ZABBIX 5.0

Certified Specialist Training

Day 1

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Facilities

Introduction

- Background/company
- Experience with CLI Unix like systems
- Experience with Zabbix
- Experience with other monitoring solutions
- Current Zabbix deployments

Questions at any moment are encouraged!

We suppose that attendees of this course have basic Linux knowledge. For the practical tasks use the "Lab manual" - it provides all required details.

DAILY SCHEDULE

	Monday	Tuesday - Thursday	Friday
09.00-11.30		Zabbix 5.0 Certified Specialist	
10.00-11.30	Zabbix 5.0 Certified Specialist		
11.30-11.45	Break		
11.45-13.00	Zabbix 5.0 Certified Specialist		
13.00-14.00	Lunch Break; Q/A session		
14.00-15.30	Zabbix 5.0 Certified Specialist		Advanced Topics
15.30-15.45	Break		Certification and presentation of certificates
15.45-17.50	Zabbix 5.0 Certified Specialist		

AGENDA

Architecture

Preparations

Installation

Interface
&
Users

Definitions

Monitoring

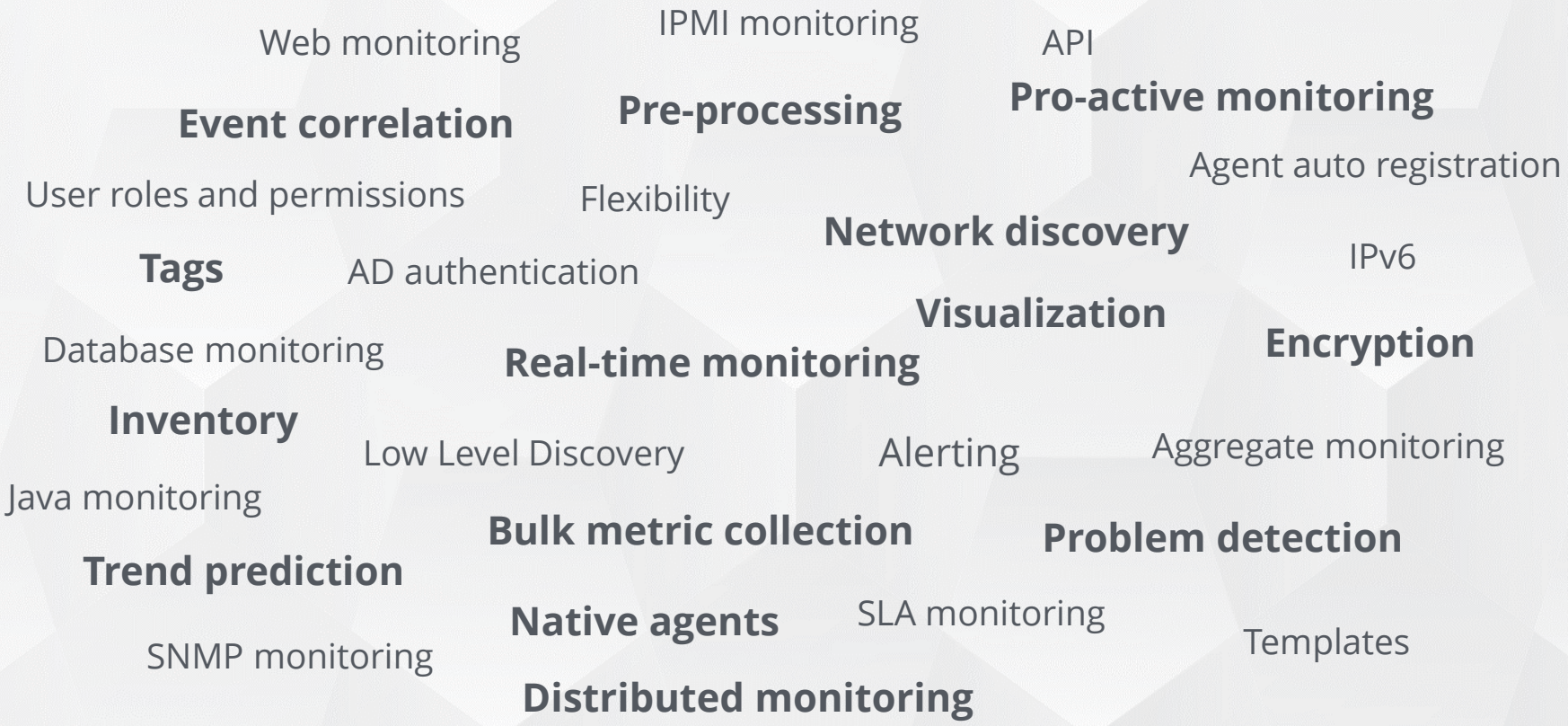
Hosts
&
Host groups

Items
&
Preprocessing

Agent-less
Checks

Intro

Zabbix is the ultimate enterprise - class monitoring platform



KEY PRINCIPLES OF DEVELOPMENT

Keep things simple (KISS)

Be efficient: use as few system resources as possible (memory/CPU usage)

Very high performance and high-quality product

Low number of third-party dependencies

Written and distributed under the GPL (General Public License) version 2

Frontend

- Open and customisable

Everything is stored in a relational database

C language for the server, proxy and agent

- Best performance
- Lowest footprint and resource usage
- Linux agent uses less than a megabyte of RAM
- (736K on 64bit; excluding shared libraries)

GO language for the agent 2

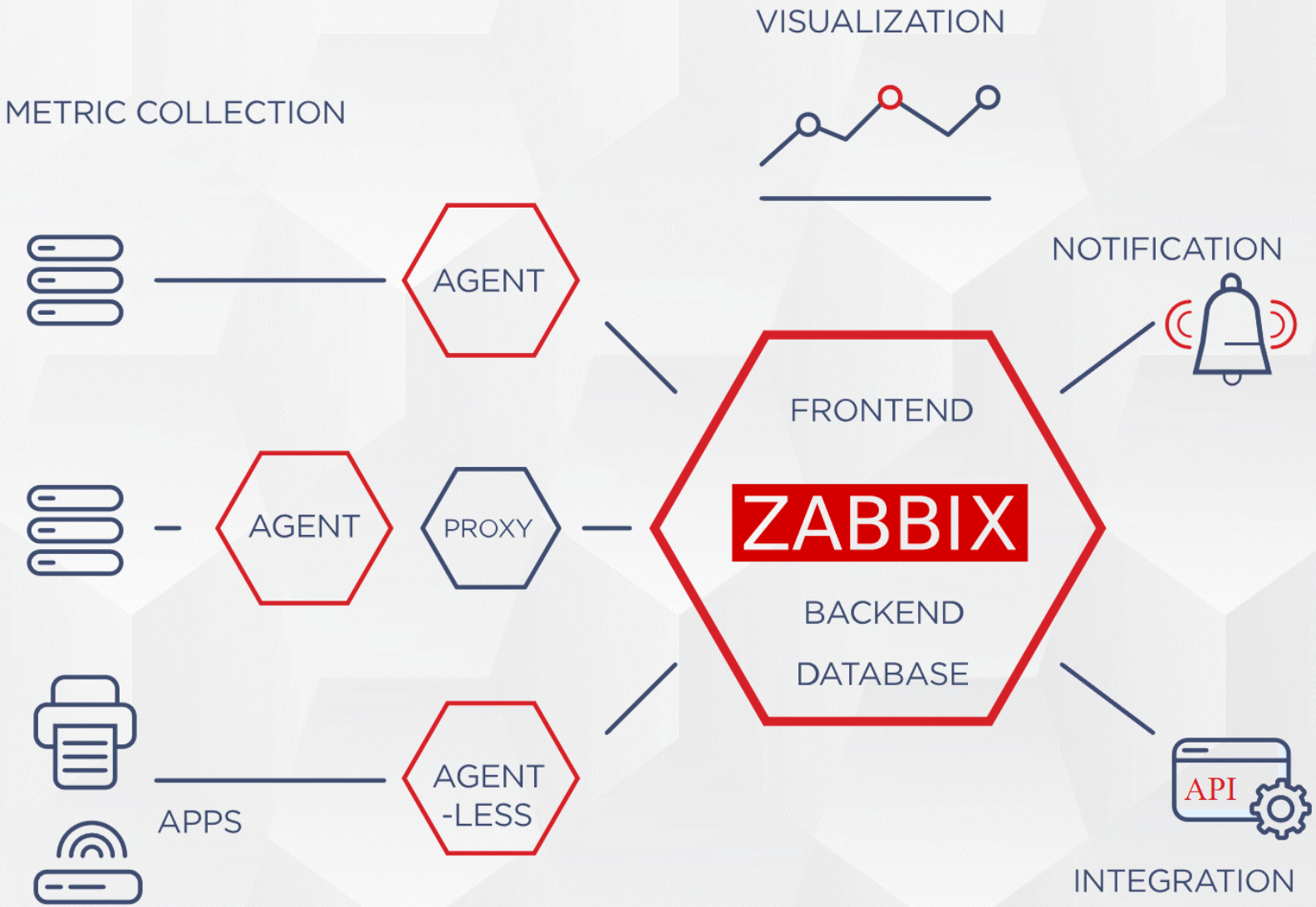
- provides more options for plugin developers

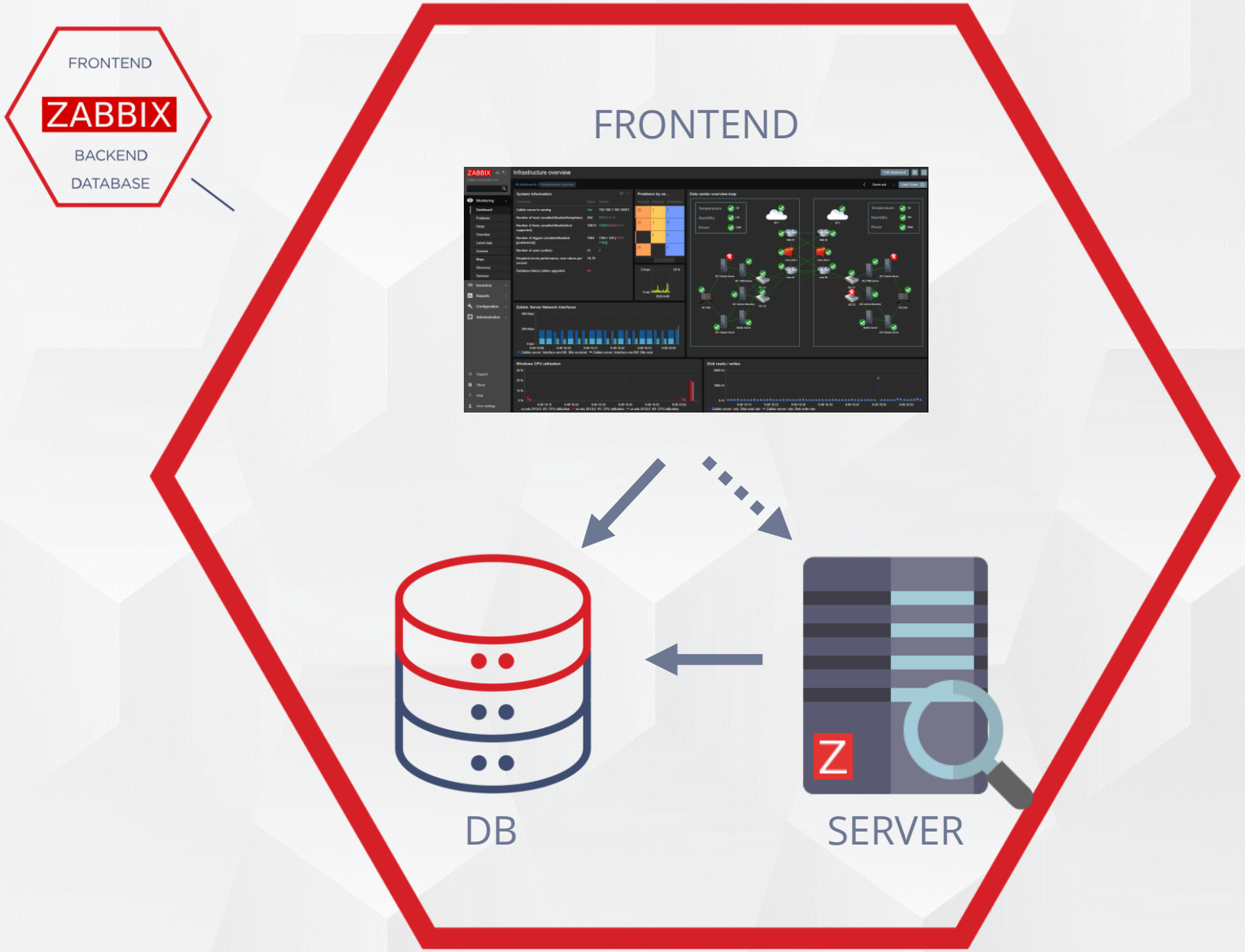
Can be used in an embedded environment

- SQLite for proxy, very small footprint

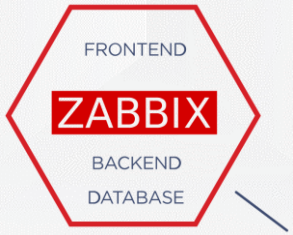
Architecture

BASIC ARCHITECTURE





INSTANCE ON SEPARATED SERVERS



FRONTEND

- ✓ Visualization
- ✓ Configuration management

- ✓ Data collection
- ✓ Problem detection
- ✓ Events
- ✓ Notification

- ✓ Data storage

DB

SERVER

Distributed monitoring

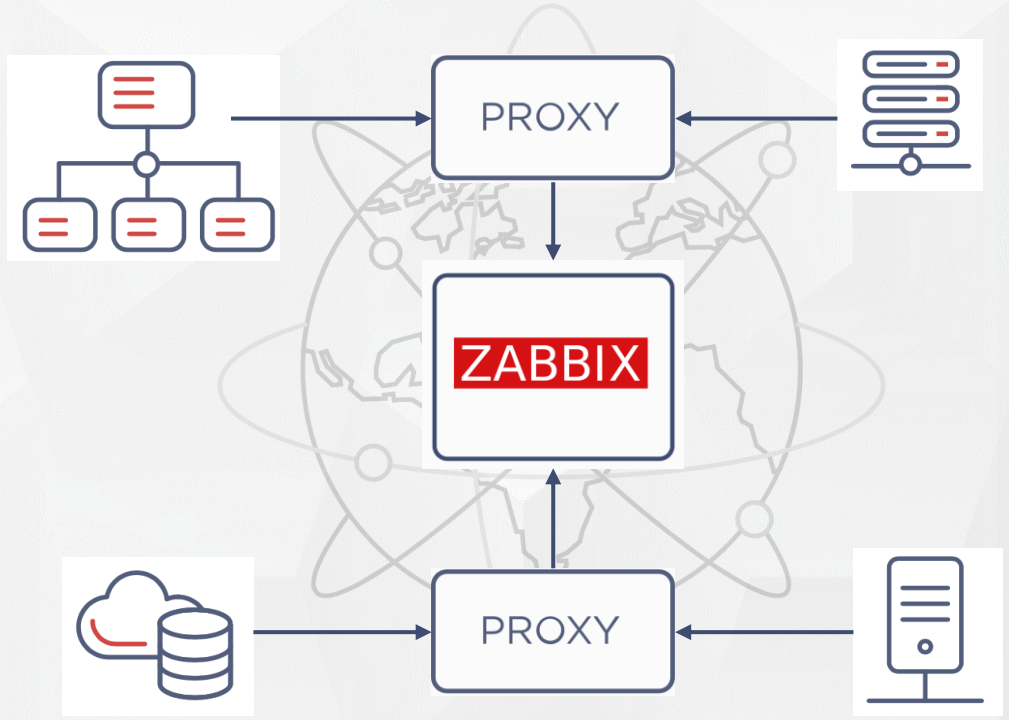
Zabbix provides an effective and reliable way of monitoring a distributed IT infrastructure using Zabbix proxies

- Monitor behind firewalls, DMZ
- Collect data in case of network issues
- Remotely run custom scripts on monitored hosts
- Collect data locally and push data to a central Zabbix server

https://www.zabbix.com/documentation/current/manual/distributed_monitoring

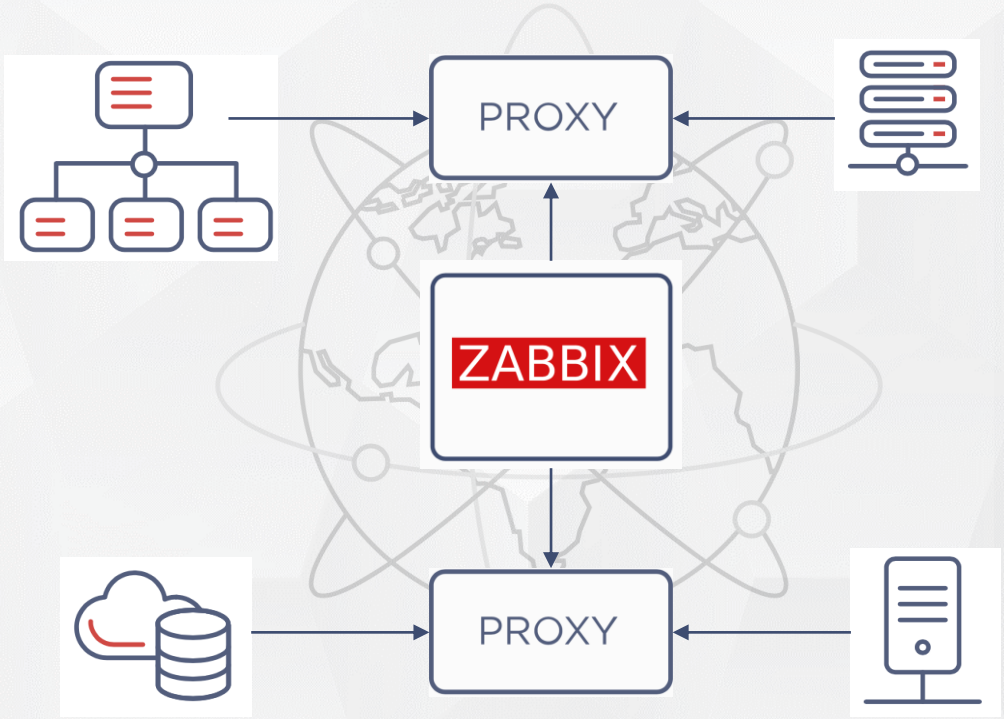
DISTRIBUTED MONITORING - ACTIVE PROXY

- Active proxy will connect to Zabbix server and request configuration data



DISTRIBUTED MONITORING - PASSIVE PROXY

- Zabbix server connects to the passive proxy
- The server requires only one TCP connection to the proxy.
  - Easier to get around a firewall as only one firewall rule is needed



DISTRIBUTED MONITORING - NOTES

- Centralized monitoring
- Proxy can collect data and perform preprocessing steps
- Zabbix server controls configuration of all proxies
- Supports any platform the server supports
- Supports any database the server supports
- Can use different DBs on the server & proxies
- Can create SQLite DB automatically
- Can buffer data in case of communication problems
- Choose the direction of connection

Don't use the same DB and schema for proxy & server!!!

Preparations

For Zabbix server to operate properly, the OS must be prepared.

