



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



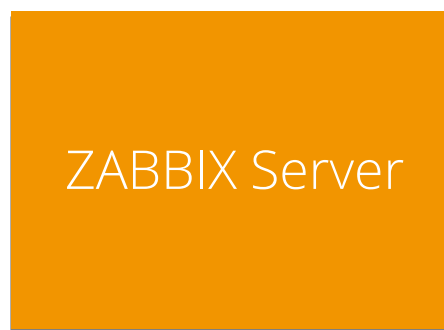
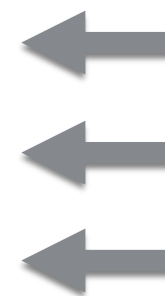
## Zabbix performance tuning

# Zabbix data flow

Notifications



Data collection

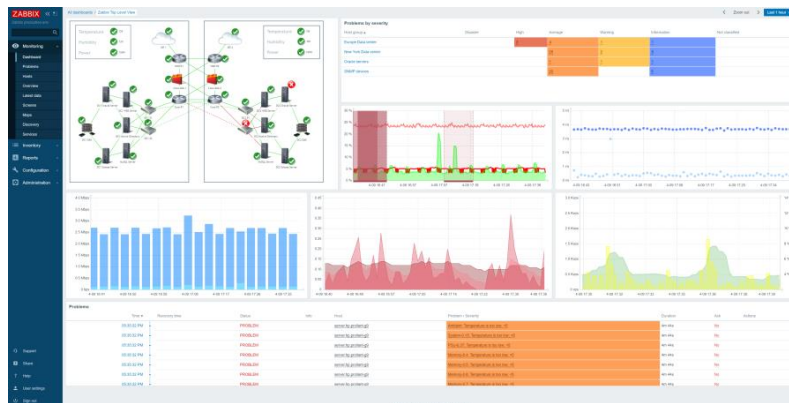


Analysis



History

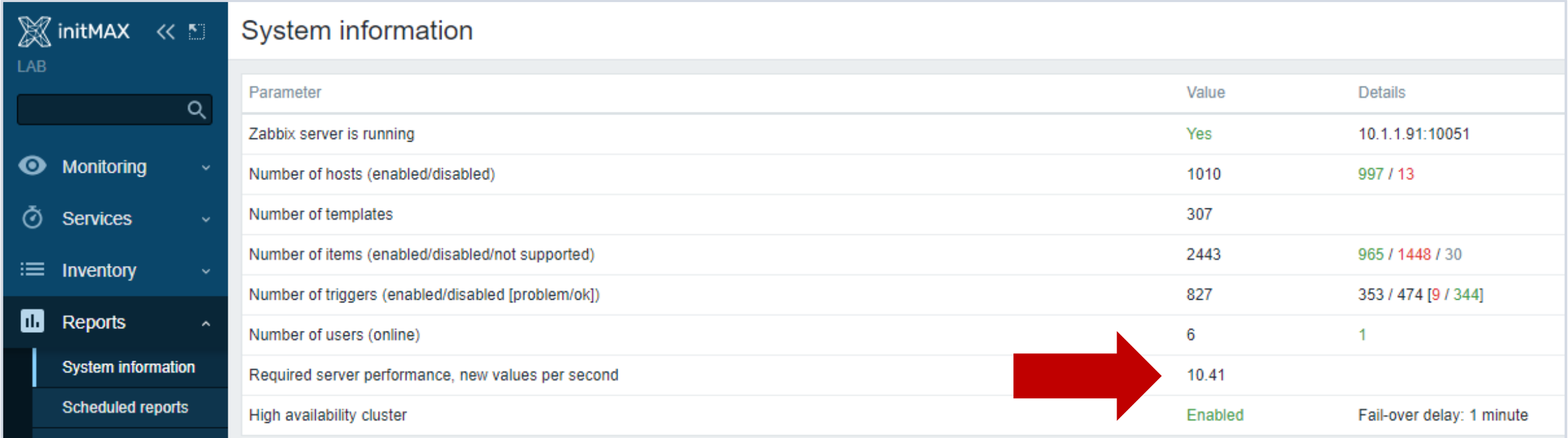
Visualization



# How to measure performance

## Number of values processed per second (NVPS)

A rough estimate of NVPS is visible in Zabbix

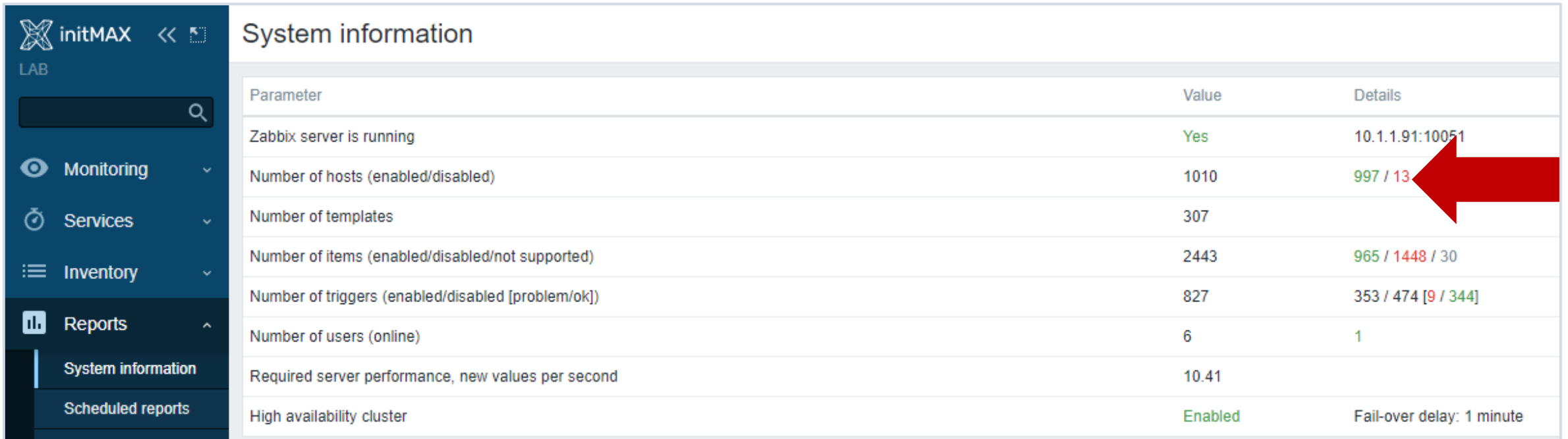


The screenshot shows the Zabbix web interface. On the left is a dark blue sidebar with navigation options: Monitoring, Services, Inventory, and Reports. The 'Reports' section is expanded, showing 'System information' and 'Scheduled reports'. The main content area is titled 'System information' and contains a table with three columns: 'Parameter', 'Value', and 'Details'. A red arrow points to the row 'Required server performance, new values per second', which has 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

