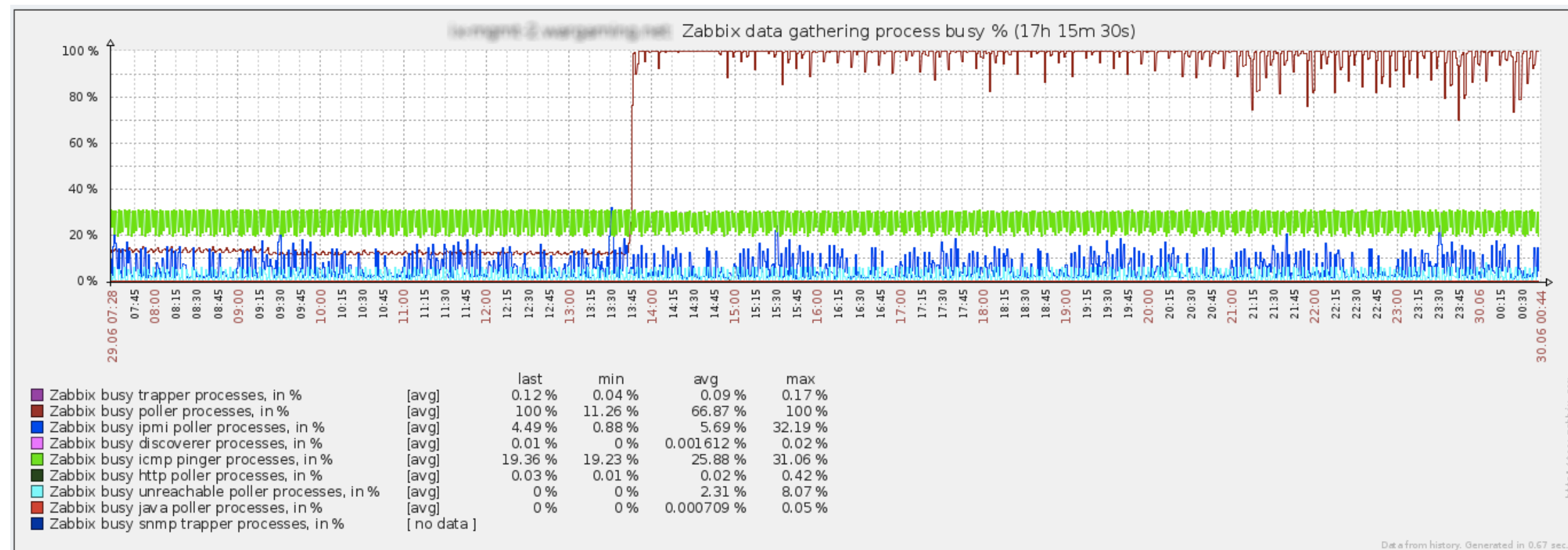
```
StartPollers=80
StartPingers=10
StartPollersUnreachable=80
StartIPMIPollers=10
StartTrappers=20
StartDBSyncers=6
```