- Setup NTP client
  - It is very important to have a precise system date
  - It is strongly recommended to maintain synchronized system date on all systems Zabbix components are running on
- Change time zone
  - To write correct timestamps in Zabbix logs
  - Zabbix server time zone is used for maintenance periods, time-based trigger functions, etc.
- Firewall
  - Zabbix server will have a lot of outgoing/incoming connections to different devices and network ports; a firewall must be configured to allow this interaction
- Built in access control systems may block Zabbix server components
  - SELINUX
  - AppArmor
  - Other security tools

To setup NTP on Centos8 "Chrony" can be used:

- Install chrony

```
# dnf install chrony
```

- Enable and start

```
# systemctl enable chronyd --now
```

- Check pool servers

```
# chronyc sources
```

- Or use your own NTP server

```
# vi /etc/chrony.conf
Add line: Server <IP/DNS>
# systemctl restart chronyd
```

- If firewall is enabled:

```
# firewall-cmd --permanent --add-service=ntp
# firewall-cmd --reload
```

Show current time zone setup

```
# timedatectl status
```

Show the list of time zones

```
# timedatectl list-timezones | grep <name>
```

Set time zone

```
# timedatectl set-timezone Europe/Riga
```

Wizard to find time zones

```
# tzselect
```

*Zabbix stores time for values in unixtime

When done, check the settings again

```
# timedatectl status
 Local time: Wed 2020-02-19 15:26:25 EET
           Universal time: Wed 2020-02-19 13:26:25 UTC
                 RTC time: Wed 2020-02-19 13:26:25
                Time zone: Europe/Riga (EET, +0200)
System clock synchronized: yes
              NTP service: active
          RTC in local TZ: no
```

Check status

```
# systemctl status firewalld
● firewalld.service - firewalld - dynamic firewall daemon
   Loaded: loaded (/usr/lib/systemd/system/firewalld.service; enabled; vendor preset: enabled)
   Active: active (running) since Wed 2020-02-19 16:20:43 EET; 35min left
     Docs: man:firewalld(1)
 Main PID: 900 (firewalld)
```

Add exclusions for the web server, Zabbix server and Zabbix agent

```
firewall-cmd --permanent --add-service=http
firewall-cmd --permanent --zone=public --add-port=10051/tcp
firewall-cmd --permanent --zone=public --add-port=10050/tcp
firewall-cmd --reload
```

In this training, we will not use a firewall. It is considered a Professional level topic.

Check status

```
# sestatus
SELinux status:                 enabled
SELinuxfs mount:                /sys/fs/selinux
SELinux root directory:         /etc/selinux
Loaded policy name:             targeted
Current mode:                   enforcing
Mode from config file:          enforcing
…
```

If enabled (enforcing):

- need to introduce policies to allow processes to run and interact with each other

To set it to permissive mode and disable on the next reboot

```
# setenforce 0
# vi /etc/selinux/config
SELINUX=disabled
```

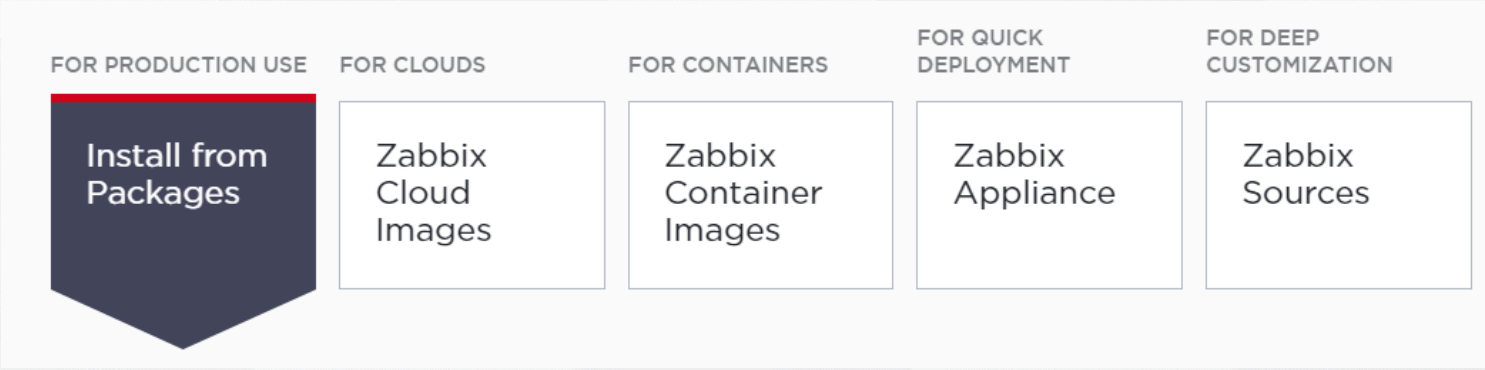
Make sure you have the latest policies installed.

For this course, SELinux is disabled; its settings are covered in the Expert training.

Server, DB, GUI installation

There are five ways of getting Zabbix:

- Install it from the official packages
- Use Zabbix Cloud images
- Deploy from containers
- Download the virtual appliance
- Download the latest source archive and compile it yourself



https://www.zabbix.com/download

INSTALL FROM PACKAGES

FOR PRODUCTION USE	FOR CLOUDS	FOR CONTAINERS	FOR QUICK DEPLOYMENT	FOR DEEP CUSTOMIZATION	FOR AGENT DEPLOYMENT
Install from Packages	Zabbix Cloud Images	Zabbix Container Images	Zabbix Appliance	Zabbix Sources	Zabbix Agents

1 Choose your platform

ZABBIX VERSION	OS DISTRIBUTION	OS VERSION	DATABASE	WEB SERVER
5.0 LTS	Red Hat Enterprise Linux	8	MySQL	Apache
4.4	CentOS	7	PostgreSQL	NGINX
4.0 LTS	Oracle Linux	6		
3.0 LTS	Ubuntu			
	Debian			

2 Install and configure Zabbix server

a. Install Zabbix repository

```
# rpm -Uvh https://repo.zabbix.com/zabbix
# dnf clean all
```

b. Install Zabbix server, frontend, agent

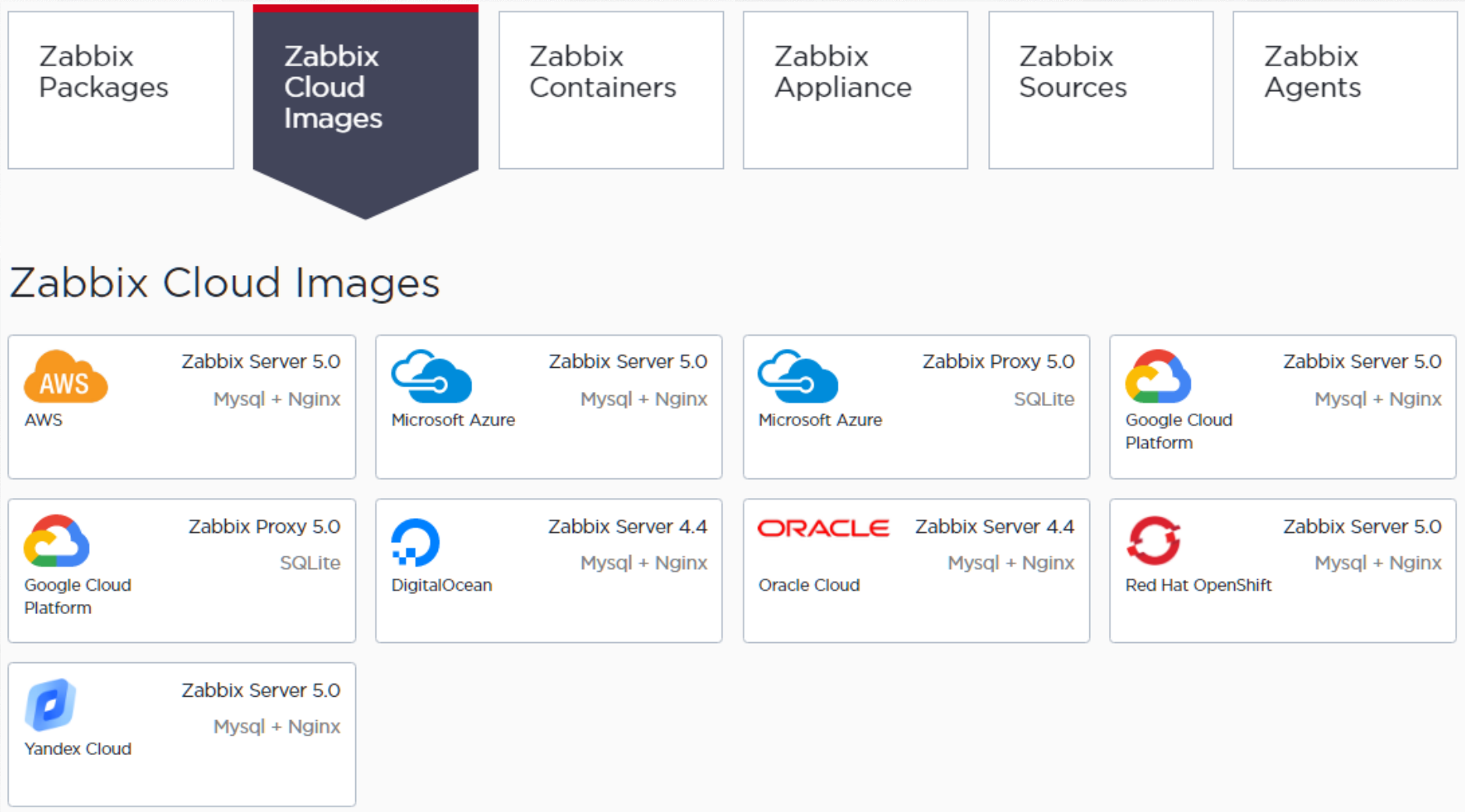
3 Start using Zabbix

Read in documentation: Quickstart guide

Watch video guide:

Zabbix server installation explained

ZABBIX CLOUD IMAGES



https://www.zabbix.com/cloud_images

ZABBIX CONTAINER IMAGES

FOR PRODUCTION USE	FOR CLOUDS	FOR CONTAINERS	FOR QUICK DEPLOYMENT	FOR DEEP CUSTOMIZATION	FOR AGENT DEPLOYMENT
Install from Packages	Zabbix Cloud Images	**Zabbix Container Images**	Zabbix Appliance	Zabbix Sources	Zabbix Agents

Documentation

Zabbix Installation from containers

Read manual

Zabbix Docker Repository GitHub

Official Dockerfiles

Video guide

Zabbix Docker Component Repositories

Zabbix Docker hub

Zabbix Server MySQL	Zabbix Server PostgreSQL	Zabbix Proxy SQLite3	Zabbix Proxy MySQL	Zabbix Frontend Apache, MySQL
Zabbix Frontend Apache, PostgreSQL	Zabbix Frontend Nginx, MySQL	Zabbix Frontend Nginx, PostgreSQL	Zabbix Agent TLS encryption	Zabbix Appliance Nginx, MySQL
Zabbix Java Gateway	Zabbix SNMP traps			

https://www.zabbix.com/container_images

FOR PRODUCTION USE | FOR CLOUDS | FOR CONTAINERS | FOR QUICK DEPLOYMENT | FOR DEEP CUSTOMIZATION | FOR AGENT DEPLOYMENT

Install from Packages | Zabbix Cloud Images | Zabbix Container Images | **Zabbix Appliance** | Zabbix Sources | Zabbix Agents

Install Zabbix Appliance

Zabbix 5.0 LTS | Zabbix 4.4 | Zabbix 4.0 LTS | Zabbix 3.0 LTS

Version	Release	Date	Platform	Release Notes	Zabbix Manual	Download
Zabbix 5.0 LTS	5.0.0	May 12, 2020	Installation CD/DVD (.iso)			Download
Zabbix 5.0 LTS	5.0.0	May 12, 2020	VMWare (.vmx)			Download
Zabbix 5.0 LTS	5.0.0	May 12, 2020	Open virtualization format (.ovf)			Download
Zabbix 5.0 LTS	5.0.0	May 12, 2020	Microsoft Hyper-V 2012			Download

https://www.zabbix.com/download_appliance

ZABBIX SERVER REQUIREMENTS

Operating system	Database	Additional libraries
Linux Red Hat Debian/Ubuntu SUSE Linux Solaris AIX HP-UX FreeBSD OpenBSD MacOS	MySQL (5.5.62 - 8.0.x) MySQL forks MariaDB Percona PostgreSQL (9.2.24 or later) TimescaleDB Oracle (11.2 or later) Elasticsearch experimental only for history	PCRE: libpcre3 Bulk metrics: libevent Compression: zlib SNMP: net-snmp Web: libcurl SSH: libssh2 IPMI: OpenIPMI VMware: libxml2 ODBC: unixODBC Encryption: OpenSSL

Use what is already familiar to you!

RHEL/CentOS

```
# dnf install https://repo.zabbix.com/zabbix/5.0/rhel/8/x86_64/zabbix-release-5.0-1.el8.noarch.rpm
# dnf clean all
# dnf install zabbix-server-mysql
```

Debian/Ubuntu/Raspbian

```
# wget https://repo.zabbix.com/zabbix/5.0/ubuntu/pool/main/z/zabbix-release/zabbix-release_5.0-1+focal_all.deb
# dpkg -i zabbix-release_5.0-1+focal_all.deb
# apt update
# apt install zabbix-server-mysql
```

SUSE Linux Enterprise Server

```
# rpm -Uvh --nosignature https://repo.zabbix.com/zabbix/5.0/sles/15/x86_64/zabbix-release-5.0-1.el15.noarch.rpm
# zypper --gpg-auto-import-keys refresh 'Zabbix Official Repository'
# zypper install zabbix-server-mysql
```

Install MySQL Server

```
# dnf -y install mysql-server
```

Start MySQL and set a root password

```
# systemctl start mysqld
## On production systems secure your instance
# mysql_secure_installation
```

To connect to MySQL from the command line

```
# mysql -u<user_name> -p <database_name>

Enter password: <your_password>
```

If you use older MySQL distributive, check this setting: innodb_file_per_table=on

Log in to MySQL and create Zabbix database and user

```
# mysql -uroot -p<password>
mysql> create database zabbix character set utf8 collate utf8_bin;
mysql> create user 'zabbix'@'localhost' identified by 'P455w0RD';
mysql> grant all privileges on zabbix.* to 'zabbix'@'localhost';
mysql> quit;
```

- character set utf8 - support for multilingualism
- collate utf8_bin - case sensitiveness of stored data

Missing collation is known to cause failed queries

Load compressed SQL files that contain

- DB schema
- Initial configuration
- Pictures

```
# cd /usr/share/doc/zabbix-server-mysql-5.*
# zcat create.sql.gz | mysql -uzabbix -pP455w0RD zabbix
```

Configure Zabbix server

```
# vi /etc/zabbix/zabbix_server.conf
DBHost=localhost
DBName=zabbix
DBUser=zabbix
DBPassword=P455w0RD
```

Start Zabbix server

```
# systemctl start zabbix-server
```

Enable auto start for the services

```
# systemctl enable zabbix-server
# systemctl enable mysqld
```

If SELinux is in enforcing mode, new SELinux policies must be applied.

Check status

```
# systemctl status zabbix-server

● zabbix-server.service - Zabbix Server
   Loaded: loaded (/usr/lib/systemd/system/zabbix-server.service; enabled; vendor preset: disabled)
   Active: active (running) since Sun 2020-05-17 18:28:39 EEST; 17h ago
  Process: 7263 ExecStop=/bin/kill -SIGTERM $MAINPID (code=exited, status=0/SUCCESS)
  Process: 7266 ExecStart=/usr/sbin/zabbix_server -c $CONFFILE (code=exited, status=0/SUCCESS)
 Main PID: 7269 (zabbix_server)
    Tasks: 38
   Memory: 54.6M
```

Check the log file for errors

```
# tail /var/log/zabbix/zabbix_server.log
```

If you encounter critical error messages, resolve the problem before proceeding.

ZABBIX SERVER - COMMAND LINE CONTROL

You can use the following command line parameters with Zabbix server

```
## to get more usage information:
# zabbix_server -h
## to get zabbix daemon version:
# zabbix_server -V
```

Server can be started with a different configuration file or/and in the foreground

```
# zabbix_server -c /tmp/test_zabbix_server.conf
# zabbix_server -f
```

Zabbix server runtime control options

```
# zabbix_server --runtime-control <option>
# zabbix_server --runtime-control config_cache_reload
# zabbix_server --runtime-control log_level_increase=1869
# zabbix_server -R log_level_decrease="history syncer",4
# zabbix_server -R housekeeper_execute
# zabbix_server -R snmp_cache_reload
```

https://www.zabbix.com/documentation/5.0/manual/concepts/server

Frontend installation

FRONTEND - PHP REQUIREMENTS

Component	Requirement
Browser	Mozilla Firefox, Chrome, Safari, Edge, Opera Other browsers (Vivaldi) may work as well
Back-end	Apache (1.3.12 or later), Lighttpd, Nginx
PHP version	7.2.0 or later
PHP database support	php-mysql, php-pgsql, php-sqlora
PHP modules	php-bcmath, php-gd(2.0.28 or later), php-xml(2.6.15 or later), php-xmlreader, php-xmlwriter, php-session, php-net-socket, php-mbstring, PNG/JPEG/FreeType support, php-gettext, php-ldap
Other requirements	Some distributions might split out core PHP features in packages like php7-ctype, php-session or php7-xml/php7-dom

https://www.zabbix.com/documentation/5.0/manual/installation/requirements

RHEL/CentOS

```
# dnf install zabbix-web-mysql zabbix-apache-conf
```

- Edit /etc/php-fpm.d/zabbix.conf to configure PHP
  - Uncomment and change time zone

```
; php_value[date.timezone] = Europe/Riga
```

- Enable and start

```
# systemctl start httpd php-fpm
# systemctl enable httpd php-fpm
```

Debian/Ubuntu/Raspbian

```
# apt install zabbix-frontend-php
```

- Edit /etc/zabbix/apache.conf to configure PHP (the same change as for the RHEL)

SUSE Linux Enterprise Server

```
# zypper install zabbix-server-mysql zabbix-apache-conf
```

- Edit /etc/apache2/conf.d/zabbix.conf to configure PHP (the same change as for the RHEL)

Edit /etc/php-fpm.d/zabbix.conf

```
pm = dynamic     ## php-fpm settings
pm.max_children = 50
pm.start_servers = 5
pm.min_spare_servers = 5
pm.max_spare_servers = 35

php_value[session.save_handler] = files
php_value[session.save_path]    = /var/opt/rh/rh-php72/lib/php/session/

php_value[max_execution_time] = 300
php_value[memory_limit] = 128M
php_value[post_max_size] = 16M
php_value[upload_max_filesize] = 2M
php_value[max_input_time] = 300
php_value[max_input_vars] = 10000
php_value[date.timezone] = Europe/Riga
```

Start and enable auto start for Apache

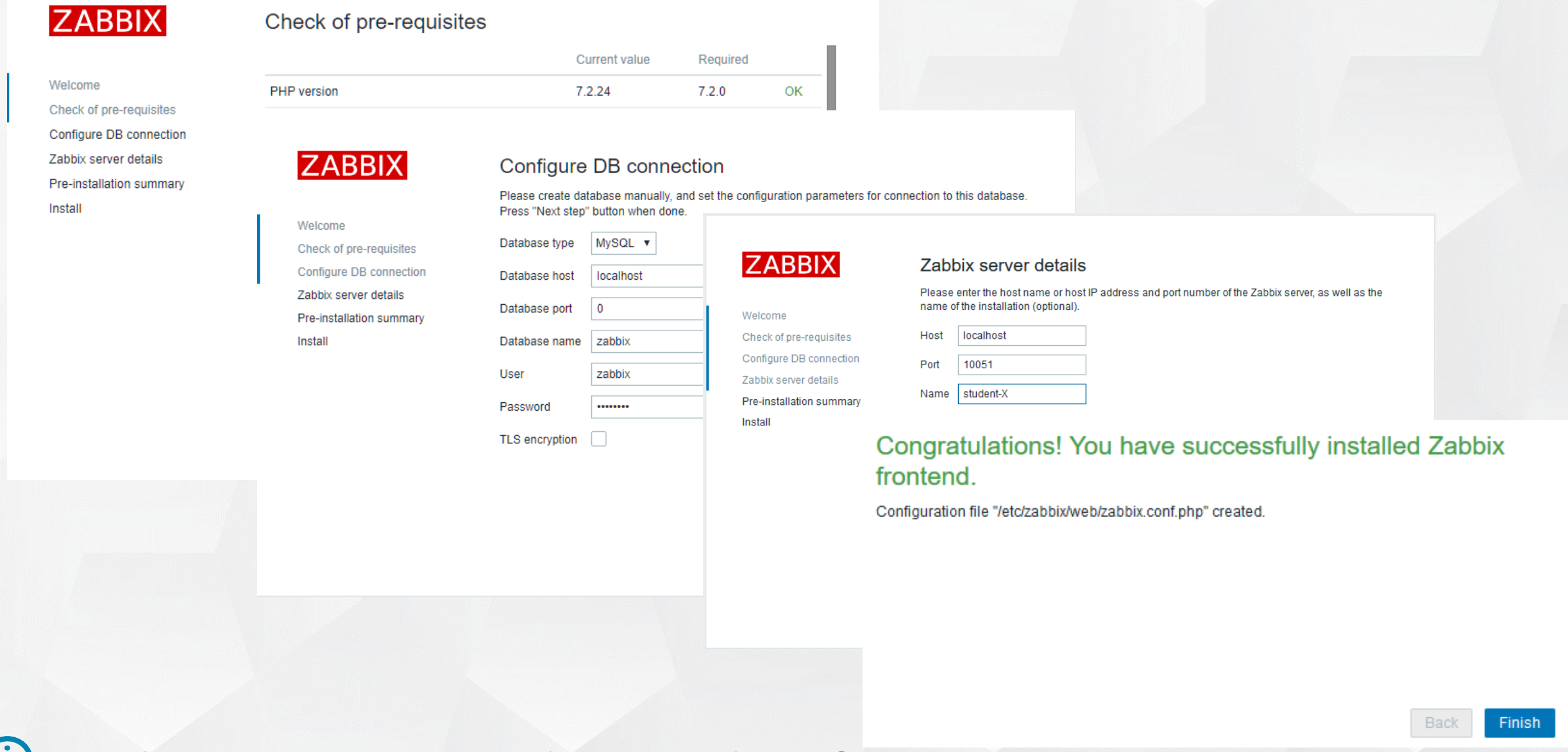
```
# systemctl start httpd php-fpm
# systemctl enable httpd php-fpm
```