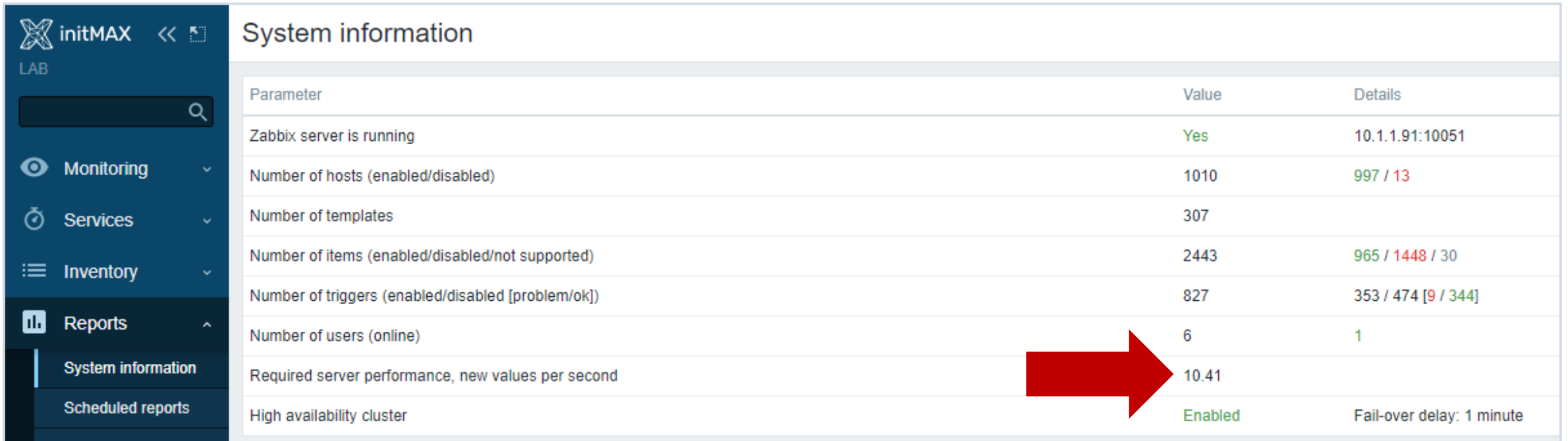
## Why the number of devices is not an indicator?



The screenshot shows the Zabbix System Information page. A red arrow points to the 'Number of hosts (enabled/disabled)' row, highlighting the '997 / 13' value in the Details column.

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# How to measure performance

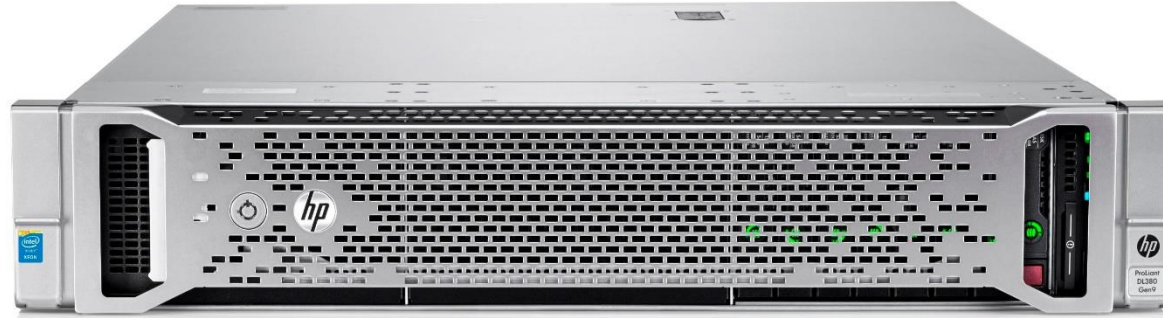


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- › Update frequency greatly affects NVPS.
- › The calculation takes into account data from the monitored devices.
- › Data types “Zabbix trapper” or “SNMP trap” are not taken into account.

# 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?

## Zabbix performance tuning

# Performance

Common problems of initial setup

Default database settings

- › Tune database for the best performance ([https://github.com/hermanekt/Zabbix\\_MYSQL\\_tunned\\_for\\_40k](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!**