Zabbix performance tuning

Tune

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

- ▶ Failures in graphs or 100% load



Zabbix performance tuning

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

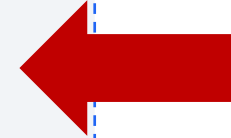
Query history

Zabbix performance tuning

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



Zabbix performance tuning

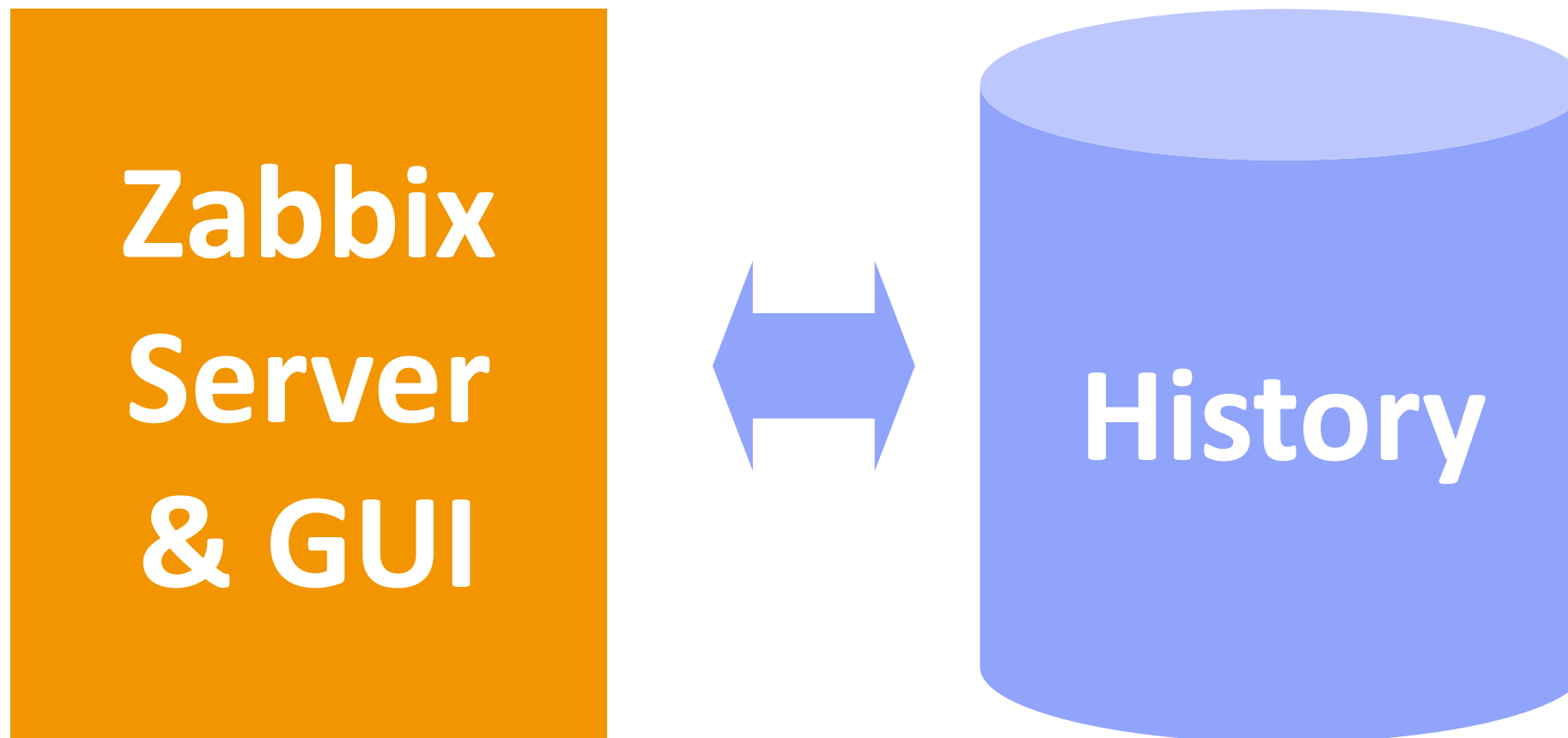
Improve

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

Improve

No table partitioning

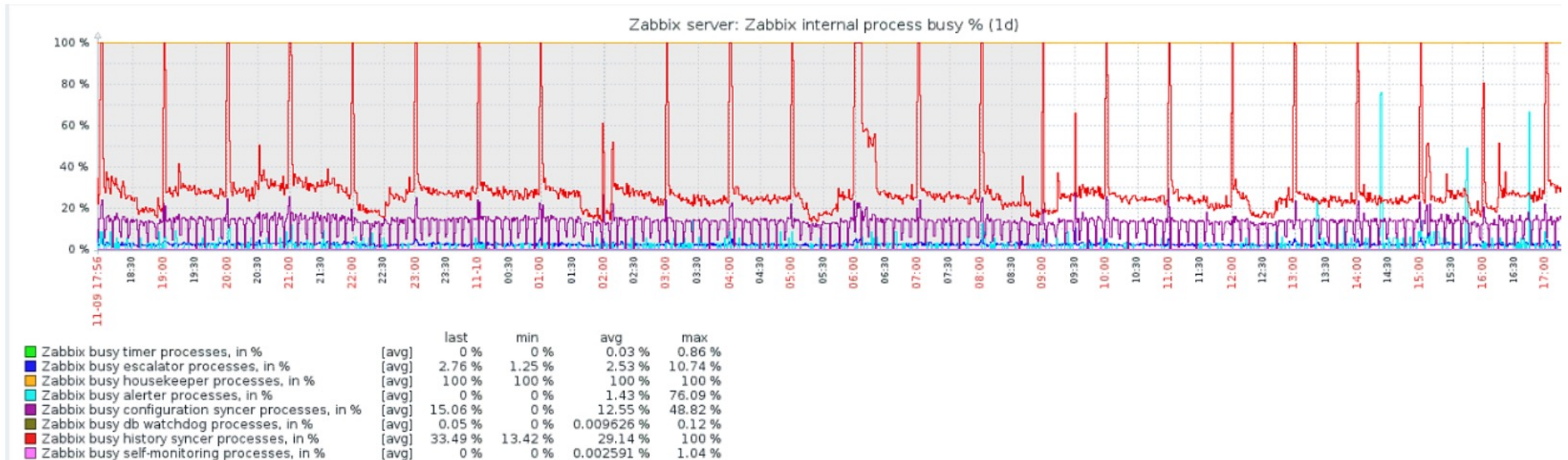


Zabbix performance tuning

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