Open Zabbix frontend from a web browser

- http://<DNS or IP>/zabbix

If a firewall is enabled, add new firewall rules to allow HTTP traffic

FRONTEND - CONFIGURATION WIZARD



The wizard creates: /etc/zabbix/web/zabbix.conf.php

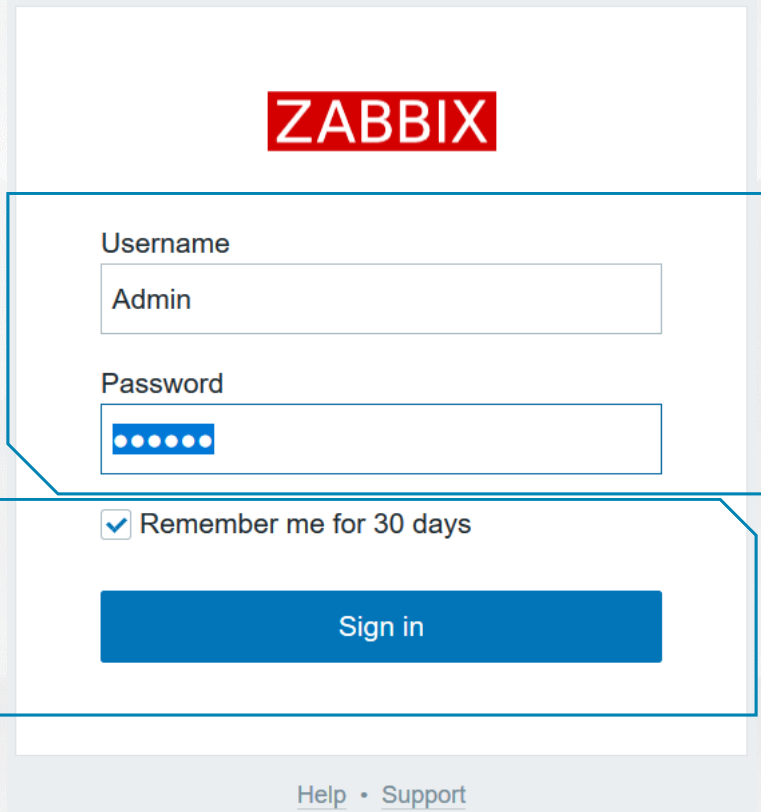
PRACTICAL SETUP

1. Install
   - MySQL 8 server
   - Zabbix Server
   - Frontend
2. Create Zabbix DB
3. Configure:
   - Zabbix server
   - Frontend
4. Start and check status of
   - Web server
   - Zabbix server
5. Check log files to see if the server and all subprocesses have started
6. Login to the frontend using user: Admin, password: zabbix

Zabbix interface

In your browser open the URL:

- http://<ip_or_name>/zabbix

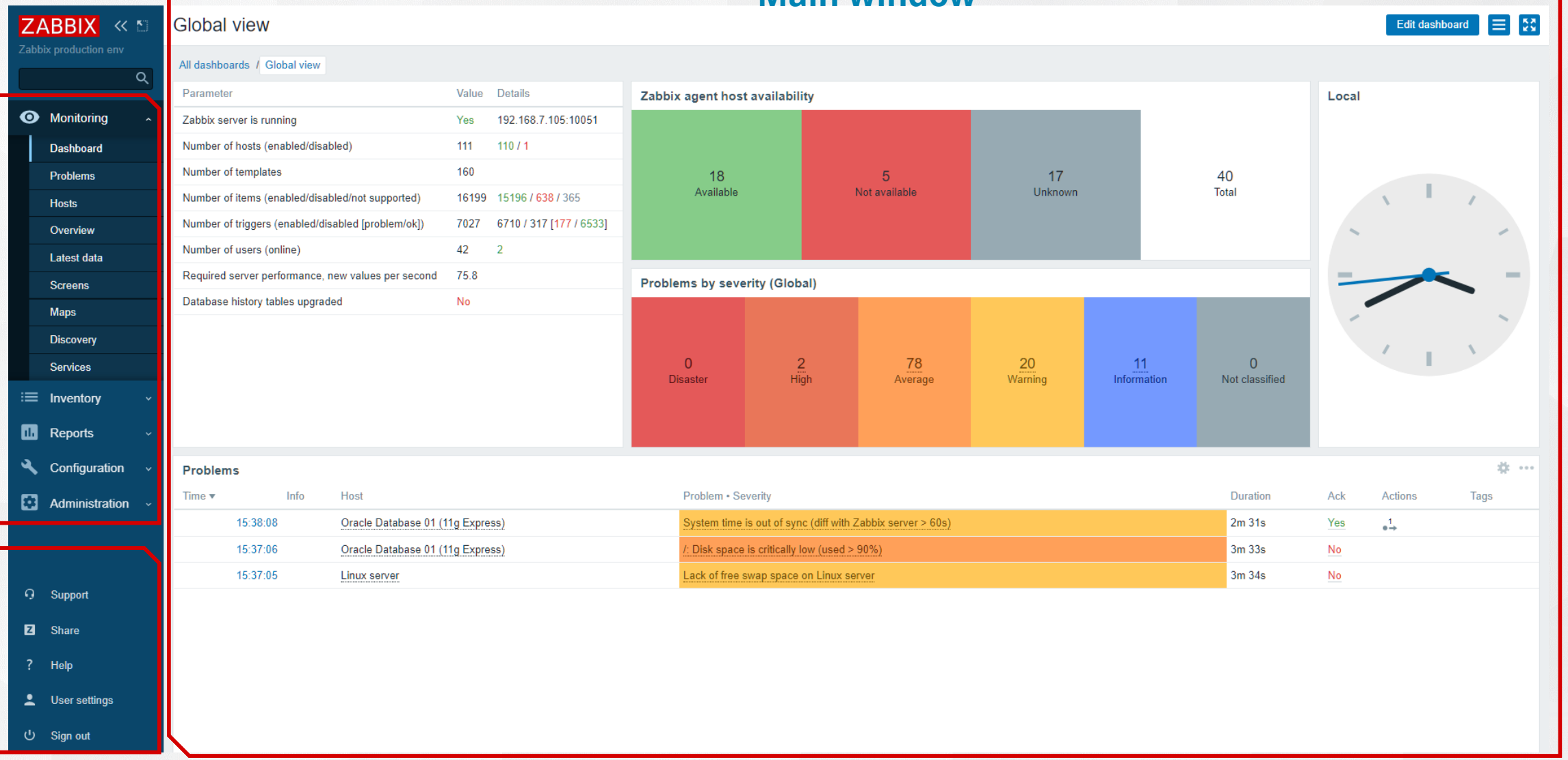


Enter credentials
Username: Admin
Password: zabbix

Save cookie
Sign in = Login

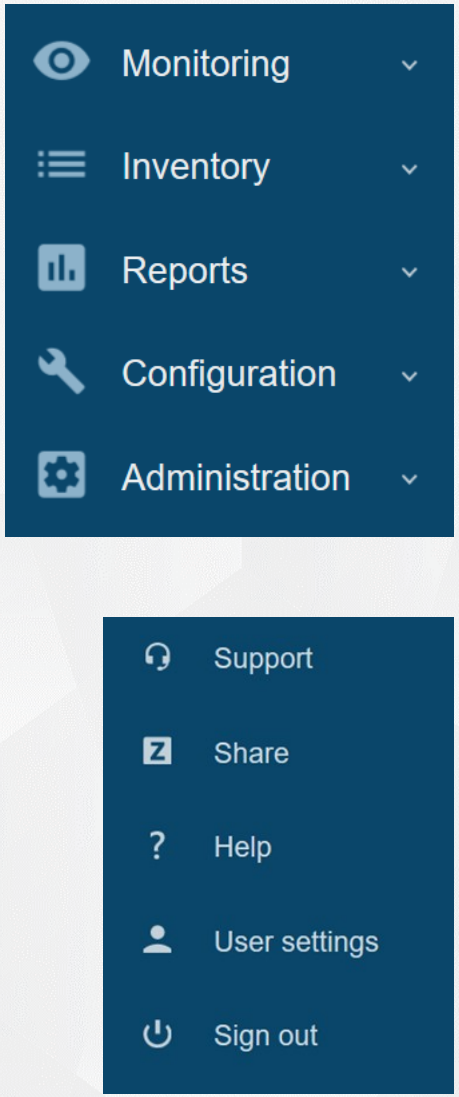
INTERFACE OVERVIEW

Main window



Main menu

Links



Main menu:

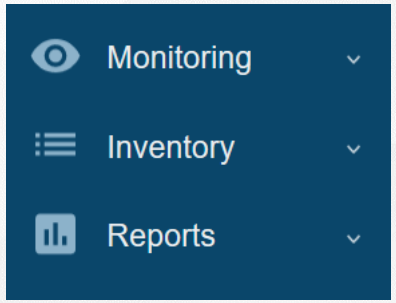
- Is all about displaying data
- Provides an overview of inventory data
- Contains a variety of predefined reports
- Contains sections for setting up Zabbix
- Is for administrative Zabbix functions

Links:

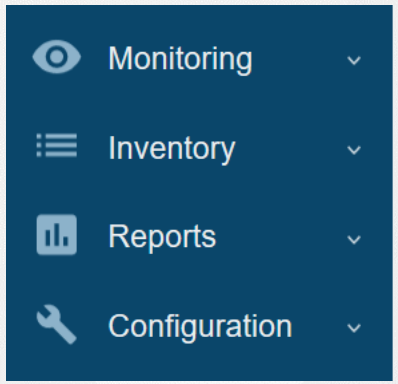
- Contact Zabbix support
- https://share.zabbix.com
- Link to the documentation
- Current user profile settings
- Log out

Access to the frontend menu sections depends on the user type.

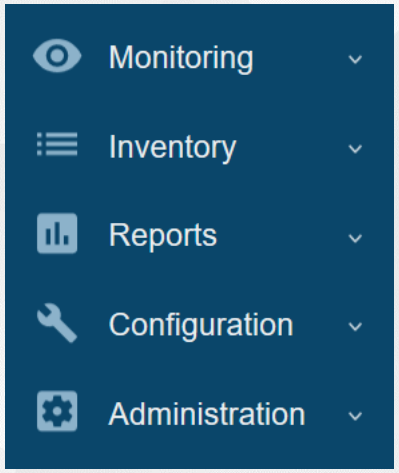
Zabbix User



Zabbix Admin



Zabbix Super Admin



- Menu can be collapsed to small icons or hidden completely
- Global search is for hosts, host groups and templates
- In the monitoring section, frontend can be switched to kiosk mode
- To exit kiosk mode, point to the upper right corner and press

Type any string

- If there are hosts that include the string, a dropdown will appear, listing all matching hosts

Search: Linux

Hosts

Hosts

Host	IP	DNS	Latest data	Problems	Graphs	Screens	Web	Applications	Items	Triggers	Graphs	Discovery	Web
linux01.training.lan	172.17.0.1	{HOST.HOST}	Latest data	Problems	Graphs	Screens	Web	Applications 16	Items 64	Triggers 23	Graphs 12	Discovery 5	Web
linux02.training.lan	172.17.0.1	{HOST.HOST}	Latest data	Problems	Graphs	Screens	Web	Applications 16	Items 64	Triggers 23	Graphs 12	Discovery 5	Web

Displaying 2 of 2 found

Host Groups

Host groups

Host group	Latest data	Problems	Web	Hosts	Templates
Linux servers	Latest data	Problems	Web	Hosts 2	Templates

Displaying 1 of 1 found

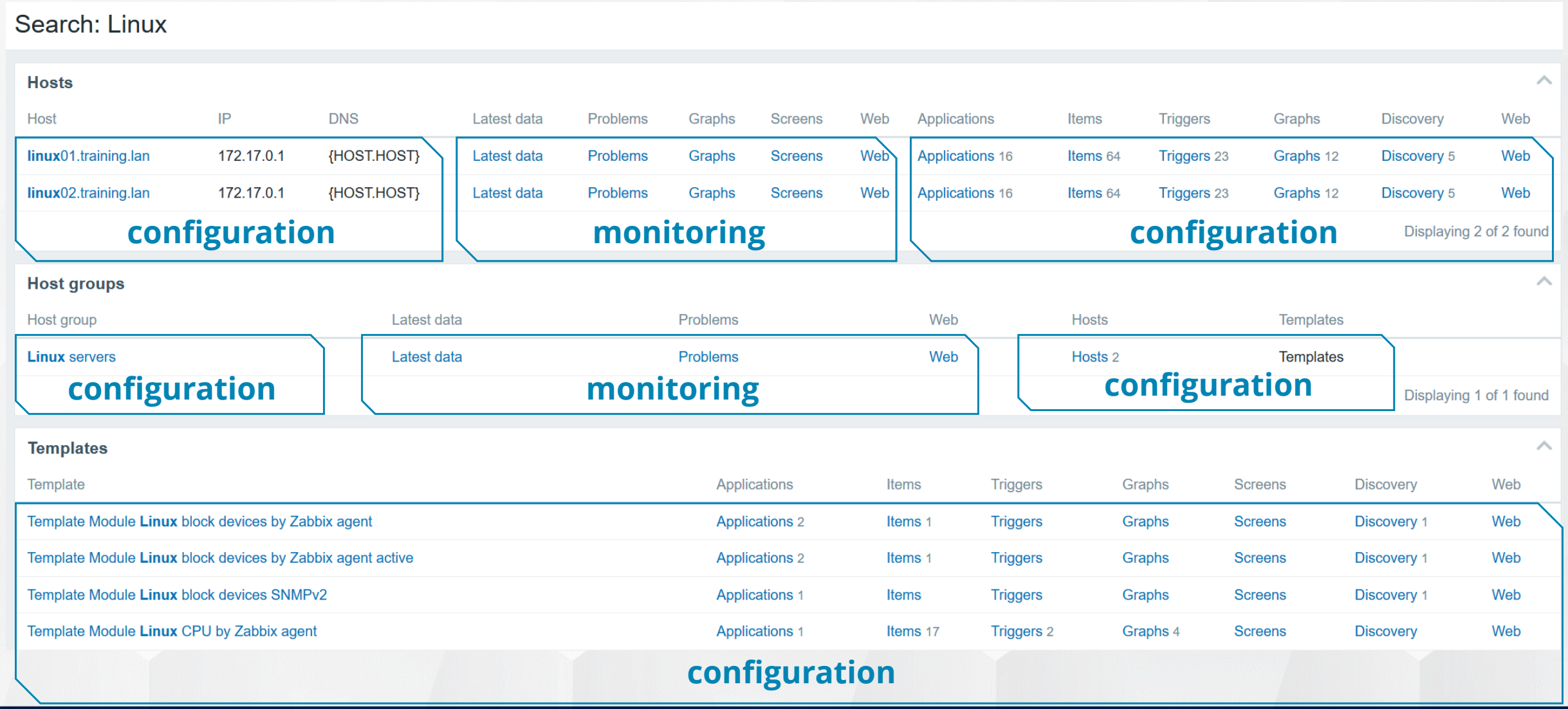
Templates

Templates

Template	Applications	Items	Triggers	Graphs	Screens	Discovery	Web
Template Module Linux block devices by Zabbix agent	Applications 2	Items 1	Triggers	Graphs	Screens	Discovery 1	Web
Template Module Linux block devices by Zabbix agent active	Applications 2	Items 1	Triggers	Graphs	Screens	Discovery 1	Web
Template Module Linux block devices SNMPv2	Applications 1	Items	Triggers	Graphs	Screens	Discovery 1	Web
Template Module Linux CPU by Zabbix agent	Applications 1	Items 17	Triggers 2	Graphs 4	Screens	Discovery	Web

INTERFACE - GLOBAL SEARCH

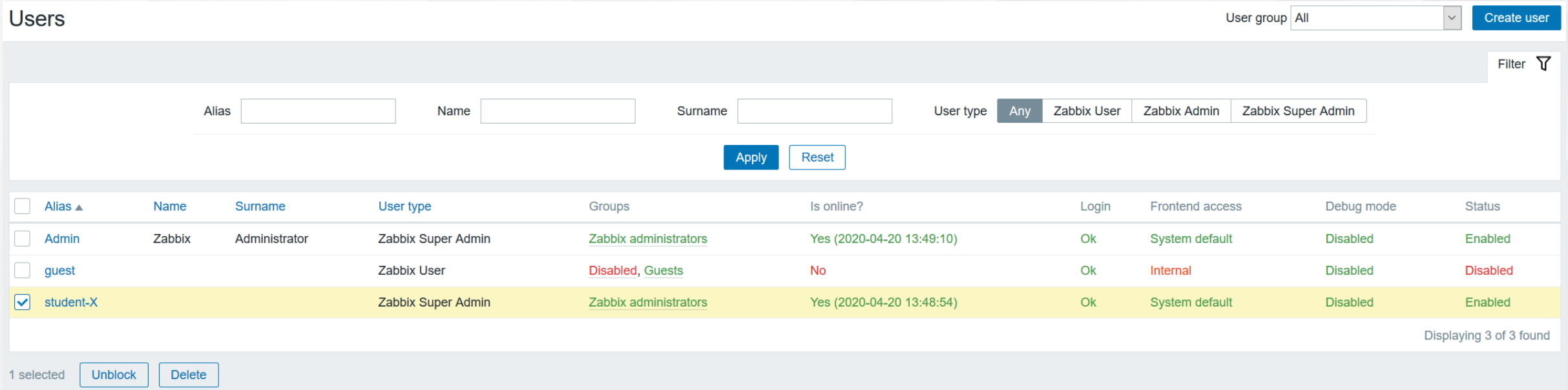
- Each entry provides links to monitoring and configuration data
- A simple way to open items configuration or list of problems