# Performance

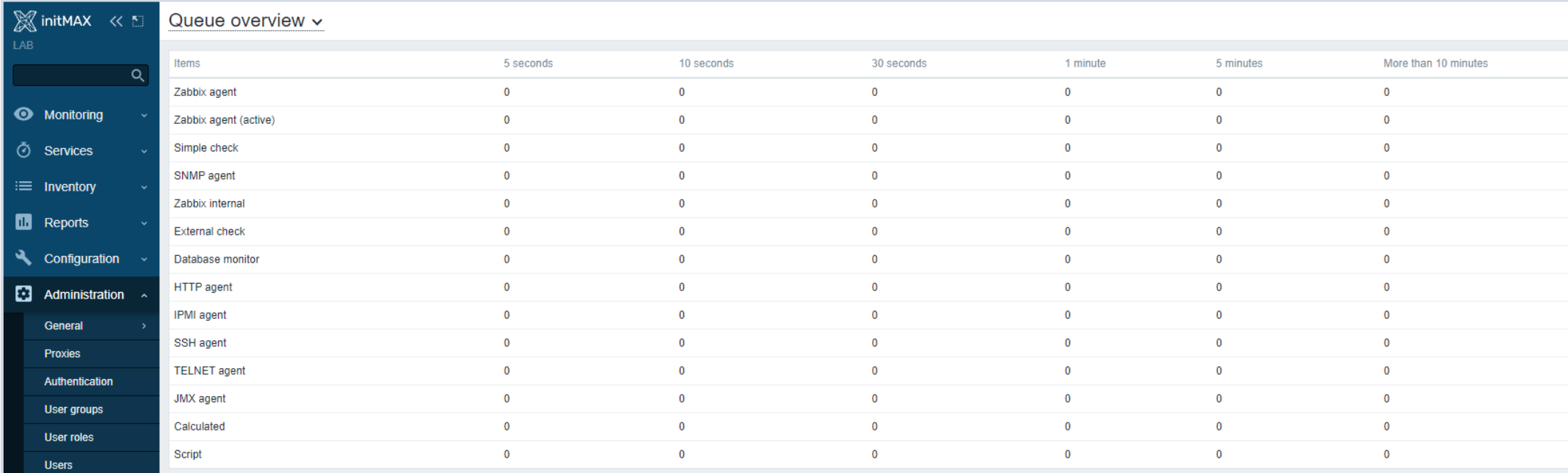
Visible symptoms of bad performance

- › 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



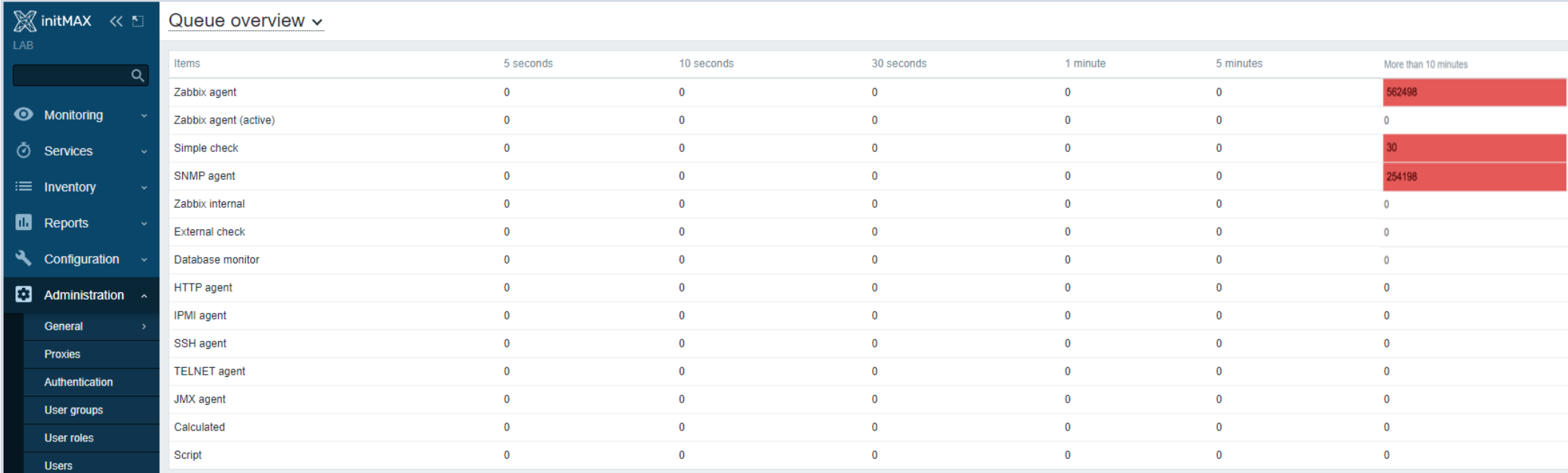
The screenshot shows the Zabbix Queue overview page. The left sidebar contains navigation menus for Monitoring, Services, Inventory, Reports, Configuration, and Administration. The main content area displays a table with columns for Items, 5 seconds, 10 seconds, 30 seconds, 1 minute, 5 minutes, and More than 10 minutes. All values in the table are 0.

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



The screenshot shows the Zabbix web interface's 'Queue overview' page. The left sidebar contains navigation menus for Monitoring, Services, Inventory, Reports, Configuration, and Administration. The main content area displays a table with columns for item types and time intervals: 5 seconds, 10 seconds, 30 seconds, 1 minute, 5 minutes, and More than 10 minutes. The 'More than 10 minutes' column is highlighted in red for items with high counts.

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

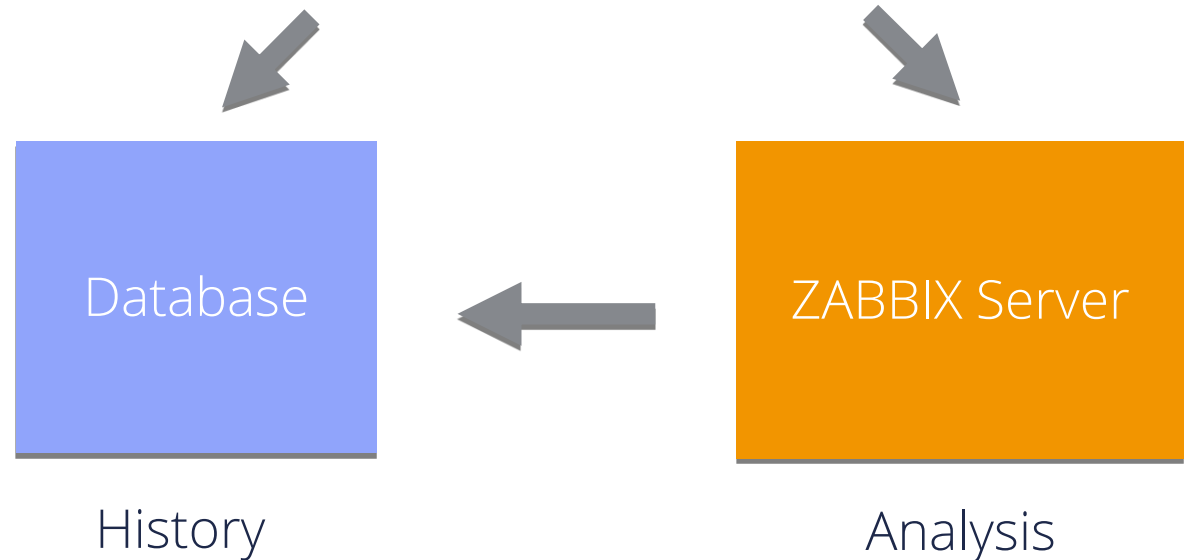
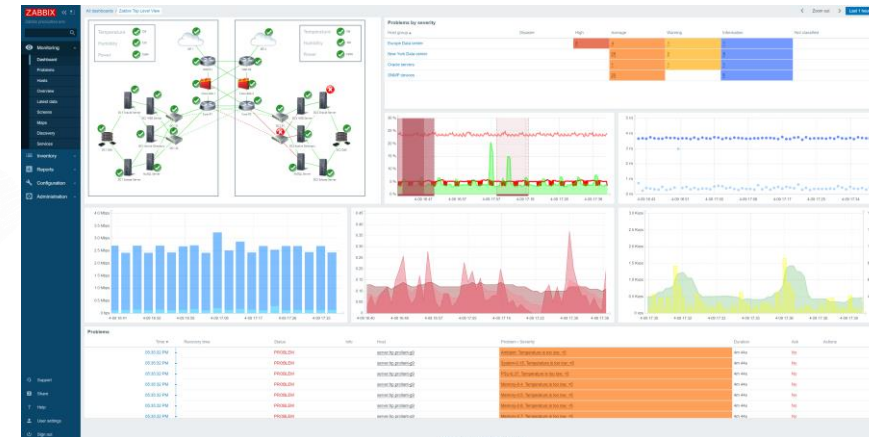