Zabbix performance tuning

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



Zabbix performance tuning

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

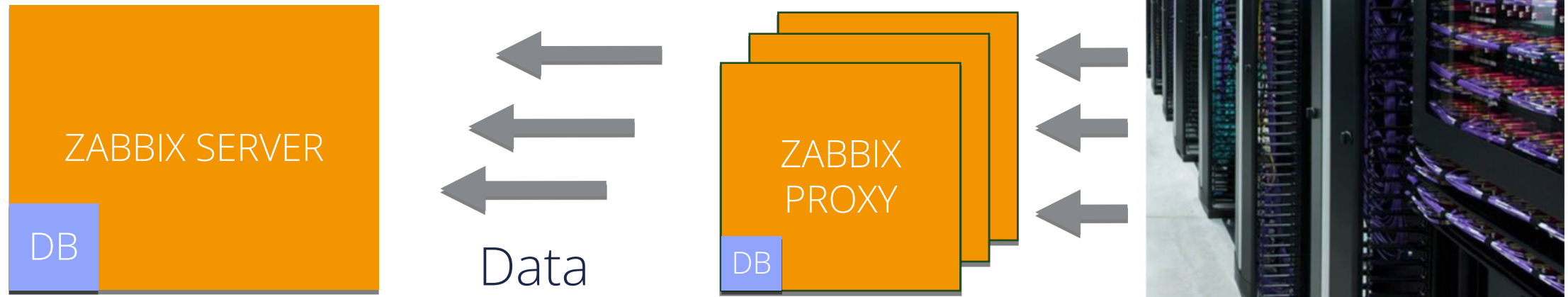


Zabbix performance tuning

Improve

I still need better performance

- › All data collection is done using a proxy



Improve

Why to use proxy?

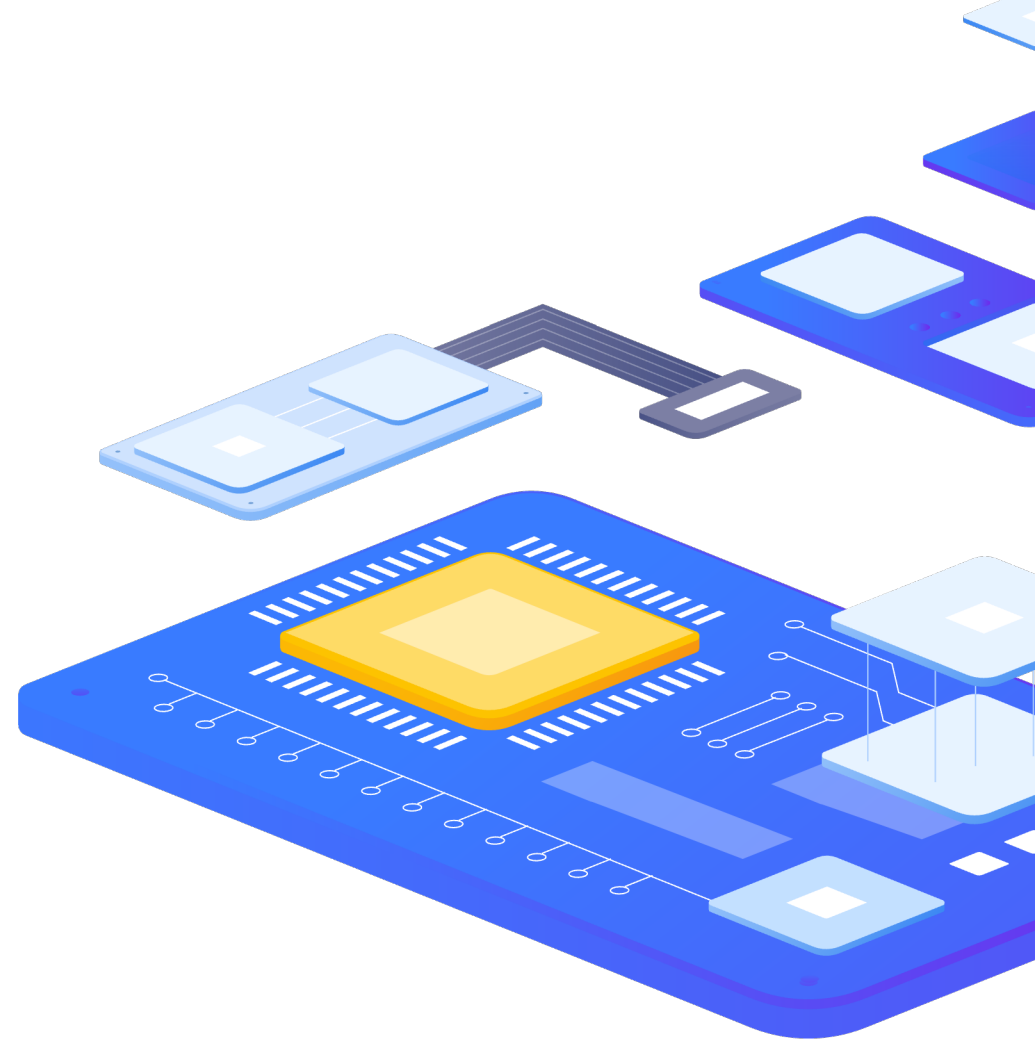
- › Zabbix Proxy "converts" passive checks into active
- › The load is distributed between the proxies
- › If one proxy is overloaded, network nodes can be moved to another proxy
- › Easy maintenance
- › Caching data when Zabbix server is not available