How to create a new user

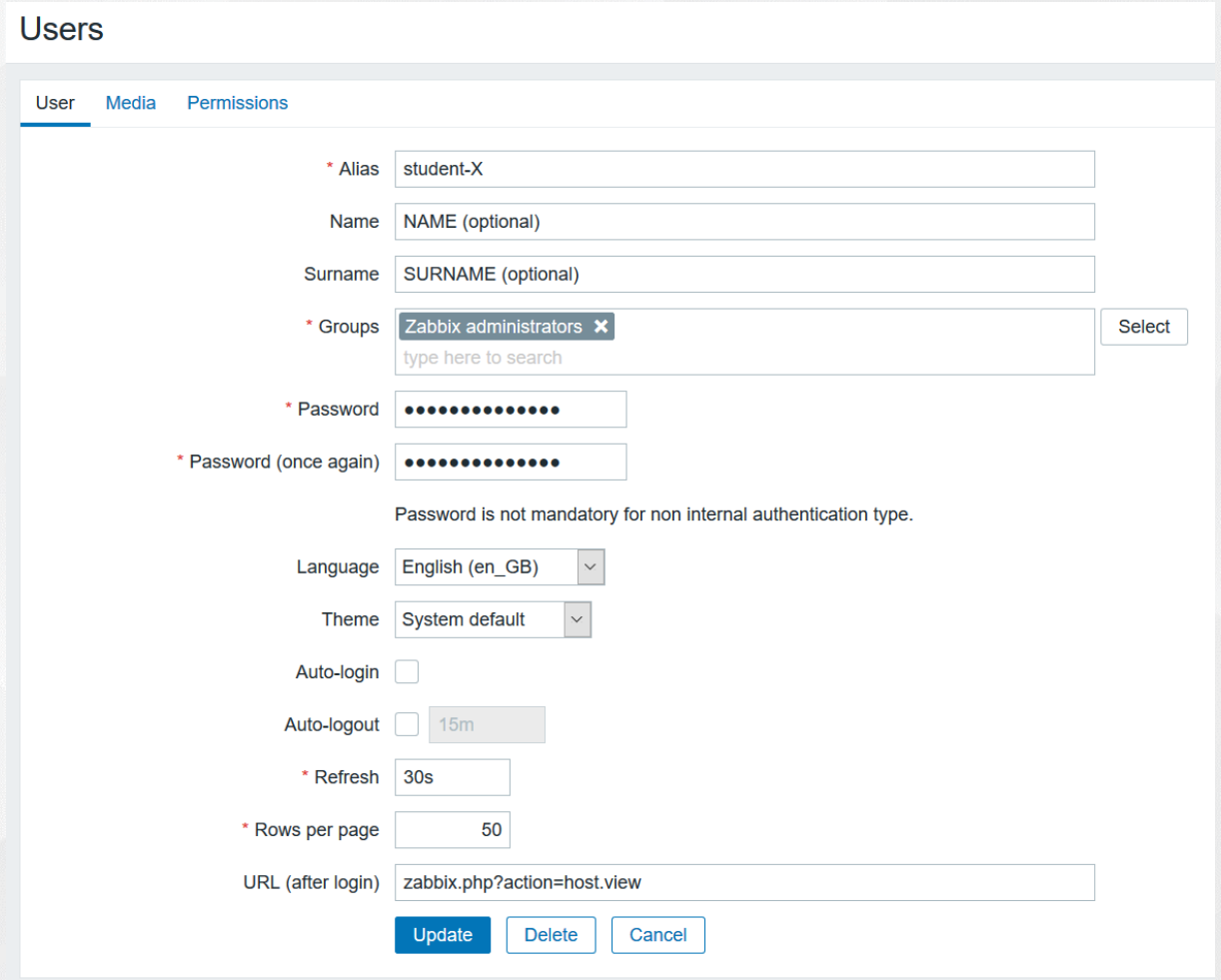
Administration > Users

- Shows a list of existing users
- Filter section to find specific ones
- Single or multiple user: [Block]/[Unblock], [Delete]
- To add a new user: Press the [Create user] button in the upper right corner



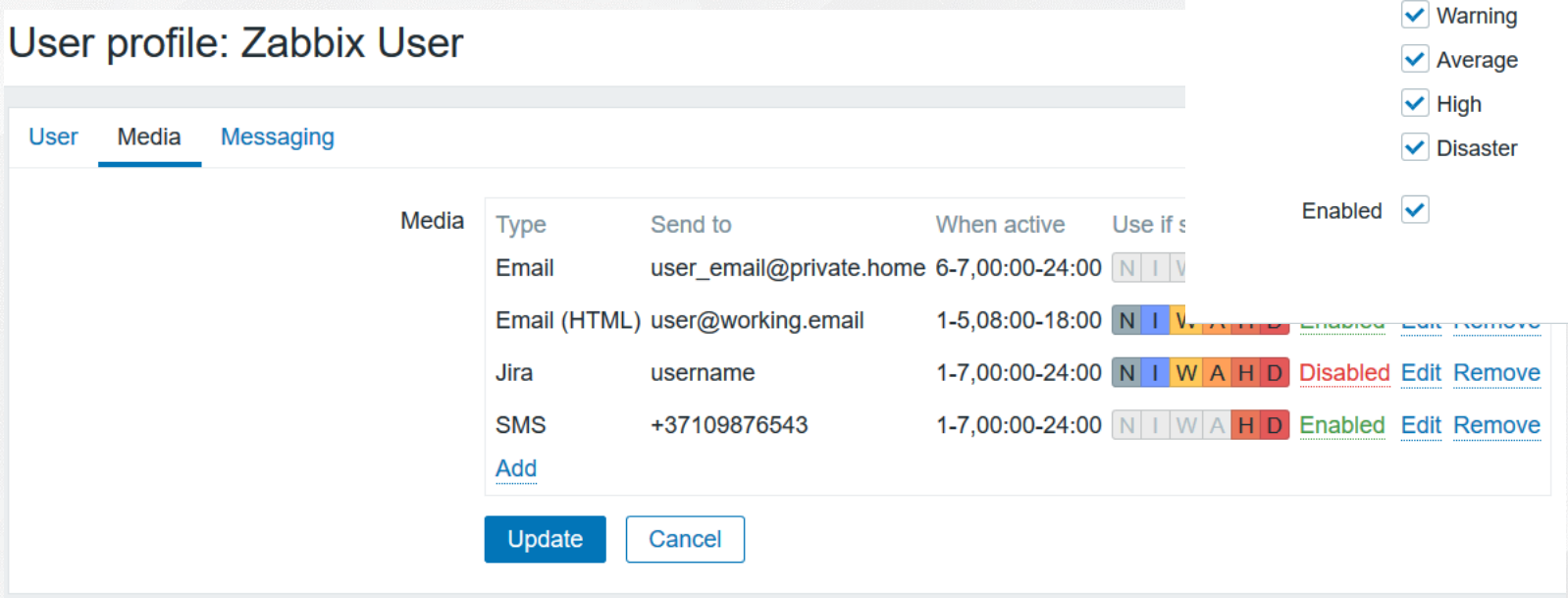
Fields in the user settings:

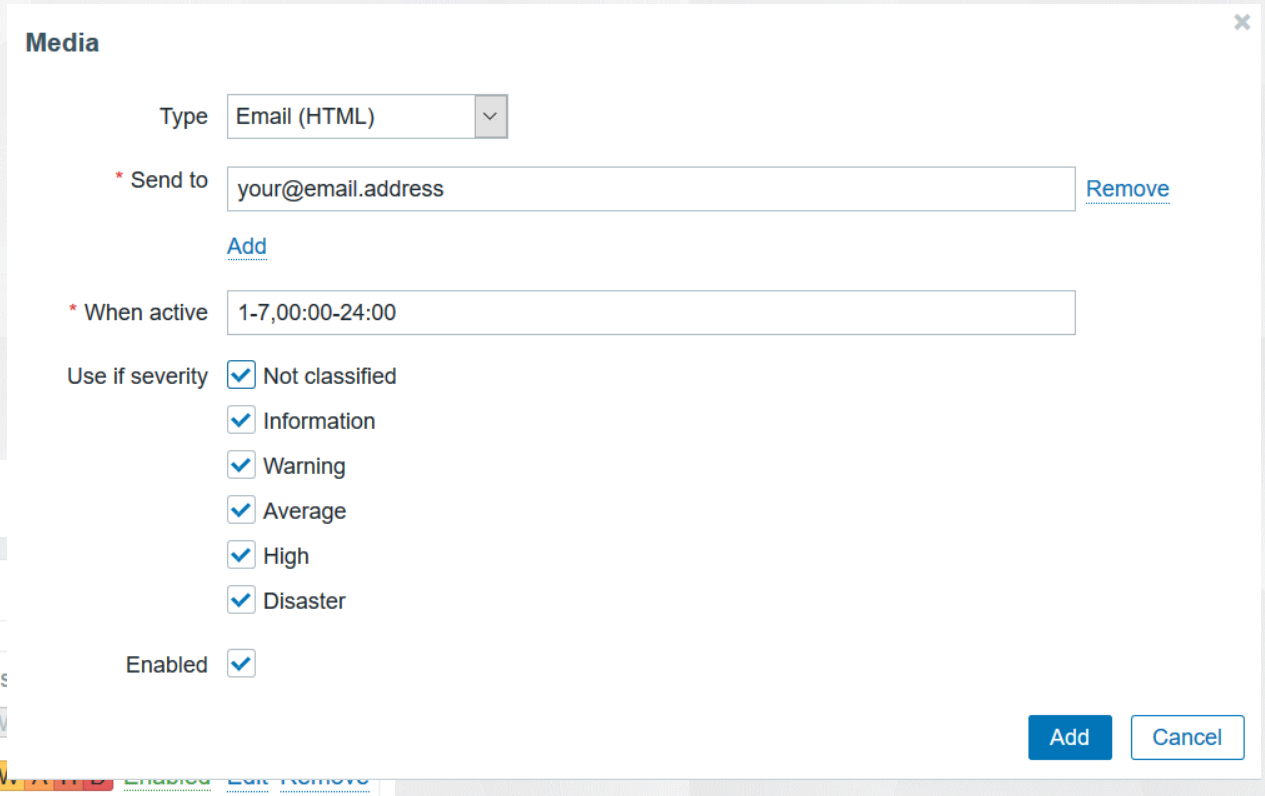
- Alias will be used for login
- Name, Surname
- Groups
- Password
- Language
- Theme
- Auto login/logout
- Refresh rate of some pages
- How many rows to display
- URL - redirection after login



User media settings:

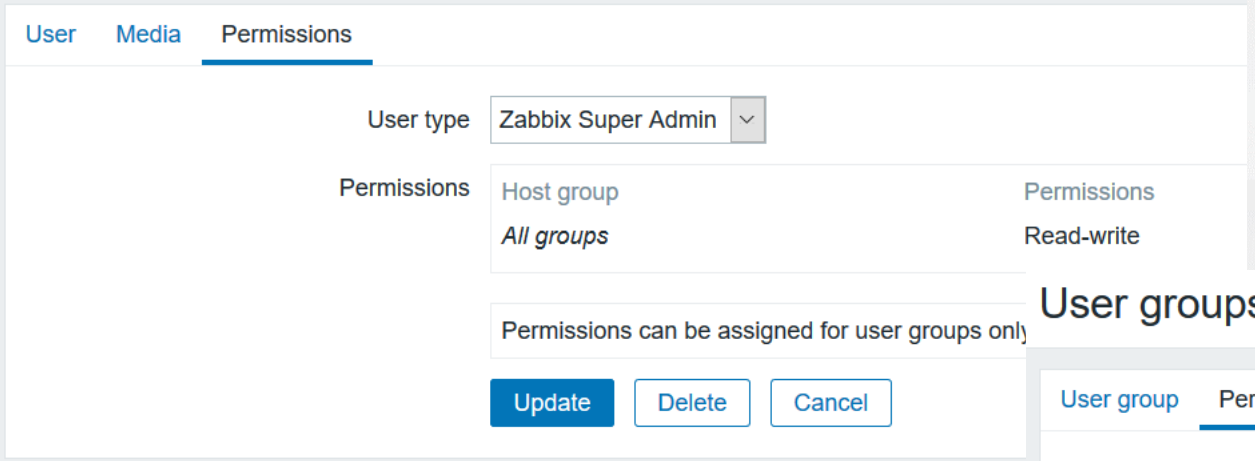
- Usually e-mail, phone number or other identifier
- Active based on time period
- Active based on severity
- One or more user media
- Not visible for Zabbix User

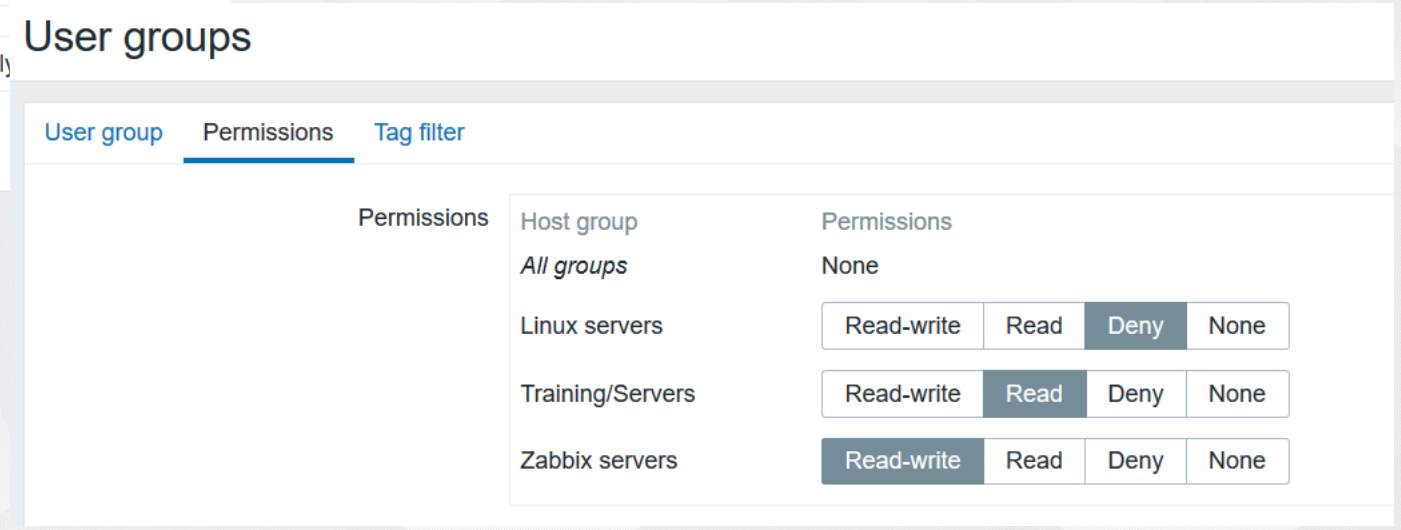




Pick User type:

- Zabbix Super Admin: No limitations
- Zabbix User and Admin: Permissions are based on Host groups and Tags

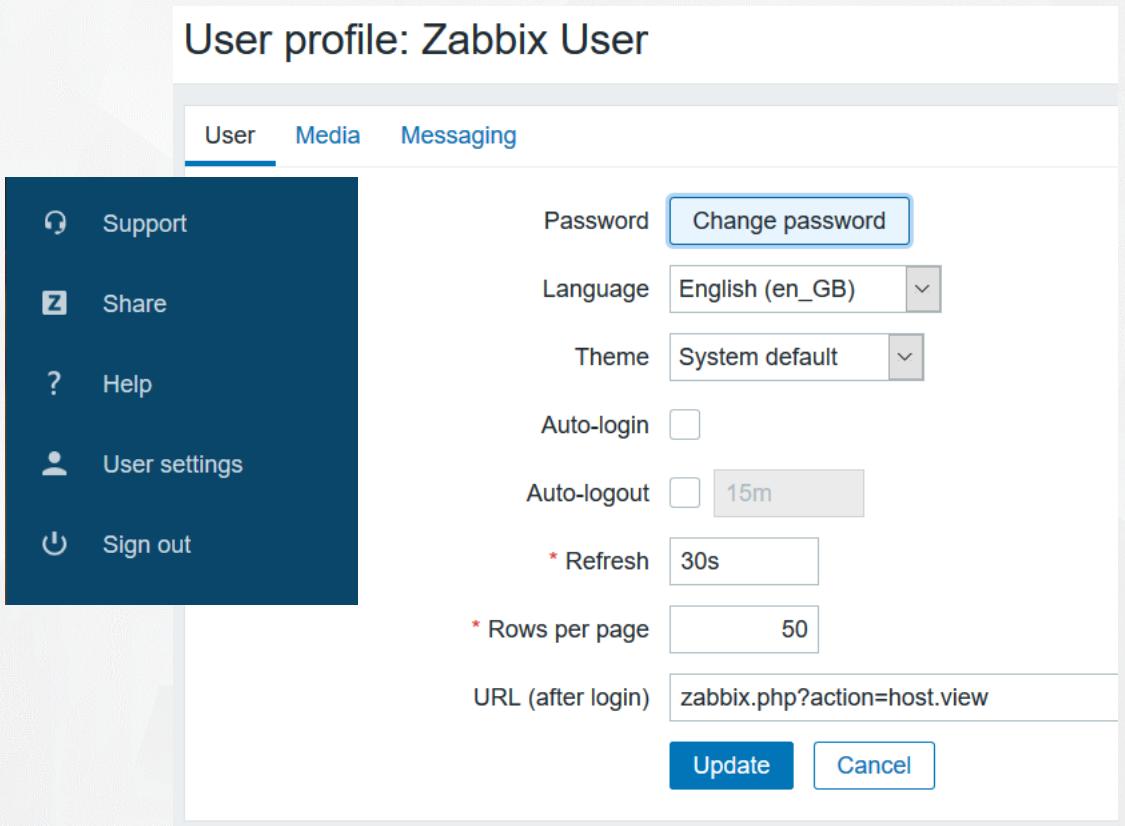




Permissions will be reviewed later! For now we will use only Super Admin

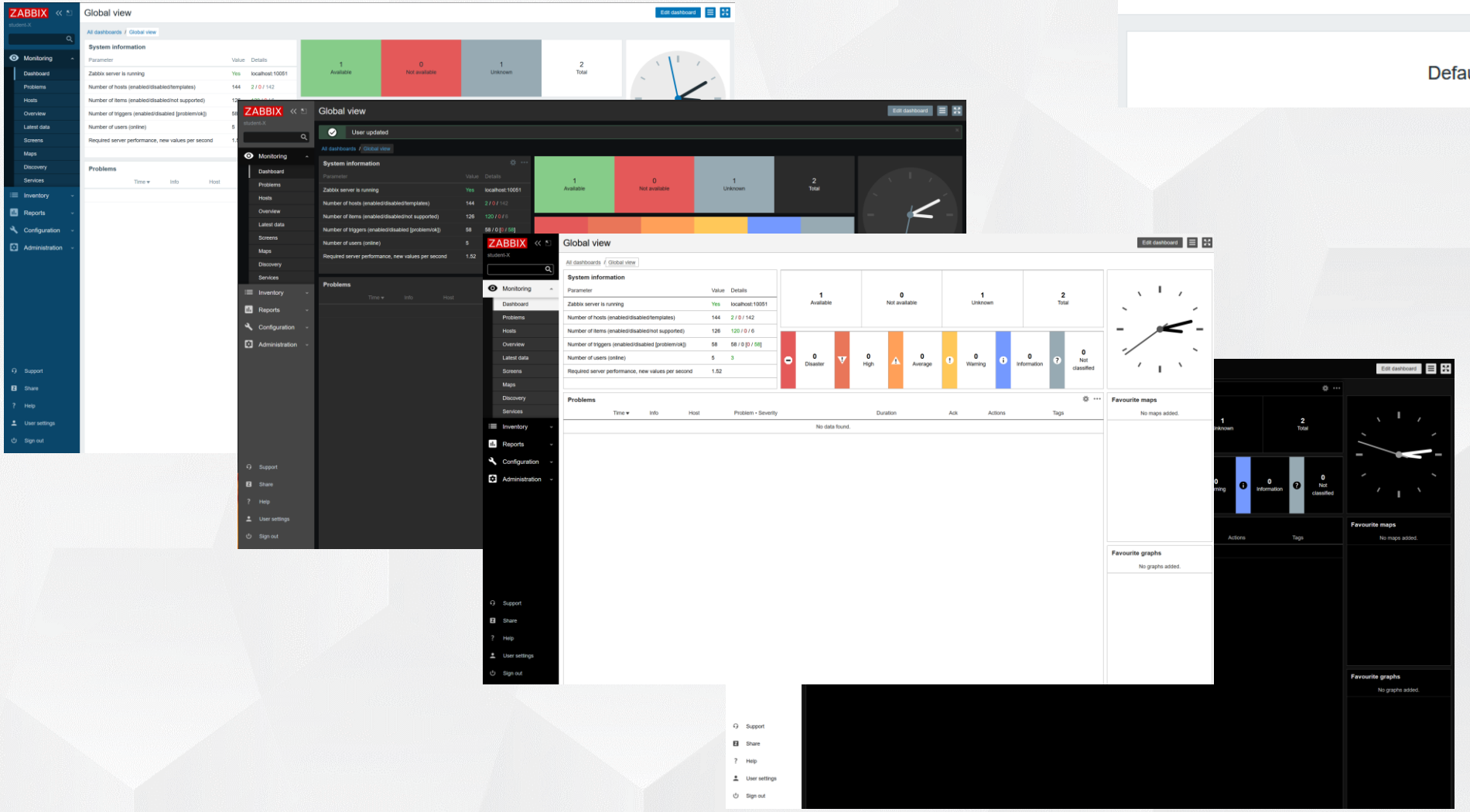
User profile

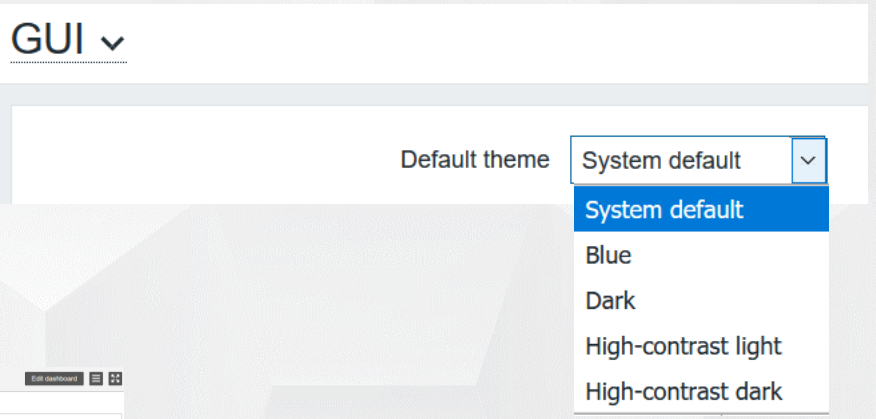
INTERFACE - USER PROFILE



- Password
- Select the interface language
- Select a color theme
- Auto login/logout
- Refresh interval for Monitoring menu
- Rows per page in the lists
- Specific URL after login (instead of Monitoring > Dashboard)
- For Zabbix internal links use relative paths