## Zabbix performance tuning

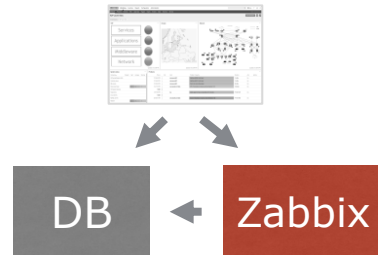
# Identify

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

## Visualization



# Identify



## Main utilities

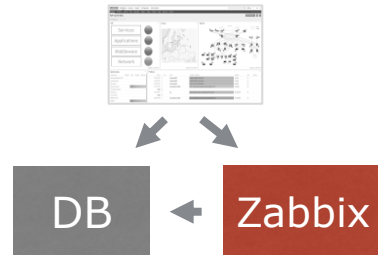
- › top, ntop, iostat, vmstat, sar
- › Zabbix itself
- › strace or log file with debugging mode enabled
- › ps aux | grep zabbix\_server

```
# 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?



# 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.

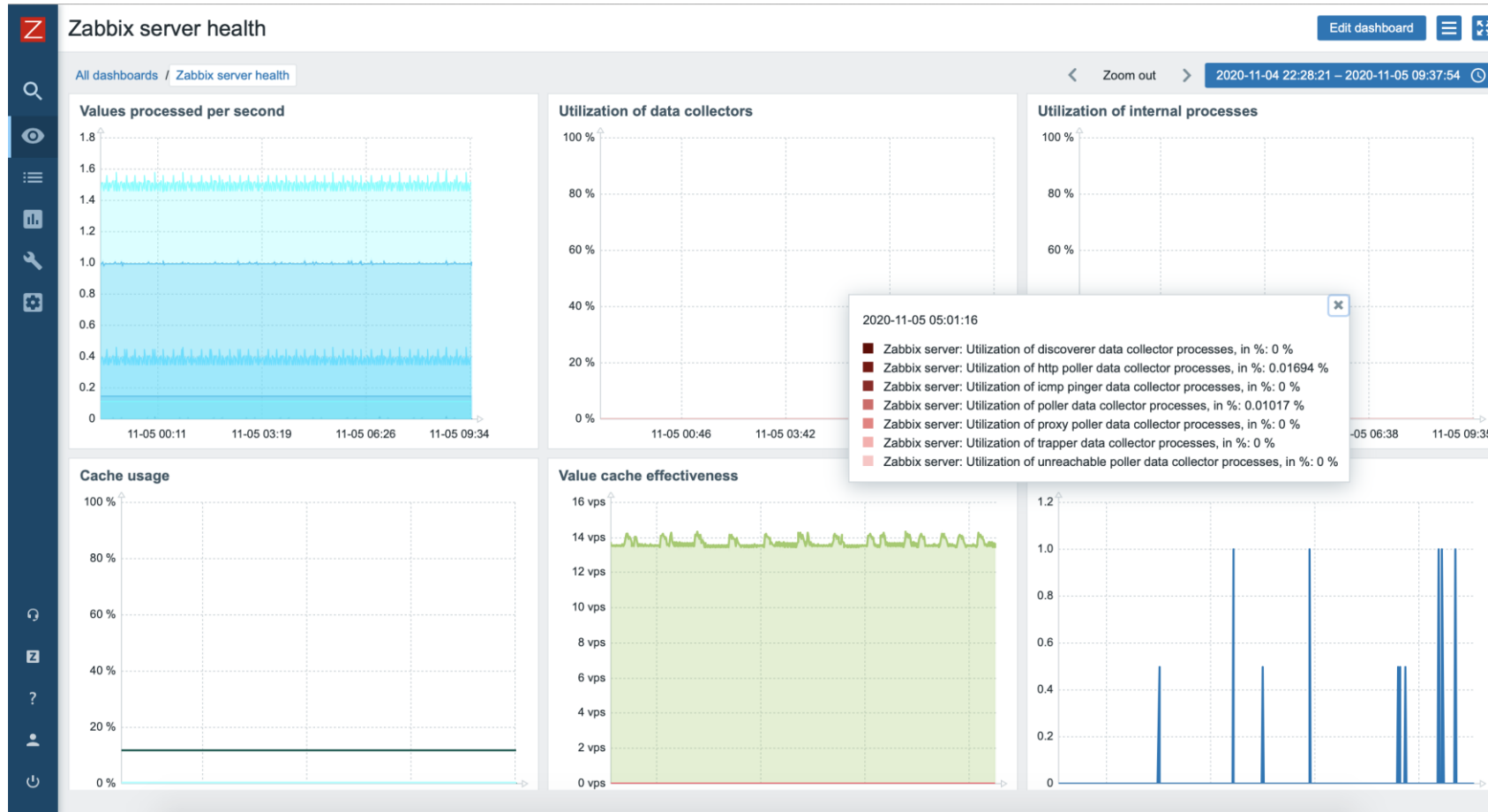
Zabbix server cache

- ▶ 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 i
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 i