Zabbix performance tuning

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



Zabbix performance tuning

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:

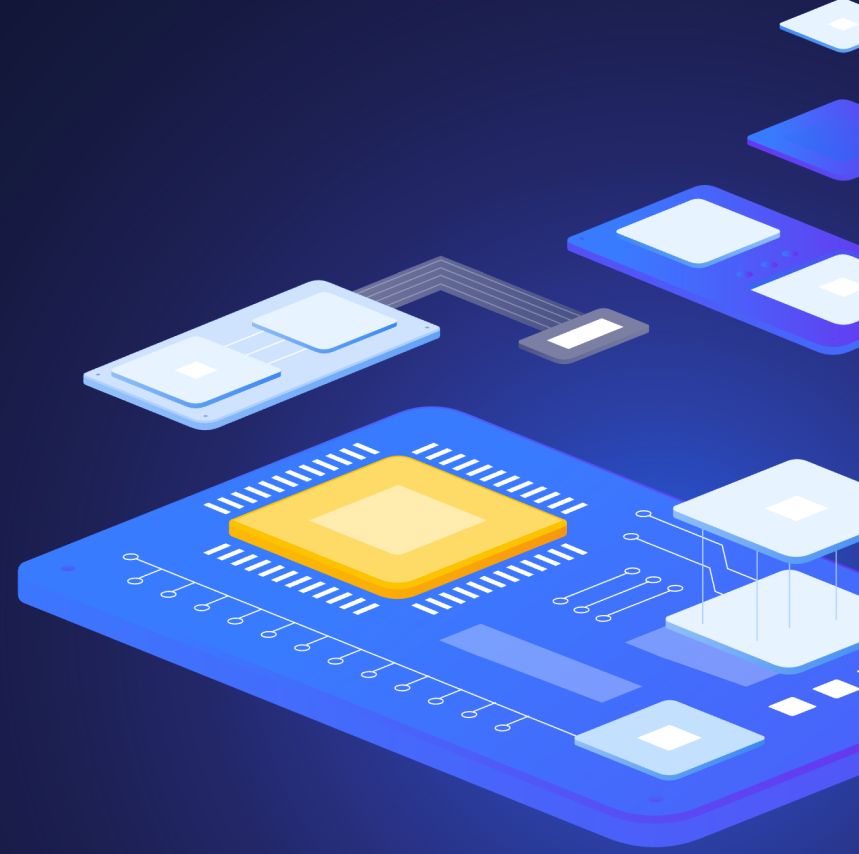
- › MySQL: http://zabbix.org/wiki/Docs/howto/mysql_partitioning
- › PostgreSQL: https://www.zabbix.org/wiki/Docs/howto/zabbix2_postgresql_partitioning (OLD)
- › PostgreSQL: <https://www.zabbix.com/documentation/current/manual/appendix/install/timescaledb>

Zabbix internal checks

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

5

Demonstration





Questions?



Why You Need Monitoring

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