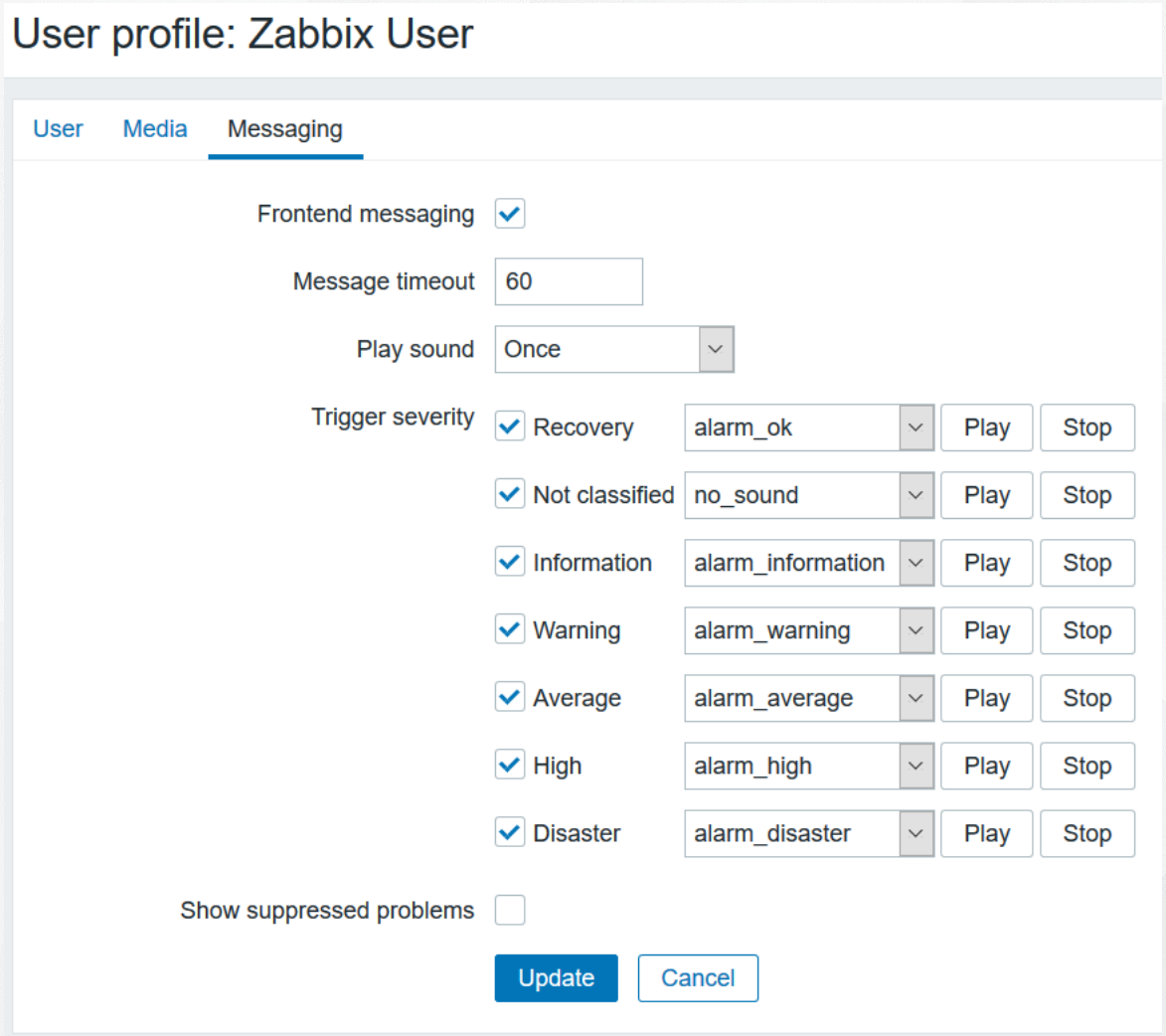
The system default theme can be set in the Administration > GUI section

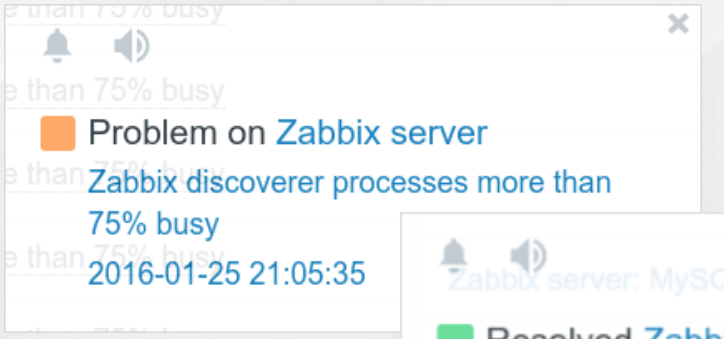




Show desktop popup for events

- Per user (can't be set by admin)
- Timeout
- Play sound once/10 sec/forever
- Different sounds depending on severity
- Snooze/mute
- Show suppressed problems





PRACTICAL SETUP

1. Create a new user group: Training
2. Create a new Zabbix user
   - Alias: use your training virtual machine hostname (student-XX)
   - Create a secure password
   - Other fields are optional
3. Add to the "Training" user group
4. User type: Zabbix Super Admin
5. Log out and log in with your newly created user
6. Change password for user "Admin" to "P455w0RD"

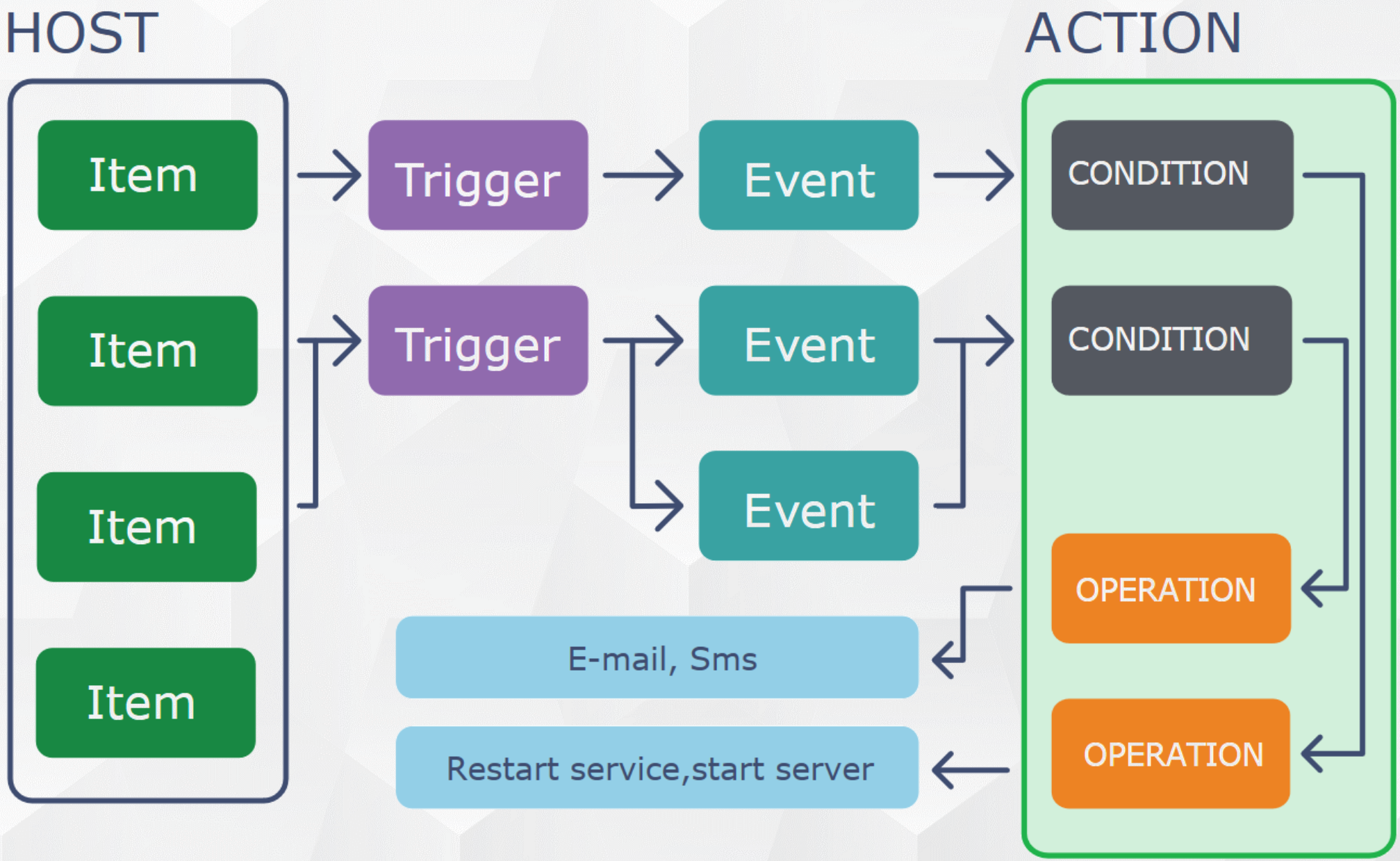
In all the following labs replace XX in names with your student number

Definitions

ZABBIX - DEFINITIONS

Definition	Description
Host	Any device, system or application that you want to monitor
Host Group	Logical grouping of hosts or templates
Item	Source of information / metric
Application	Logical grouping of items
Trigger	Expression representing problem condition
Template	Set of entities (items, triggers, etc.) ready to be applied to one or several hosts
Event	Element state change
Tag	Pre-defined marker for an event
Action	Set of operations based on events filtered by conditions
Operation	Execution of a command (notification, remote command, configuration change)

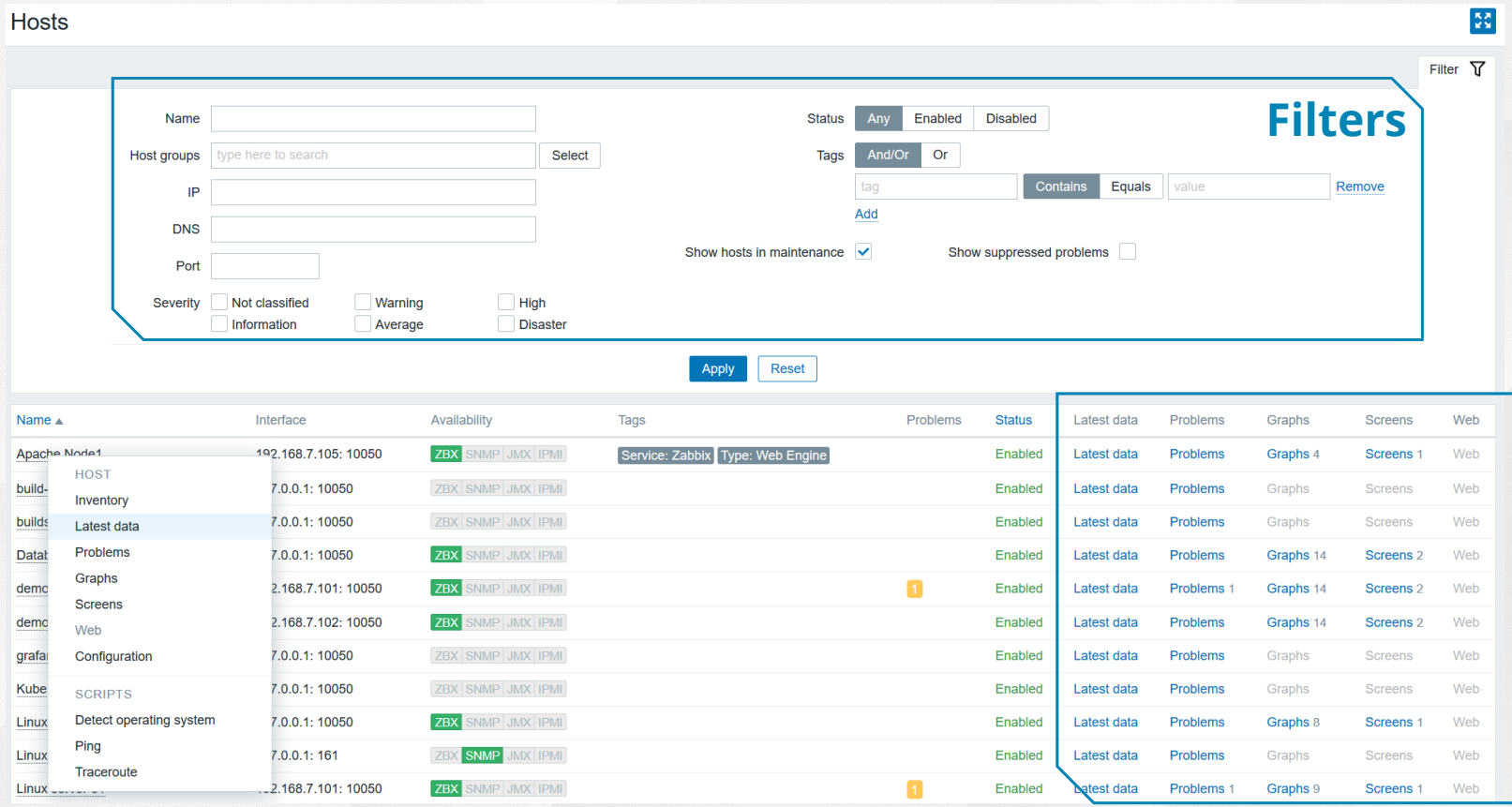
https://www.zabbix.com/documentation/5.0/manual/definitions



Monitoring > Hosts

Monitoring > Hosts

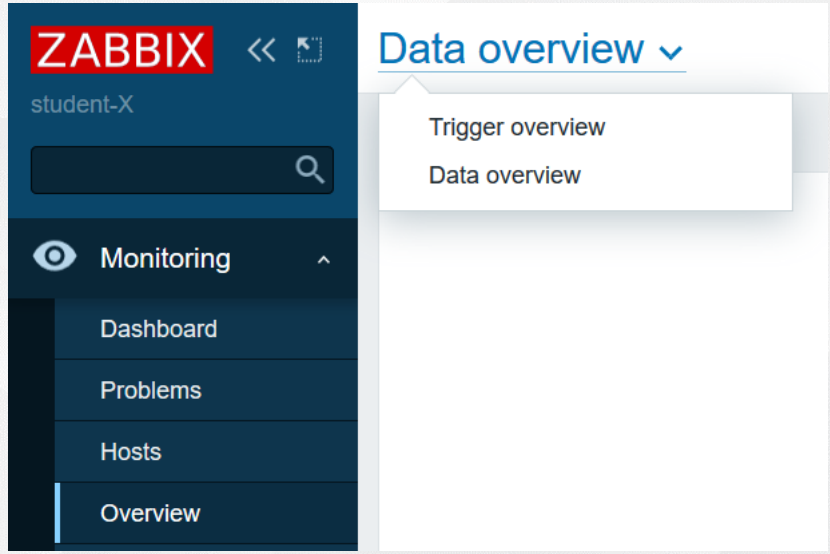
- Section provides an easy way to see the status
- Navigate to configuration, latest data, problems and other sections
- See tags and number of problems for specific hosts



Monitoring > Overview

Monitoring > Overview > Data

- Performance data for a group of servers
- Displays problems
- Quick navigation to Graphs and Plain text data



Hosts

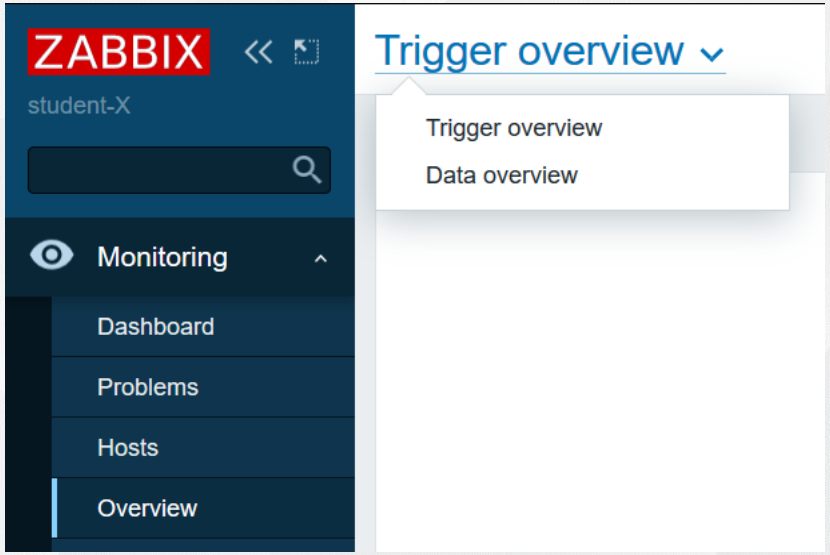
Items

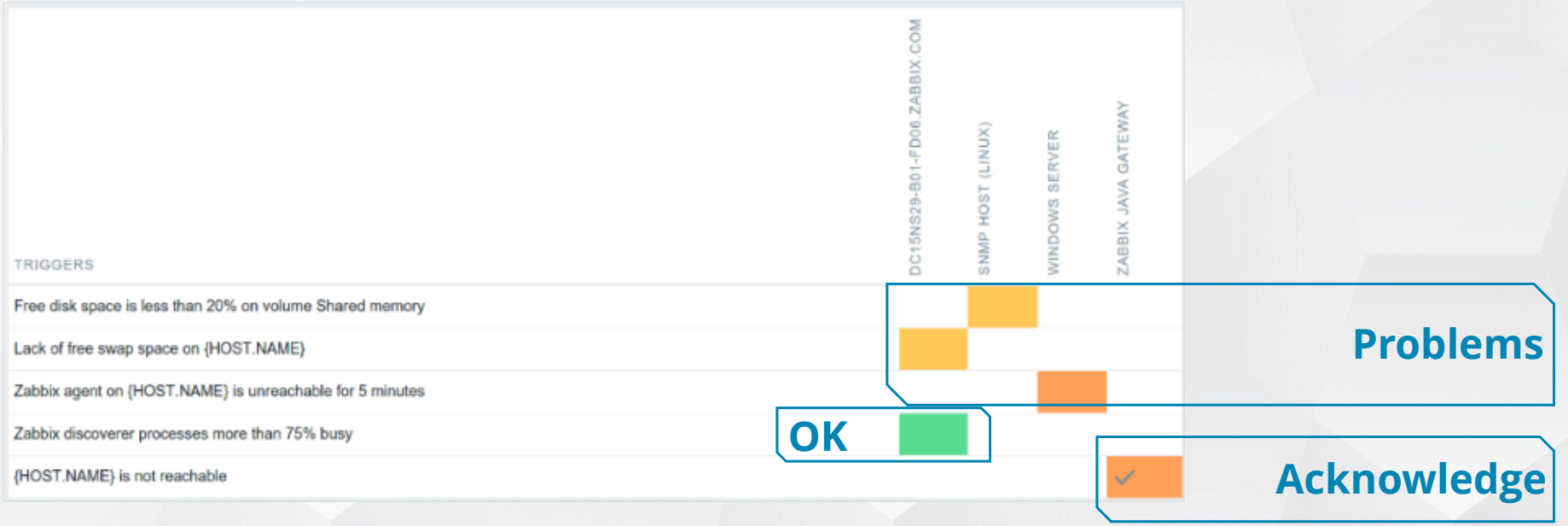
Values

ITEMS	OPENSUSE_13.1_TF	WINDOWS SERVER
Average number of bytes read from the disk Hard disk 1	0 Bps	0 Bps
Average number of bytes written to the disk Hard disk 1	0 Bps	0 Bps
Average number of reads from the disk Hard disk 1	0	0
Average number of writes to the disk Hard disk 1	0	0
Ballooned memory	0 B	0 B
Cluster name		
Committed storage space	4.55 GB	4.9 GB
Compressed memory	0 B	0 B
CPU ready	11 %	15 %