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 i
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 i
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 i
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 i
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 i
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 i
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

## Zabbix performance tuning

# Identify

### Main utilities

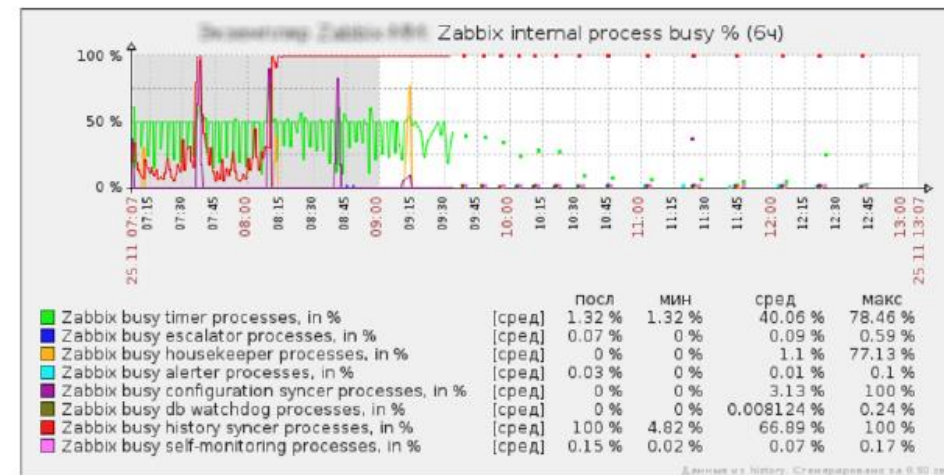
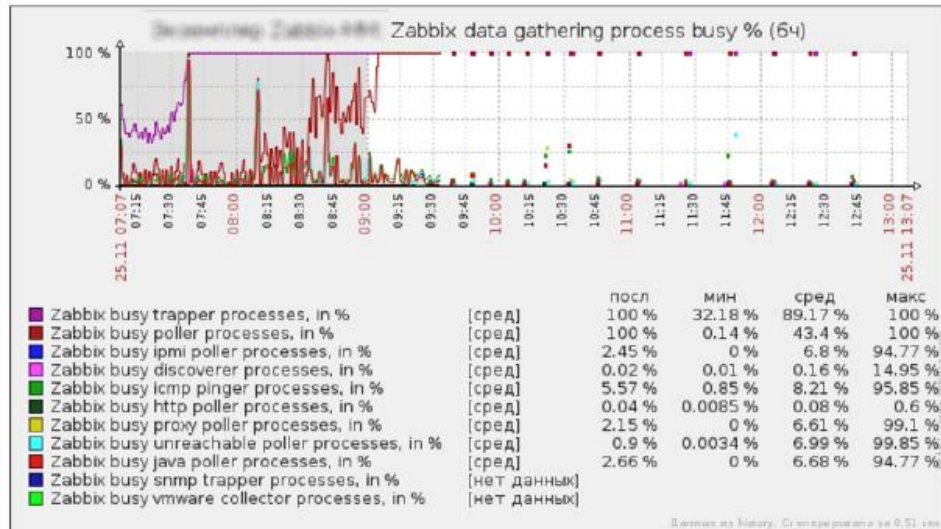
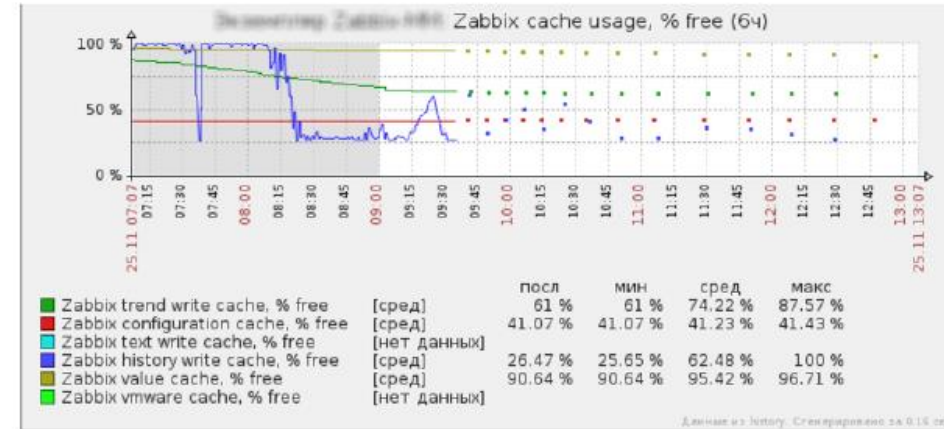
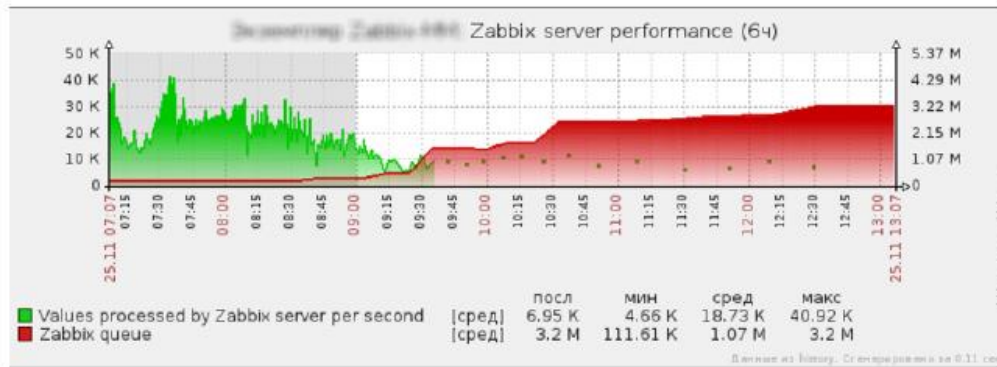
- › top, ntop, iostat, vmstat, sar
- › DB statistics, innotop