Monitoring > Overview > Triggers

- Status of a group of servers
- Different colours for different trigger severities
- Blinking on a change
- Quick navigation to Events and Graphs

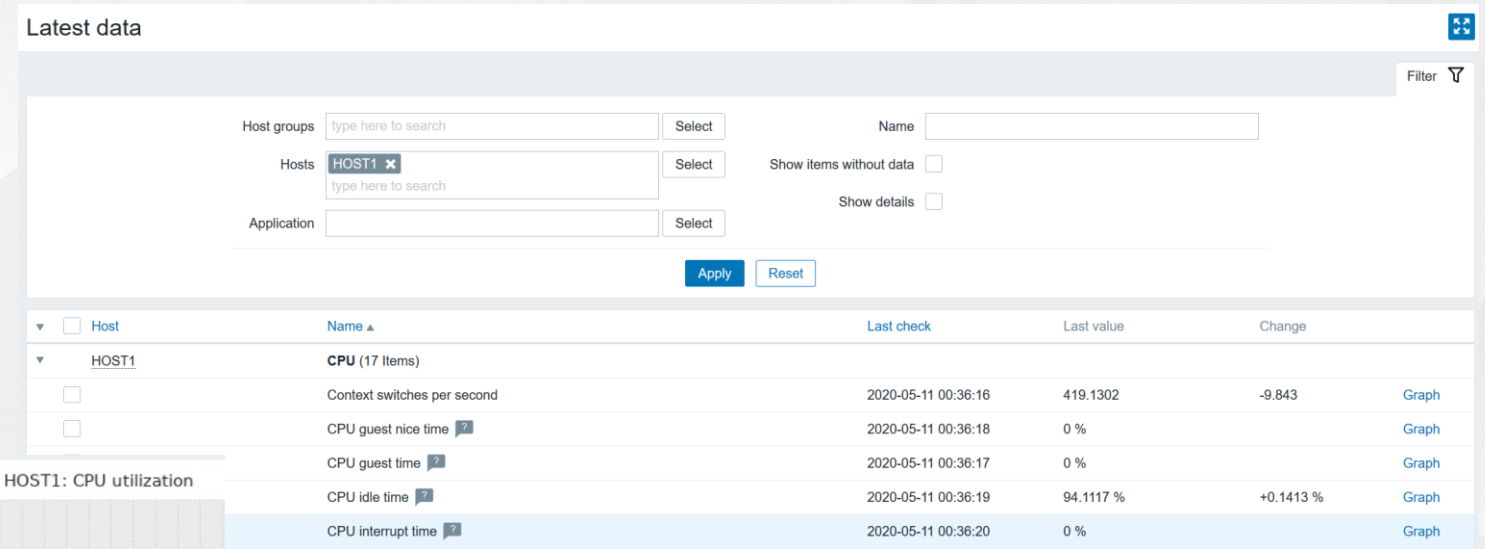


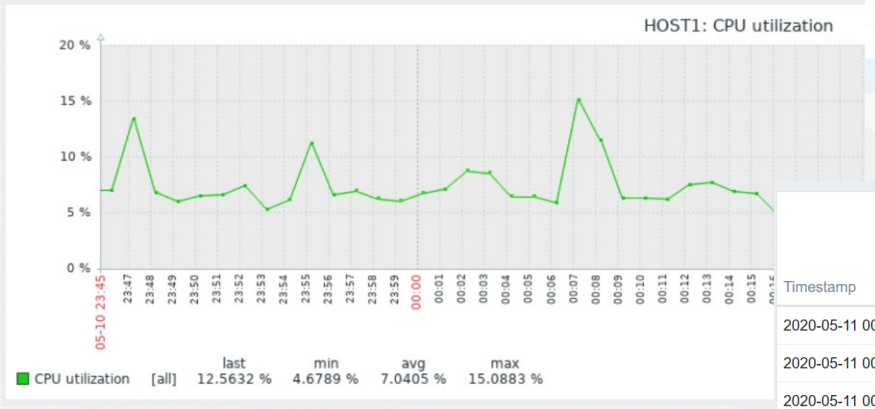


Monitoring > Latest data

Monitoring > Latest data

- Performance data for a selected server/group
- Simple graphs
- Plain text information
- Configuration details

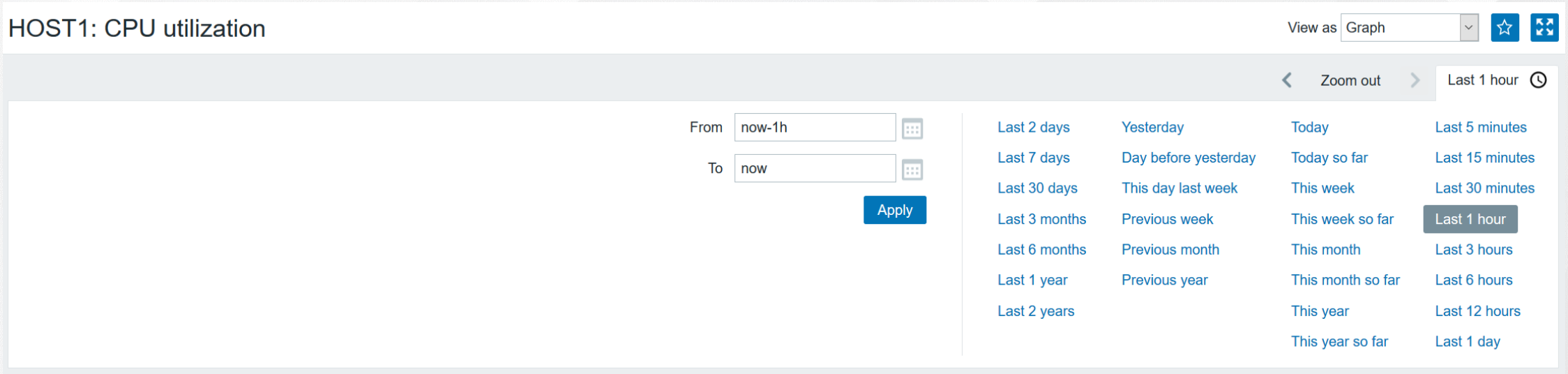




Timestamp	CPU utilization
2020-05-11 00:49:19	6.7686
2020-05-11 00:48:19	6.2112
2020-05-11 00:47:19	13.0523
2020-05-11 00:46:19	7.8293
2020-05-11 00:45:19	12.5632
2020-05-11 00:44:19	12.1528
2020-05-11 00:43:19	6.6711

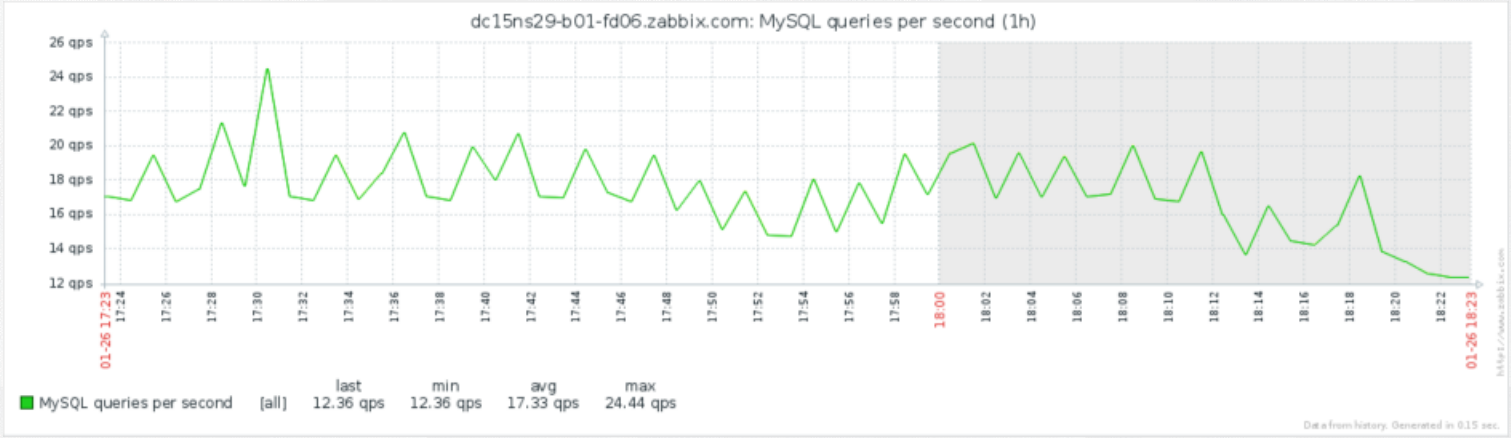
Time selector

- There is a time period selector in the upper right corner
- It allows to select the required period with a mouse click
- This allows to show values for a specific time period

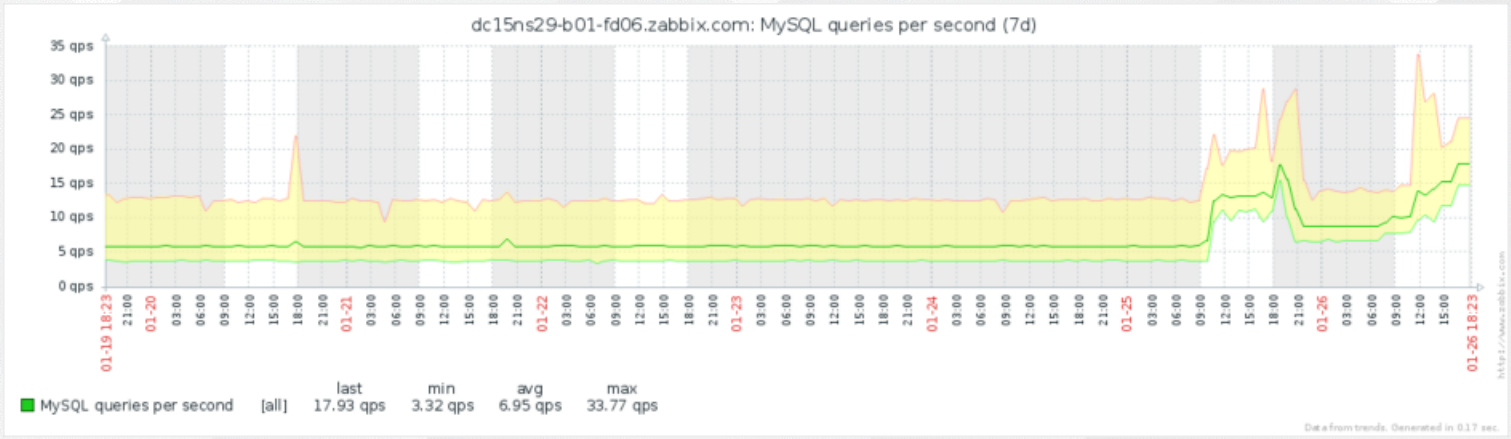


With [Zoom out] and arrows, users can shift or expand the graph time frame

History (raw data)



Trends (min, avg, max)



AD-HOC GRAPHS FOR SEVERAL ITEMS

Latest data

Filter

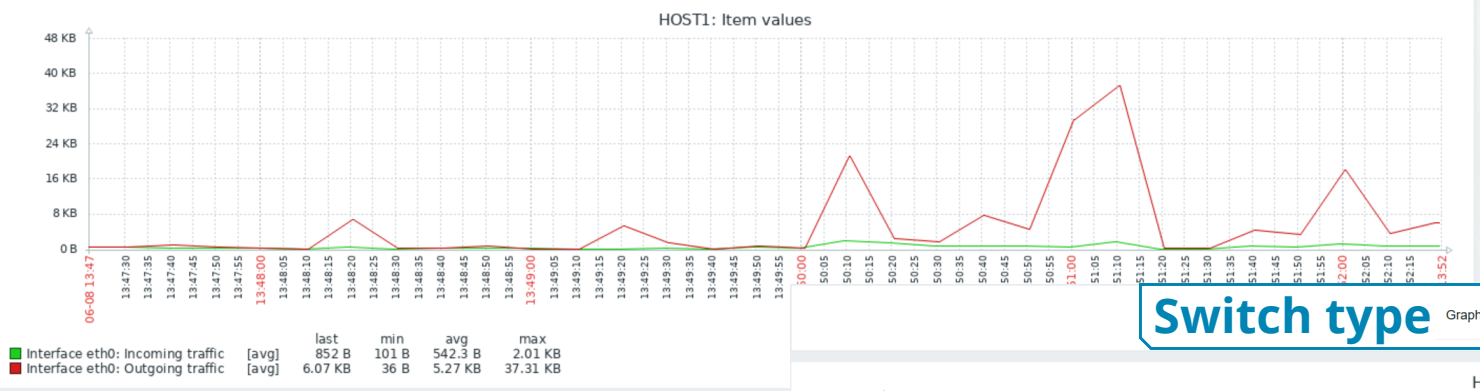
Select multiple items

Host	Name ▲	Last check	Last value	Change	
HOST1	**Interface eth0** (2 Items)				
☑	Interface eth0: Bits received	2020-05-11 00:59:33	12.55 Kbps	+824 bps	Graph
☑	Interface eth0: Bits sent	2020-05-11 00:59:36	26.38 Kbps	+3.86 Kbps	Graph

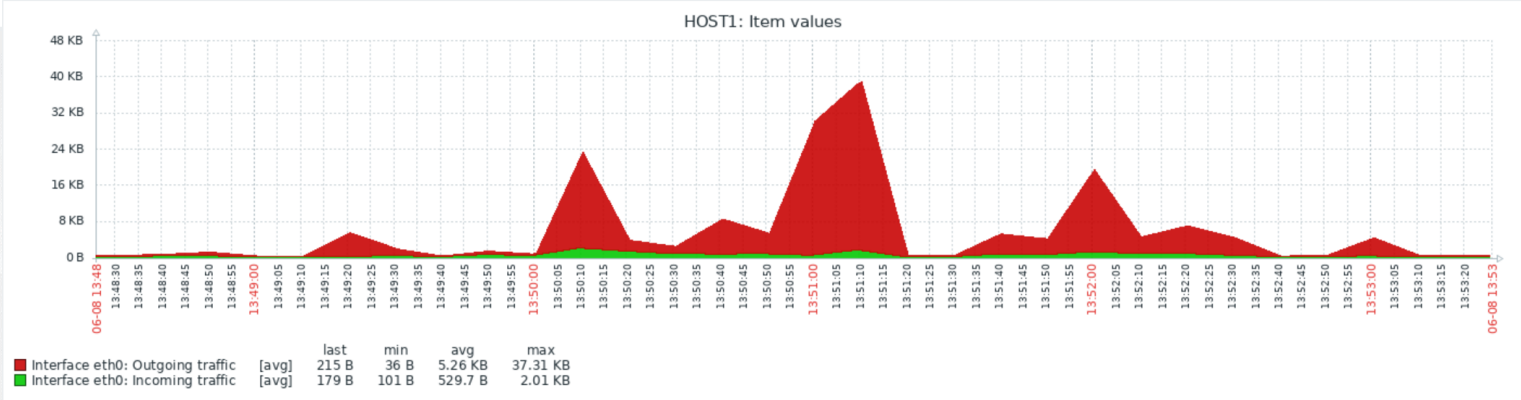
Displaying 2 of 2 found

Choose type

2 selected | Display stacked graph | Display graph



Switch type Graph type: Normal | Stacked



Group of items

- One application, many items
- One item, many applications

Applications and items

Collapse and expand items

Host	Name ▲	Last check	Last value	Change	
HOST1	**CPU** (17 Items)				
HOST1	**Filesystem /** (4 Items)				
	/: Free inodes in %	2020-05-11 13:42:39	99.3087 %	-0.000016 %	Graph
	/: Space utilization	2020-05-11 13:42:40	22.6389 %	+0.002443 %	Graph
	/: Total space	2020-05-11 13:42:41	24.99 GB		Graph
	/: Used space	2020-05-11 13:42:42	5.66 GB	+640 KB	Graph
HOST1	**General** (9 Items)				
HOST1	**Interface eth0** (8 Items)				
HOST1	**Inventory** (3 Items)				
HOST1	**Memory** (5 Items)				
HOST1	**Monitoring agent** (1 Item)				
HOST1	**Security** (1 Item)				
HOST1	**Status** (1 Item)				
HOST1	**Zabbix raw items** (1 Item)				

1 2 ▸ Displaying 1 to 50 of 78 found

Host groups

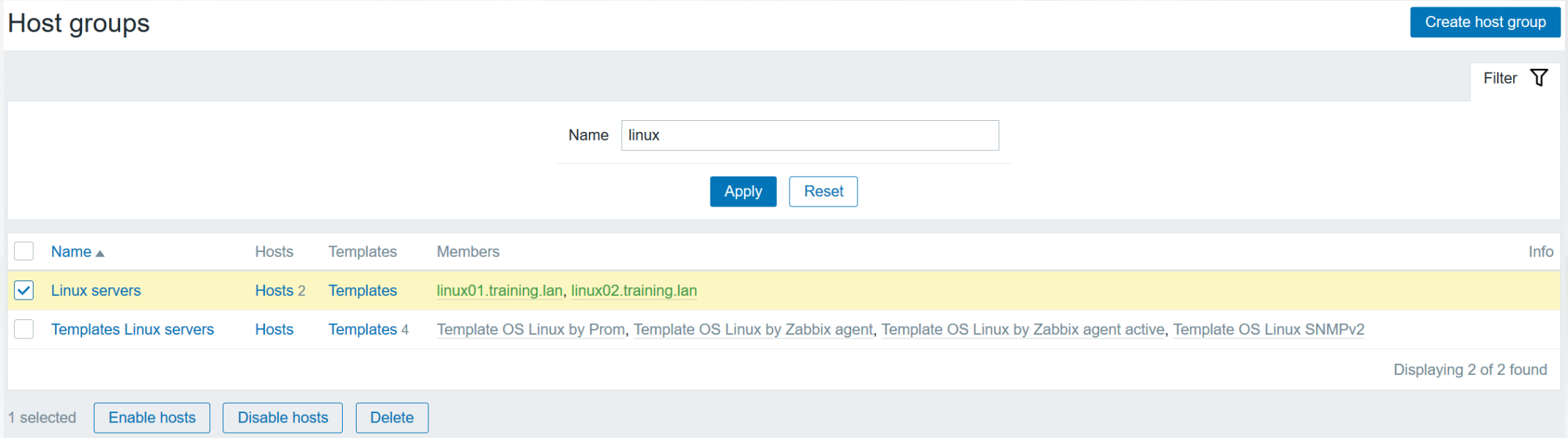
Host groups

- Are used for logical grouping of hosts and/or templates
- Permissions are assigned using host groups only
- Can be used in filters based on a group name
- Nested representation of host groups is accomplished by using the '/' forward slash to create multi-level grouping

Examples:

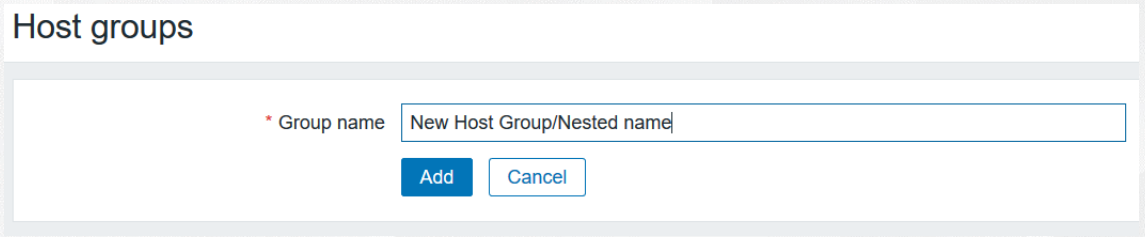
Applications	Location	Templates
Network	Location/Africa	Templates/Official
Servers	Location/Europe	Templates/Services
Servers/Cloud	Location/Japan	Templates/Vendors
Servers/Windows	Location/North America	Templates/Vendors/HP

- A host group may contain multiple hosts
- A host can belong to any number of host groups
- Enable and Disable buttons will enable/disable all hosts belonging to the selected groups
- Delete button:
  - Will unassign hosts from this group and delete the host group
  - An operation will fail if this is the only group for some hosts



Configuration > Host groups > [Create host group]

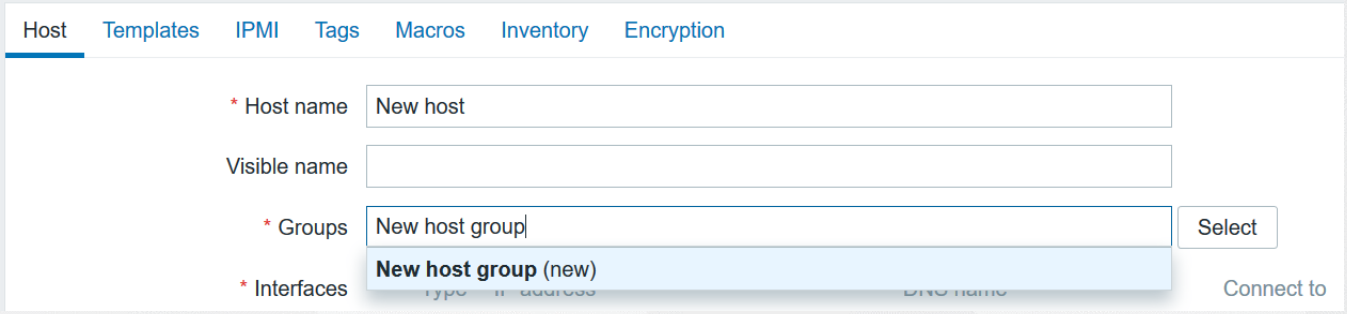
- Type a unique name and press [Add]



Alternatively, the same can be done from the Host configuration form

Configuration > Hosts > [Create host]

- Type a unique name like "New host group" and click on "New host group (new)"

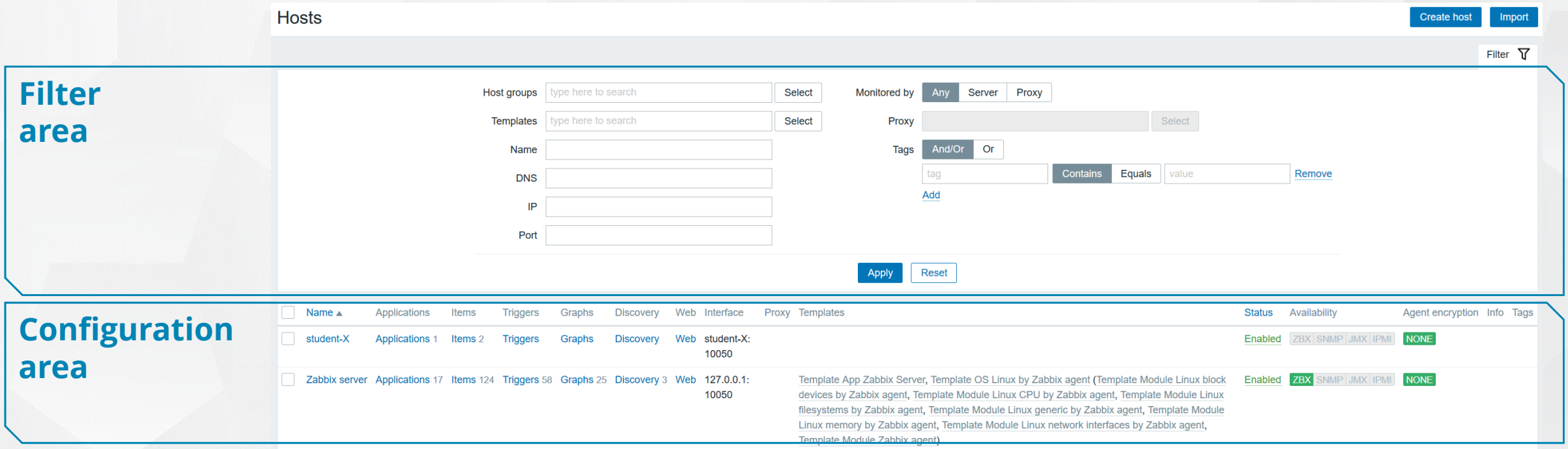


Hosts

The section where users can create and configure hosts

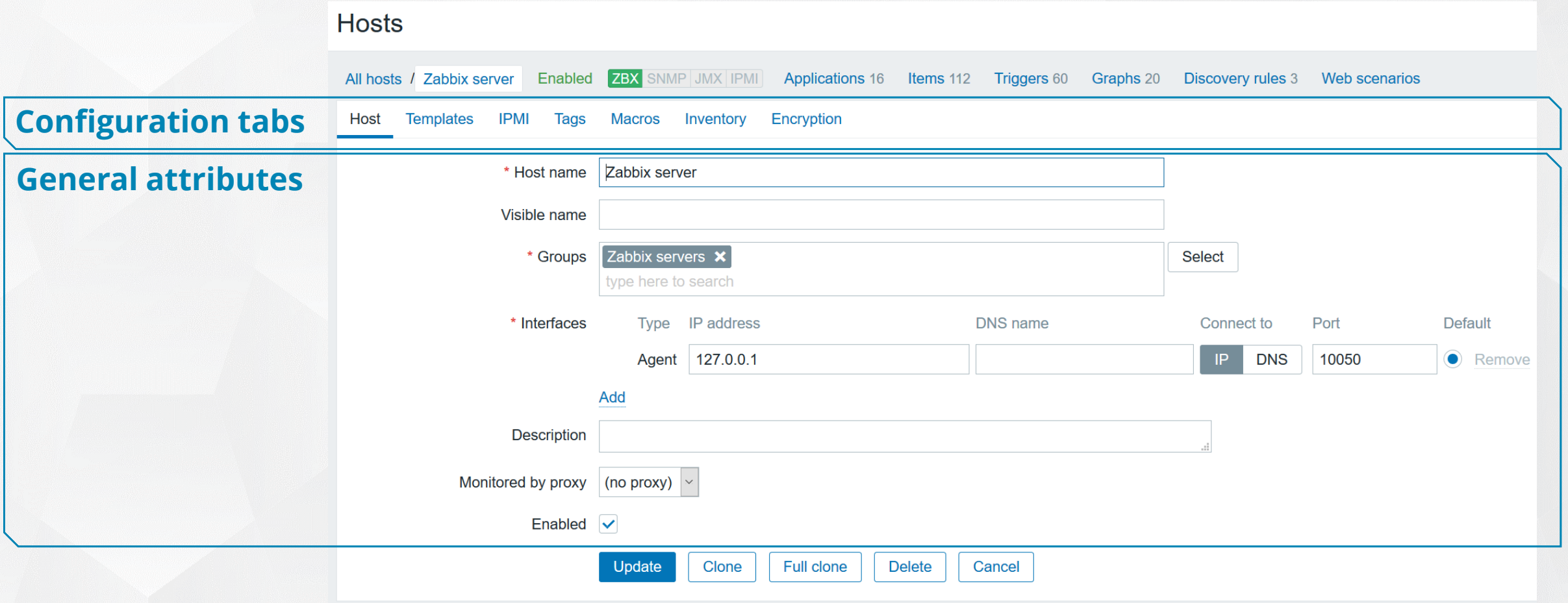
- Filter area allows to find specific hosts based on a host group, a host name, etc.
  - The filter can be displayed or hidden by clicking on the filter sign 

- Configuration area allows to change host properties
  - Clicking on a host name will open the host configuration form
  - Clicking on an entity name will open its configuration page



The Host tab contains general host attributes

All mandatory input fields are marked with a red asterisk.



Host name (must be defined)

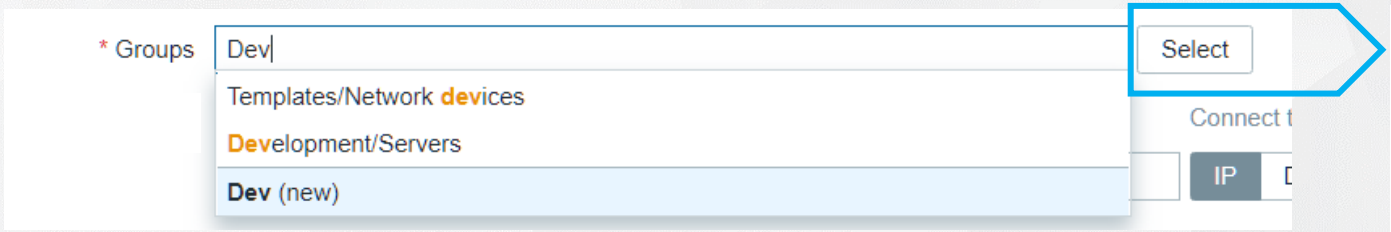
- Is case sensitive and must be unique
- This is the "technical" name of the host
- Alphanumeric characters, spaces, dots, dashes and underscores are allowed
- Leading and trailing spaces are not allowed

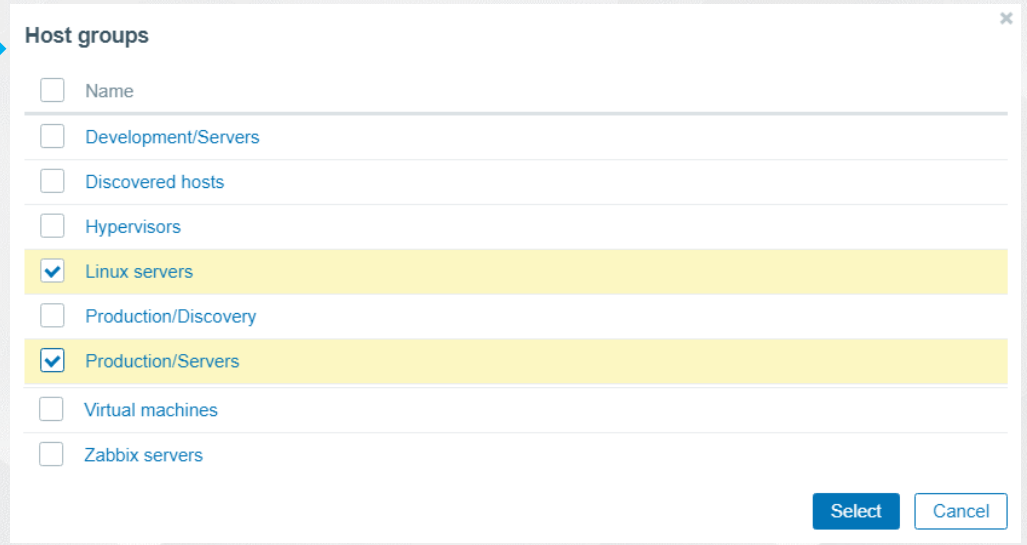
Visible name (optional)

- Can be empty – a "Host name" will be used instead
- If defined, it is also case sensitive and must be unique
- If a "Visible name" is set, it will be used in all frontend sections for visualisation
- Has UTF-8 support, local languages can be used

Host groups

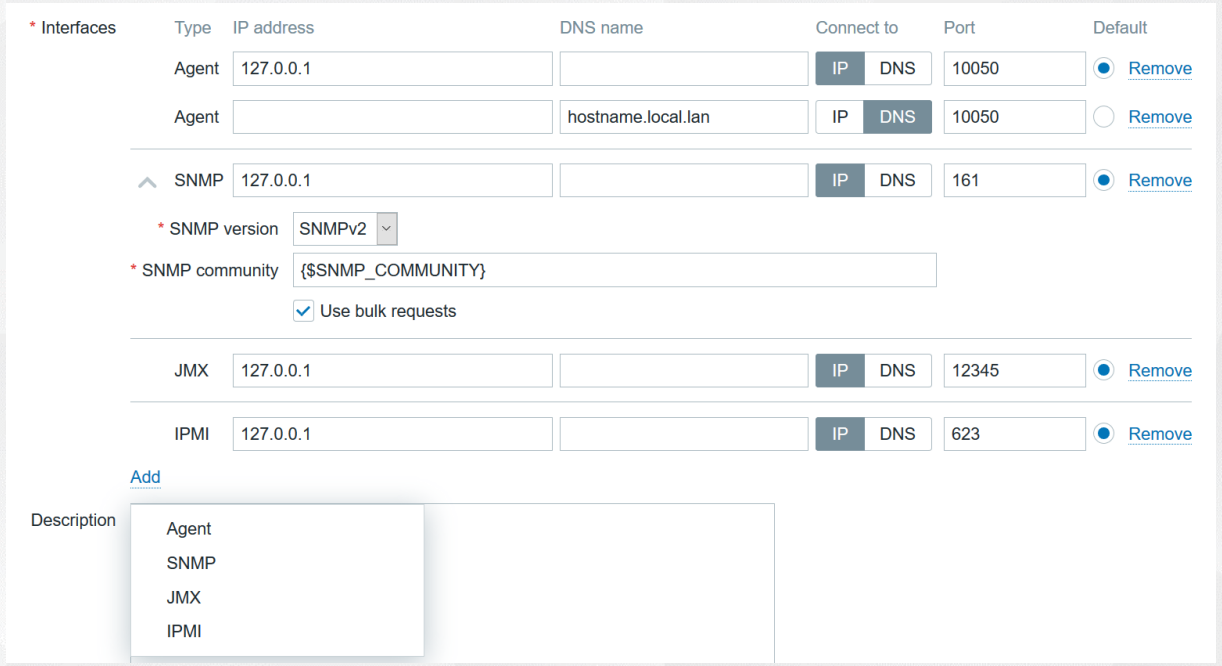
- A host must have at least one host group
- Select button allows to select one or more existing groups
- Groups input field can also be used to
  - Create and link the host to a new group - by typing a non-existing group name
  - Find and link the host to an existing group - by typing a part of the group name and selecting it





Host interfaces

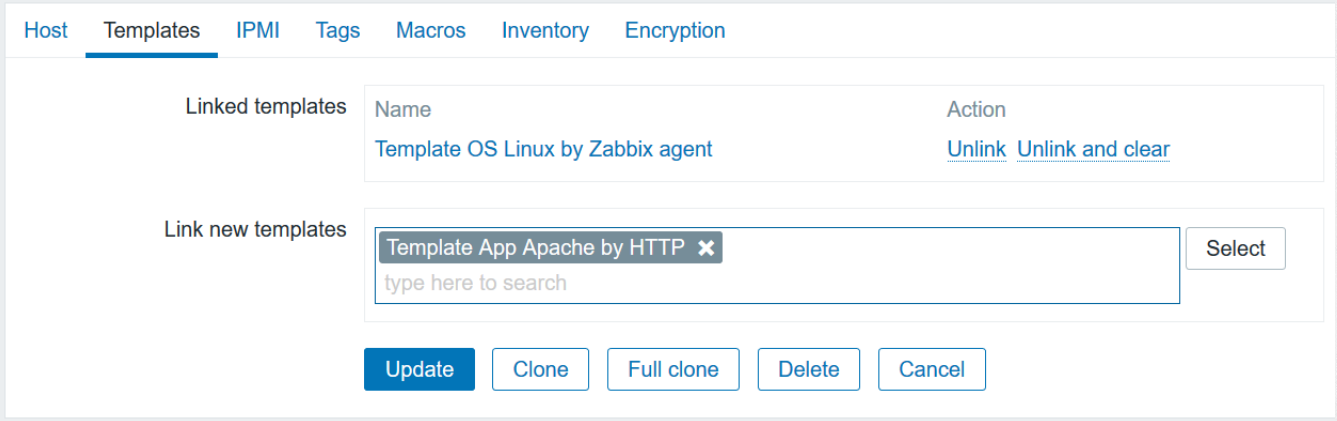
- Several host interface types are supported
  - Zabbix Agent
  - SNMP
  - JMX
  - IPMI
- Interface used for monitoring cannot be removed
- Use bulk requests option allows to enable/disable bulk data collection for SNMP



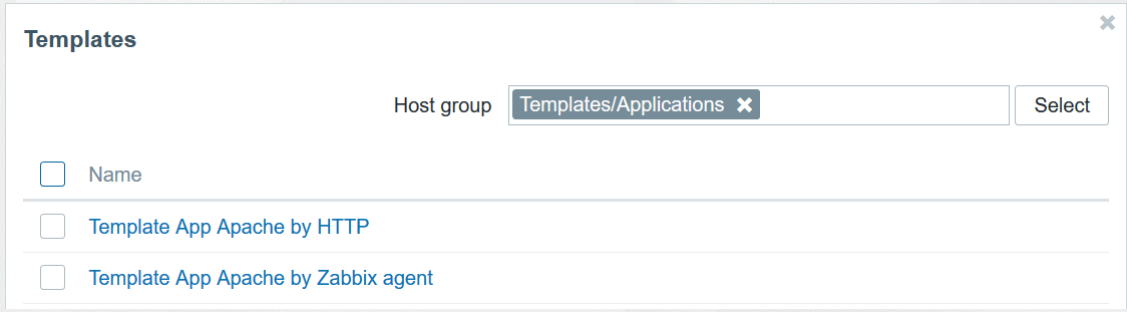
At least one interface must be defined for a host, even if it is not used

Templates

- In this section users can
  - See linked templates
  - Unlink
  - Unlink and clear