```
# 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

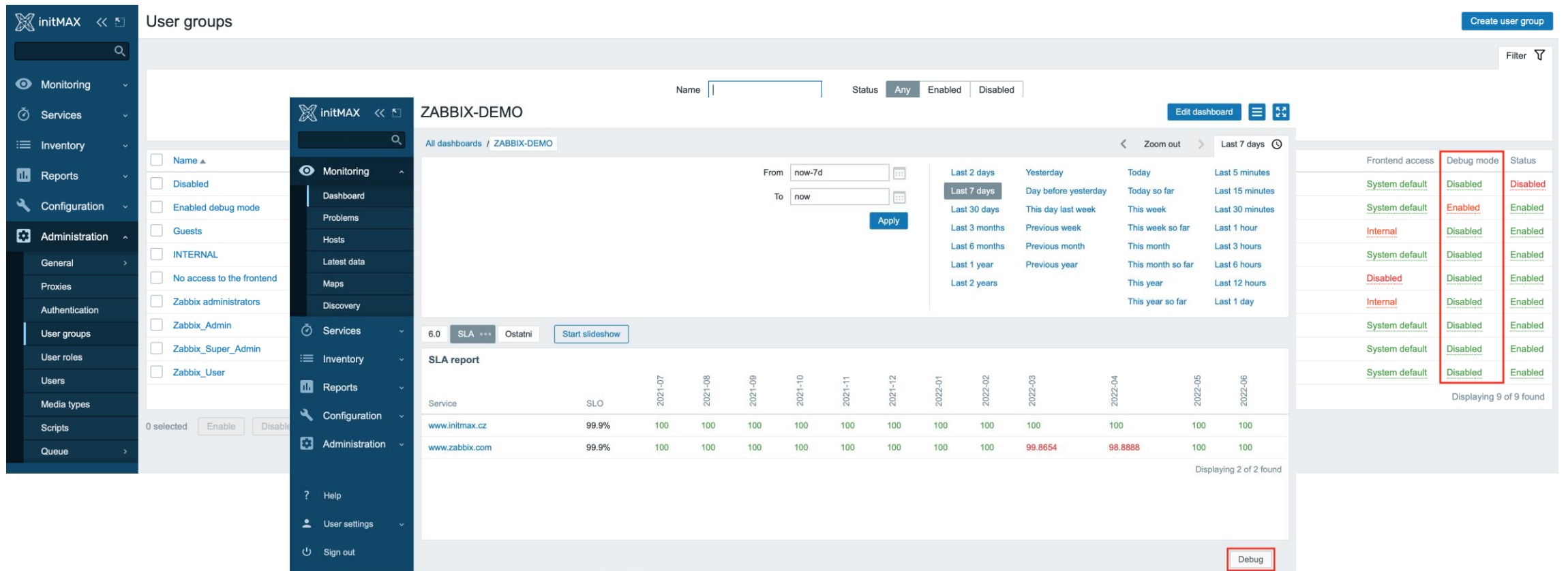
### Slow DB?



## Zabbix performance tuning

# Identify

## Debug mode



The screenshot shows the Zabbix Admin interface. On the left, the 'Administration' menu is open, with 'User groups' selected. The 'User groups' page shows a list of groups with columns for Name, Disabled, Enabled debug mode, and Frontend access. A red box highlights the 'Debug mode' column, showing 'Disabled' for 'System default' and 'Enabled' for 'INTERNAL'. Below this, the 'SLA report' table shows performance data for services like 'www.initmax.cz' and 'www.zabbix.com'. A red box at the bottom right highlights the 'Debug' button.

**User groups table:**

Name	Disabled	Enabled debug mode	Frontend access	Debug mode	Status
System default	<input type="checkbox"/>	<input type="checkbox"/>	System default	Disabled	Disabled
System default	<input type="checkbox"/>	<input type="checkbox"/>	System default	Enabled	Enabled
INTERNAL	<input type="checkbox"/>	<input type="checkbox"/>	Internal	Disabled	Enabled
System default	<input type="checkbox"/>	<input type="checkbox"/>	System default	Disabled	Enabled
System default	<input type="checkbox"/>	<input type="checkbox"/>	System default	Disabled	Enabled
System default	<input type="checkbox"/>	<input type="checkbox"/>	System default	Disabled	Enabled
System default	<input type="checkbox"/>	<input type="checkbox"/>	System default	Disabled	Enabled
System default	<input type="checkbox"/>	<input type="checkbox"/>	System default	Disabled	Enabled
System default	<input type="checkbox"/>	<input type="checkbox"/>	System default	Disabled	Enabled
System default	<input type="checkbox"/>	<input type="checkbox"/>	System default	Disabled	Enabled

**SLA report table:**

Service	SLO	2021-07	2021-08	2021-09	2021-10	2021-11	2021-12	2022-01	2022-02	2022-03	2022-04	2022-05	2022-06
www.initmax.cz	99.9%	100	100	100	100	100	100	100	100	100	100	100	100
www.zabbix.com	99.9%	100	100	100	100	100	100	100	100	99.8654	98.8888	100	100

# 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

## Zabbix performance tuning

# Identify

Debug mode

```
***** Script profiler *****  
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**Problem  
with web  
server**

## Zabbix performance tuning

# Identify

Debug mode

```
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Total time: 10.960905  
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SQL count: 5636 (selects: 4065 | executes: 1571)  
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`:

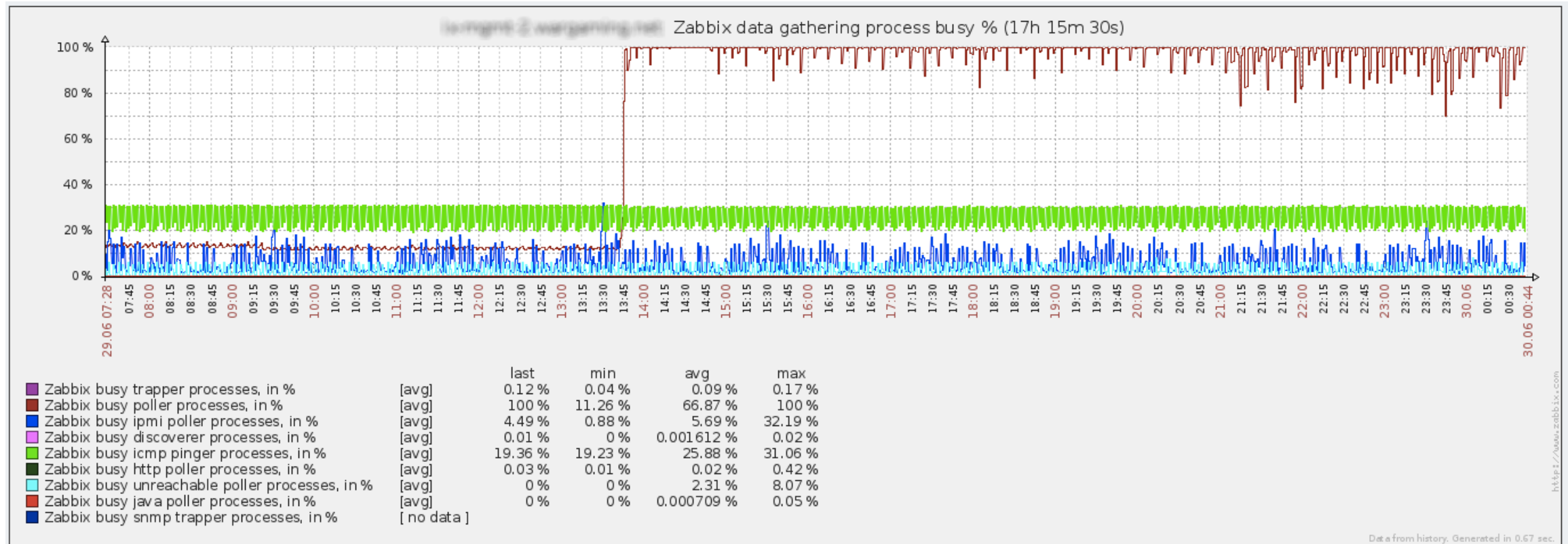
```
StartPollers=80
StartPingers=10
StartPollersUnreachable=80
StartIPMIPollers=10
StartTrappers=20
StartDBSyncers=6
```

## 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

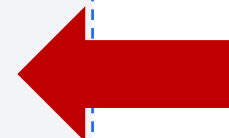
Query history

## 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

Zabbix performance tuning

# Improve

No table partitioning



**Zabbix  
Server  
& GUI**

The diagram illustrates the connection between the Zabbix Server & GUI and the History database. On the left, an orange rectangle contains the text 'Zabbix Server & GUI'. In the center, a blue double-headed arrow indicates bidirectional communication. On the right, a blue cylinder represents the 'History' database.

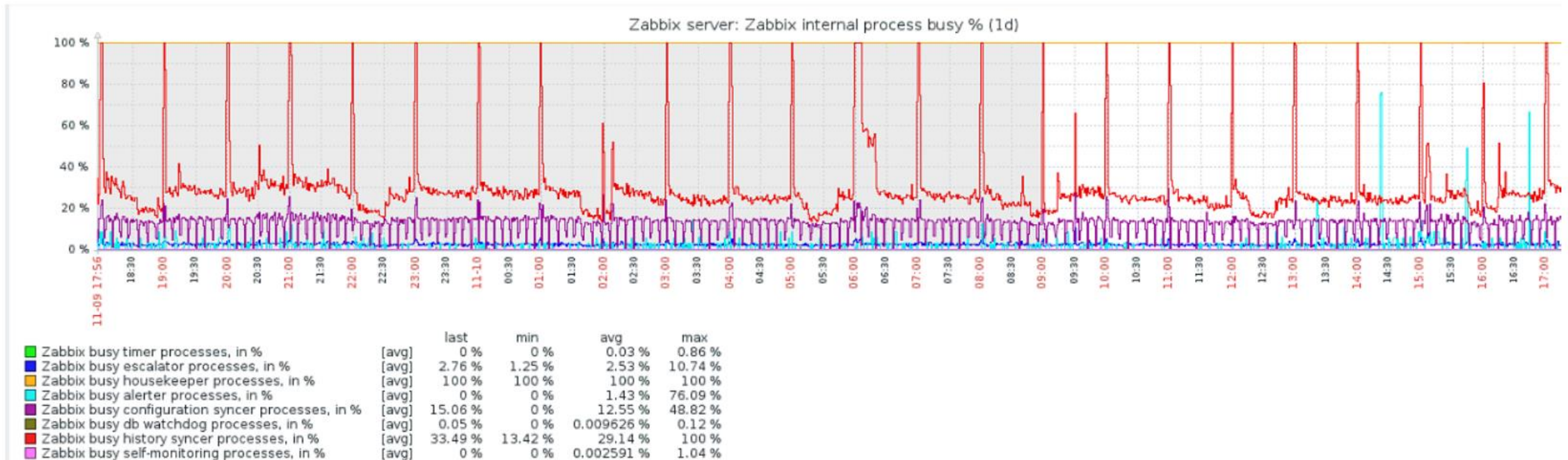
**History**

## 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

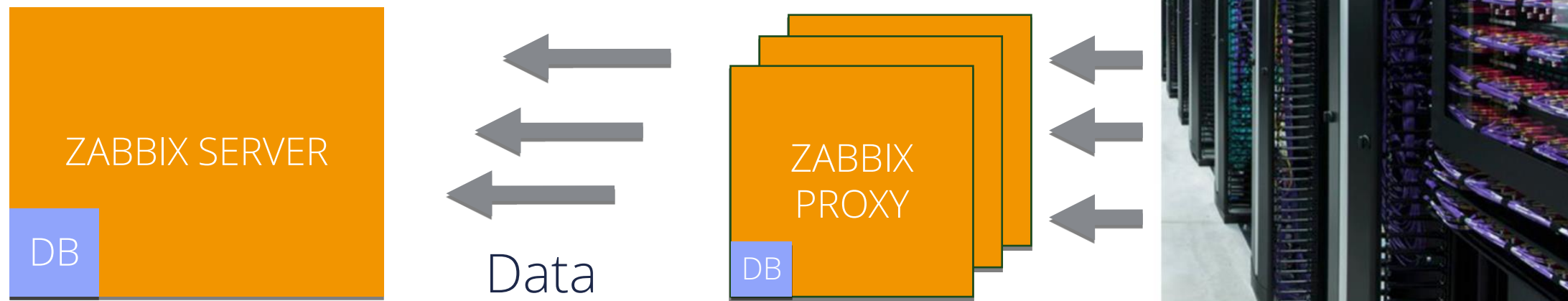


## Zabbix performance tuning

# Improve

I still need better performance

- › All data collection is done using a proxy



## Zabbix performance tuning

# Improve

Why to use proxy?

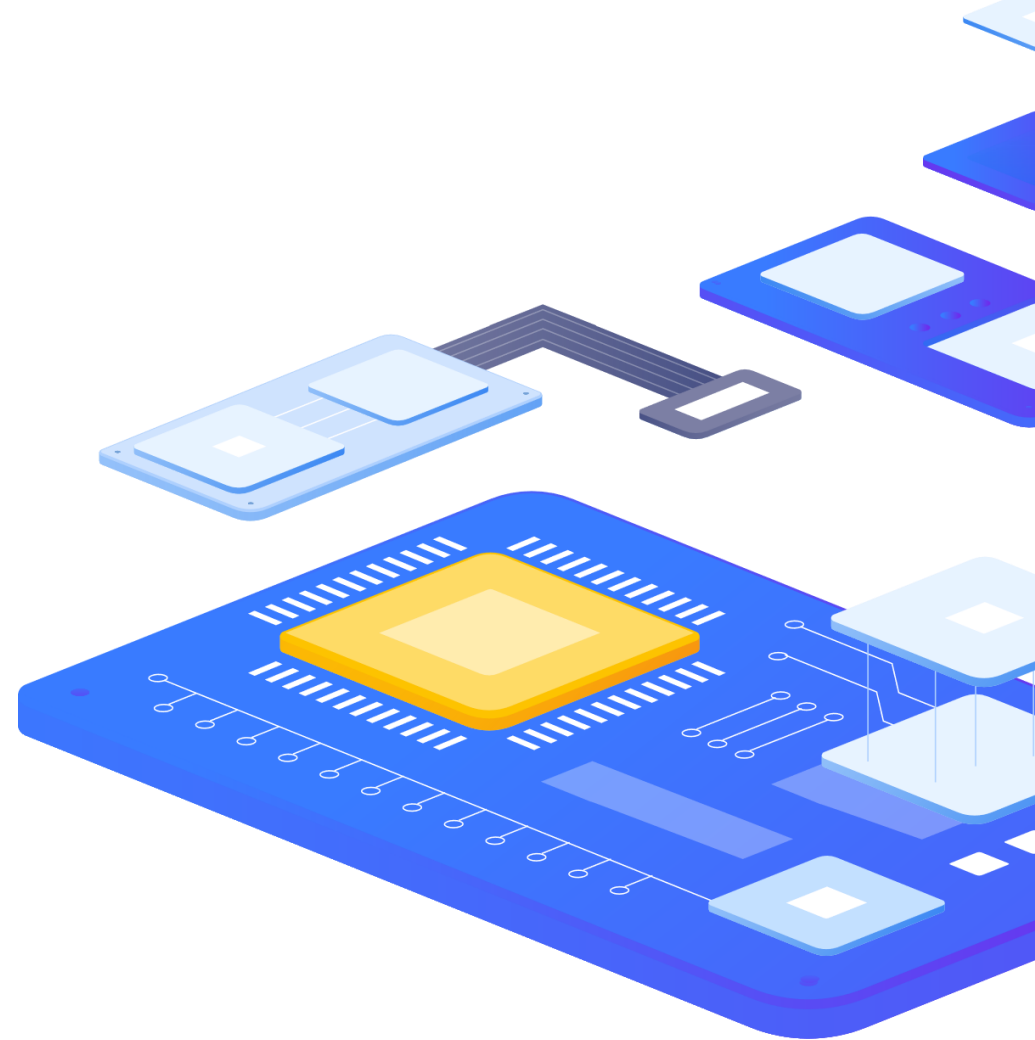
- › Zabbix Proxy "converts" passive checks into active
- › The load is distributed between the proxies
- › If one proxy is overloaded, network nodes can be moved to another proxy
- › Easy maintenance
- › Caching data when Zabbix server is not available

## 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](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](http://zabbix.org/wiki/Docs/howto/mysql_partitioning)
- › PostgreSQL: [https://www.zabbix.org/wiki/Docs/howto/zabbix2\\_postgresql\\_partitioning](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



# 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**



# Highlighting of latest versions

Zabbix 6.2

- › User macro cache
- › Reload proxy configuration in frontend or in linux console
- › **Optimized server configuration update**

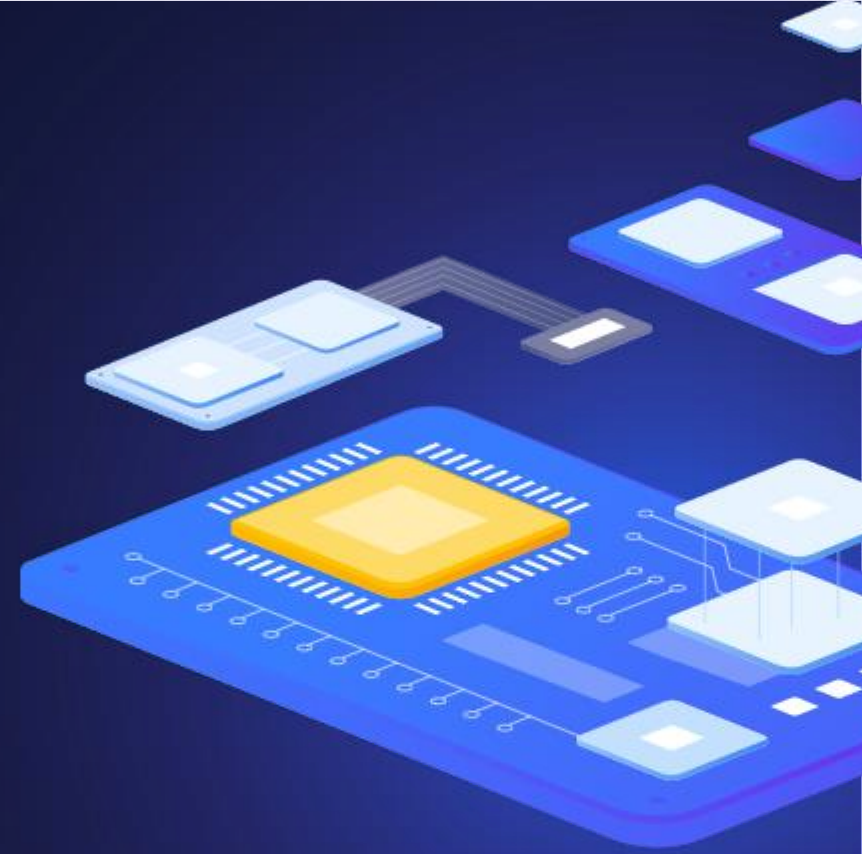
# Highlighting of latest versions

## 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

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Demo





Questions?



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