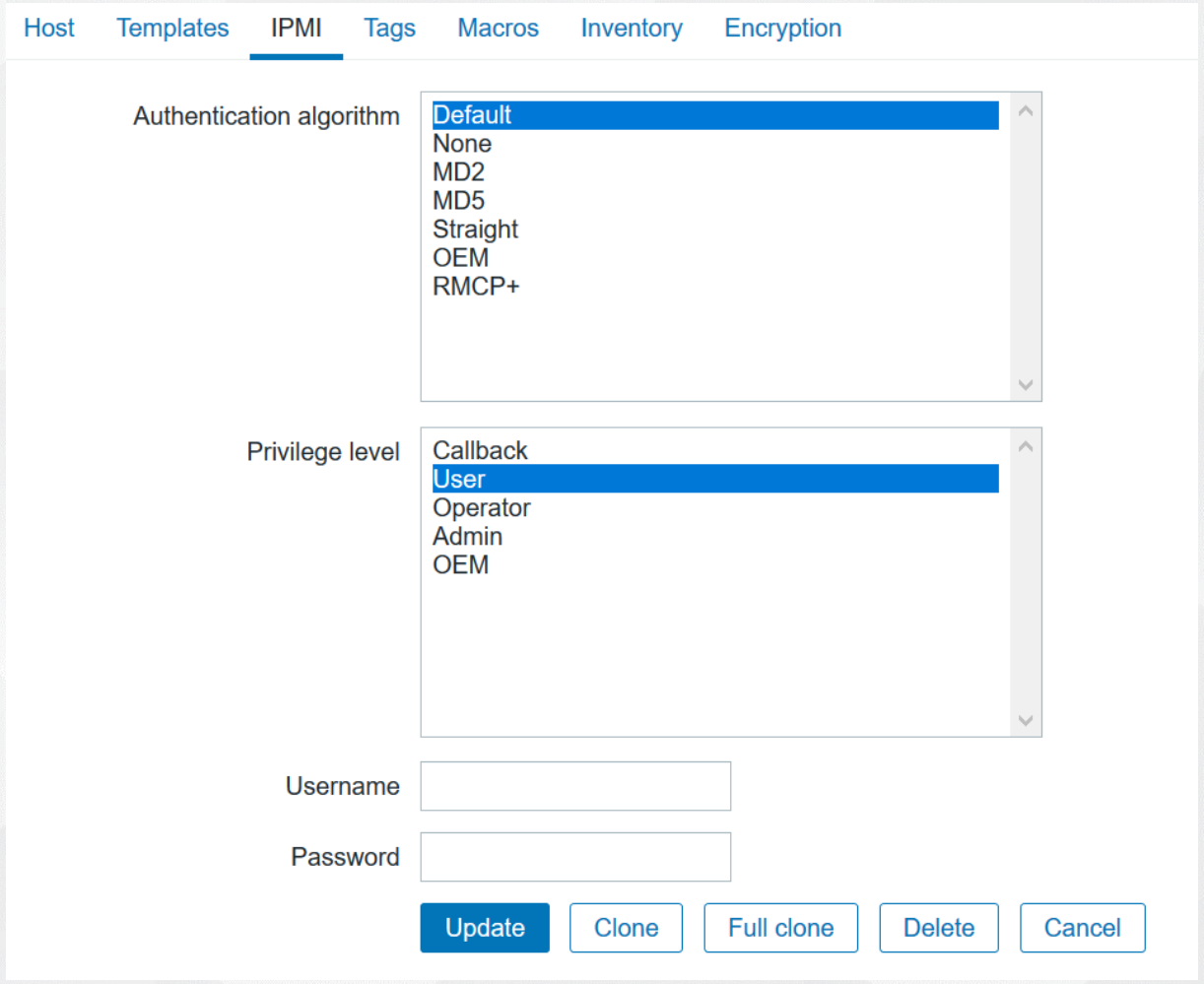


- Link existing templates
  - Auto lookup field
  - Select from list



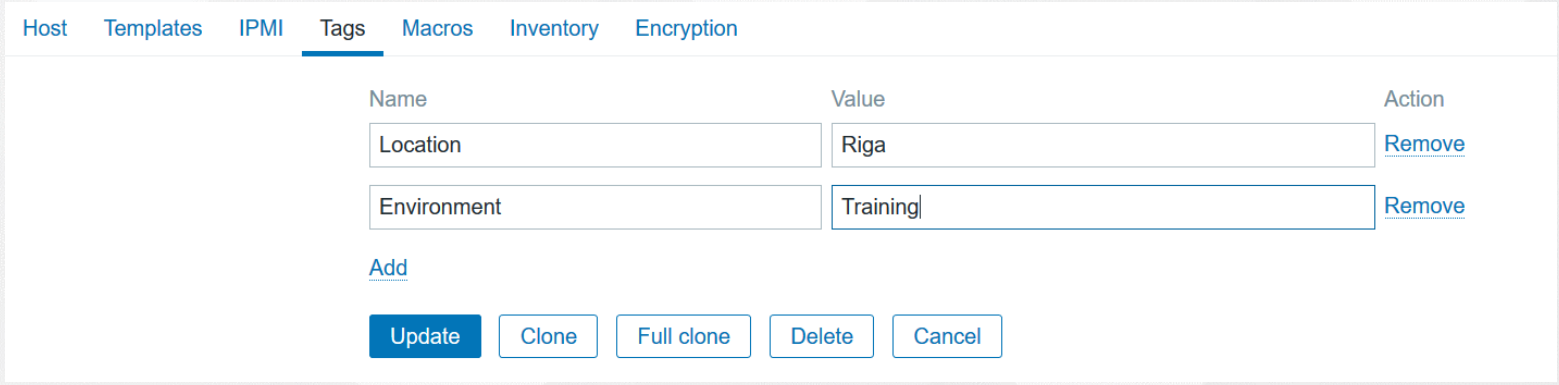
IPMI settings

- Needed if a host has an IPMI interface
- This section controls settings for
  - Authentication algorithms
  - Privilege level
  - Username
  - Password



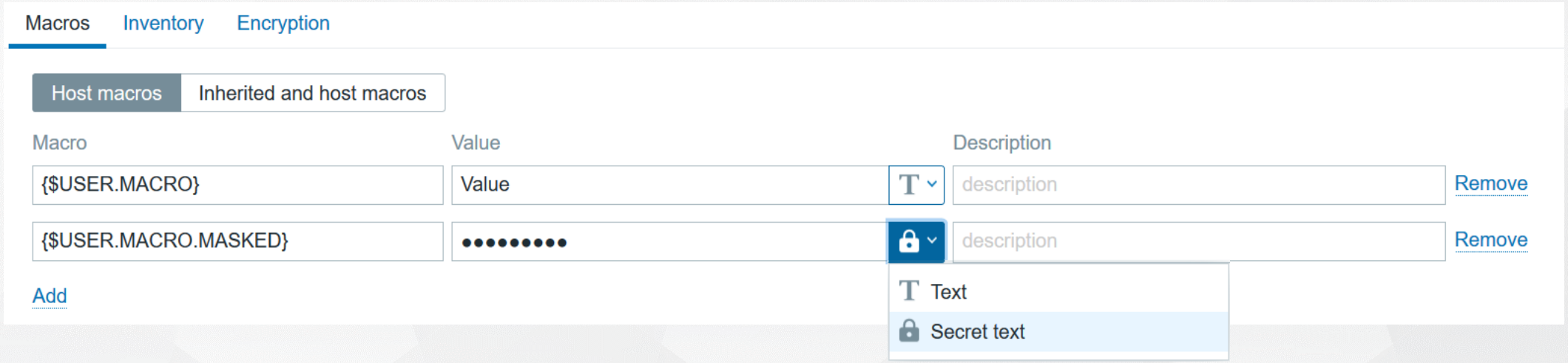
Host-level tags

- Event tags are realized as a pair of the tag name and value
- You can either use just the name or pair it with a value
  - MySQL
  - Service: MySQL
  - Application: Java
- All problems of this host will be tagged with the values entered here
- Macros are supported in tags



Tags are covered in the problem detection topics

Host level user macros



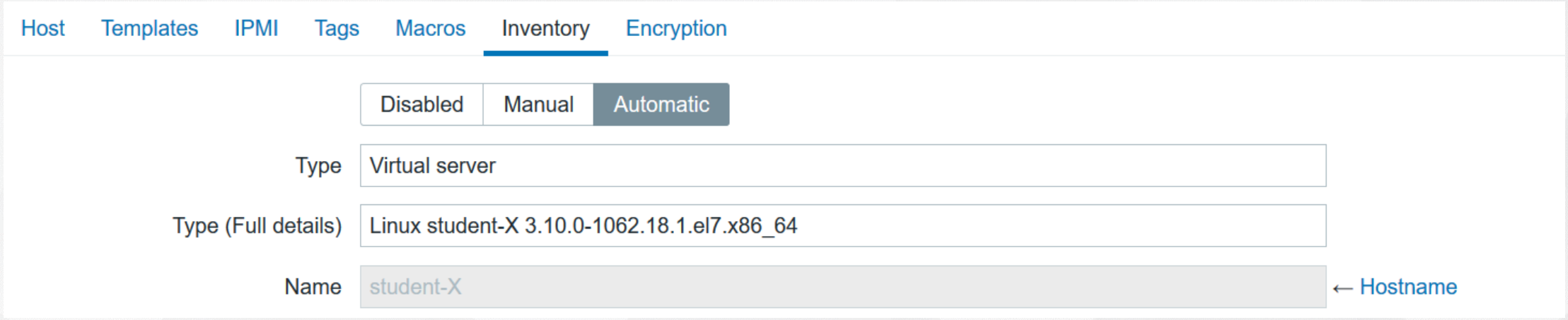
Two types:

- Text (visible to all users with Read-Write access)
- Secret text (masked - no way of seeing values)

Macros are covered in the upcoming topics

Host inventory

- Manual or Automatic way of storing values from hosts for later use (like a variable)
- Gives users an option to overview/find hosts by values in the fields
- Stored information can be used later in the
  - Media (emails, SMS, etc.)
  - Tags
  - Scripts



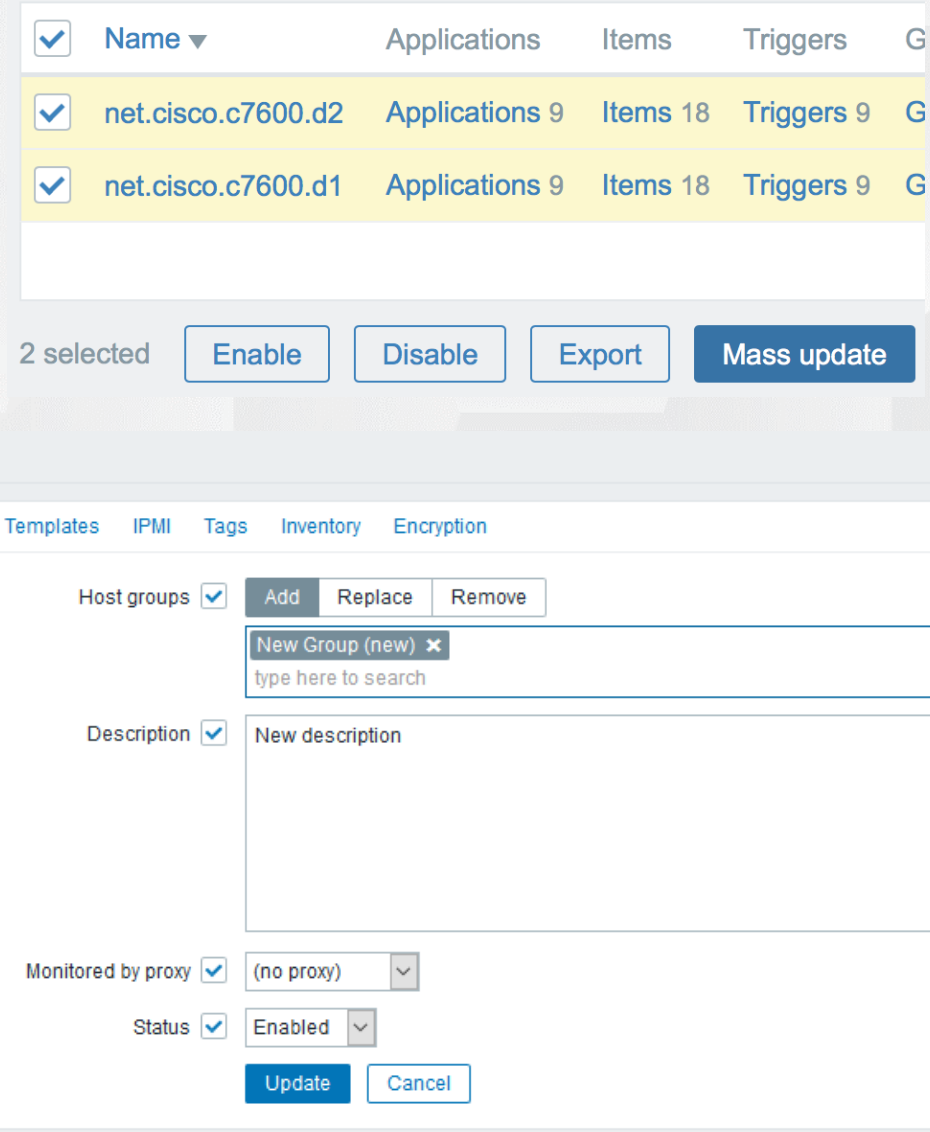
The inventory is covered in the upcoming topics

MASS EDITING FOR HOSTS

Configuration > Hosts

[Mass update] allows to modify

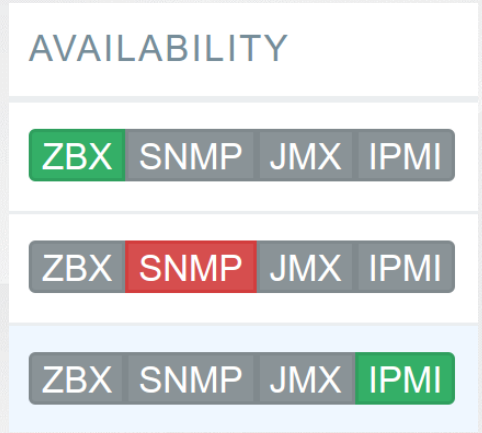
- Host groups
- Description
- Proxy
- Status
- Templates
- IPMI
- Tags
- Inventory
- Encryption



WHAT IS HOST AVAILABILITY?

Availability is kept for 4 different types of checks separately

- ZBX Zabbix passive agent
- SNMP Simple Network Management Protocol
- JMX Java Management Extensions
- IPMI Intelligent Platform Management Interface

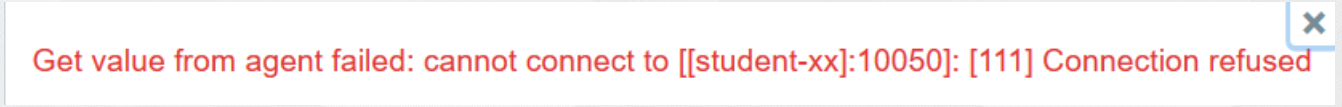


Error messages are preserved for each interface status

Calculated by the server internally

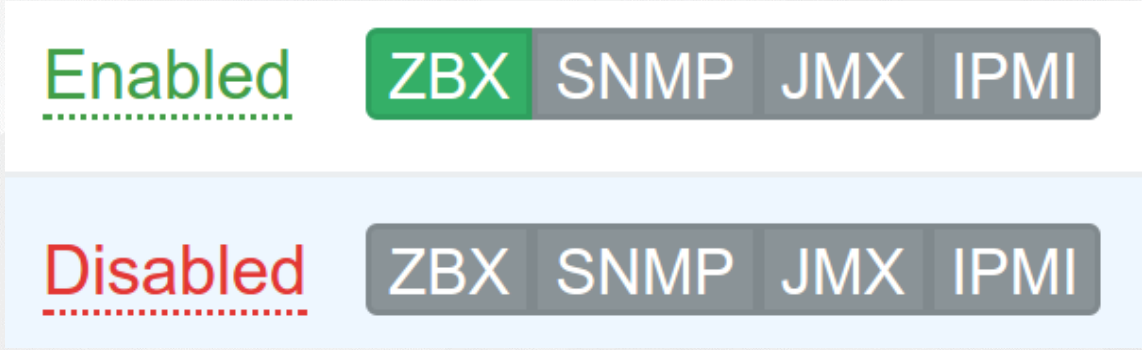
Shown in the list and the host properties

Green - available
Red - not available (error upon mouseover)
Gray - unknown or not configured



Zabbix server will set the host availability icon to gray if

- There are no enabled items on the corresponding interface
- The host has been switched to be monitored by other server or proxy (until config cache updates)
- The host is monitored by a proxy that appears to be offline
- The host is disabled



PRACTICAL SETUP

1. Create new host groups:
   - Training
   - Training/Servers
2. Create a new host:
   - Host name: Training-VM-XX
   - Host group: Training/Servers
3. Add a Host-level tag:
   - Tag name: Location Value: <use your current Training location>

Items

Item (an individual metric) - gathers data from a host or performs calculations

Workflow usually is

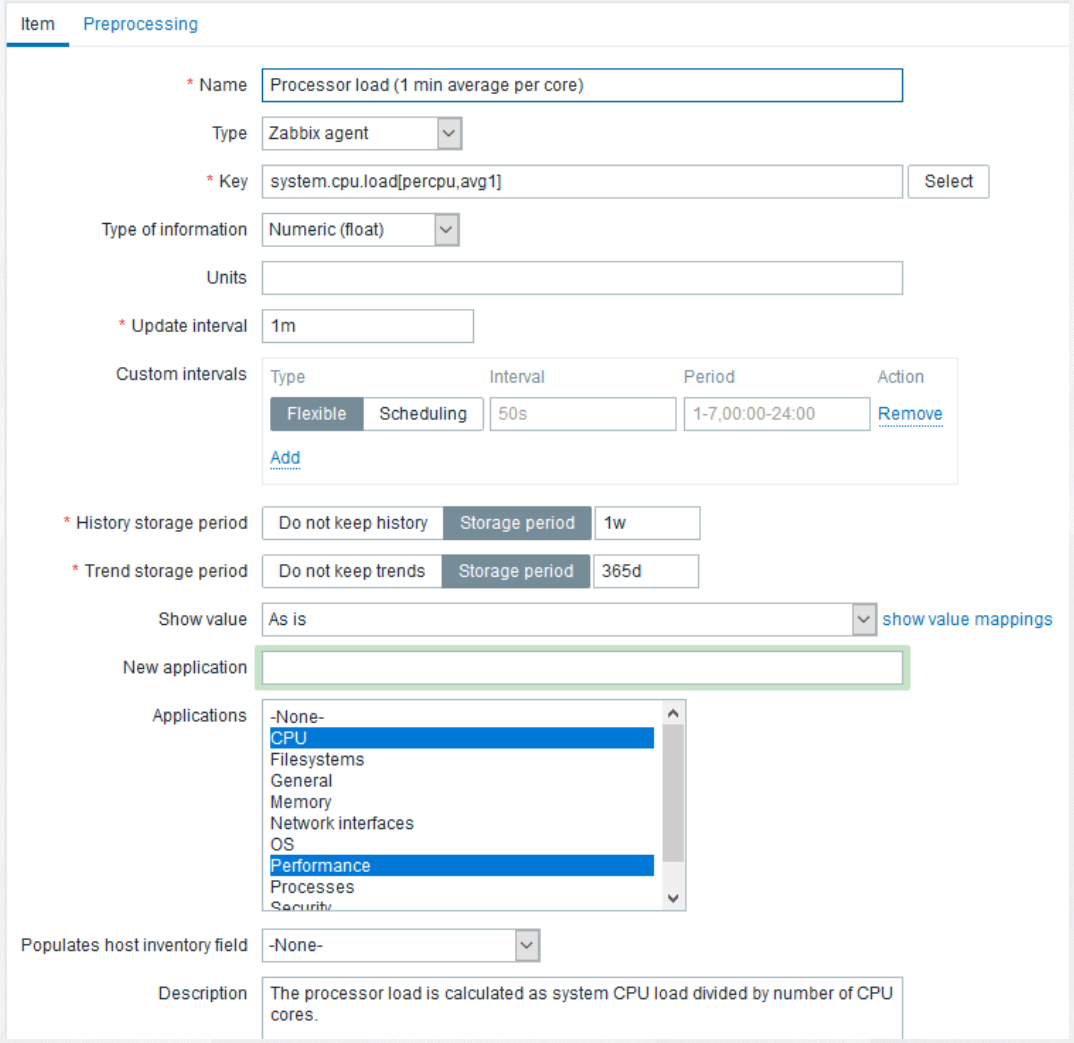
- Create a new host or use an existing one
- Create a new item and set parameters
  - Name
  - Type
  - Key (must be unique on a host)
  - Data type
  - Update interval
  - Other (Authentication, data storage periods)

Some items will need 4-5 parameters, others - more than 10

https://www.zabbix.com/documentation/5.0/manual/config/items/item

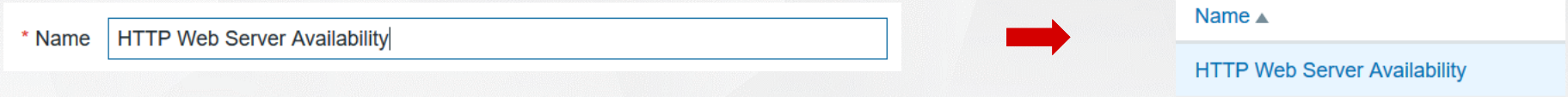
Configuration > Hosts > Items

[Create item]



- All mandatory input fields are marked with a red asterisks
- The form changes according to the selected Type and other parameters
- Some values like an Update interval can be set to 0 or left blank
- [Select] button for the Key field displays list of keys for the selected item type
- Some items (such as SNMP and JMX) need to have corresponding interface on a host.

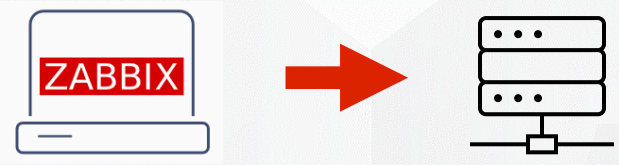
This is how the item will be named and displayed in the other frontend sections



Naming guide:

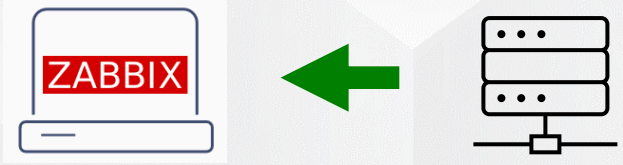
- Choose a simple, descriptive name for each item.
- Prefix item names (metric) with object name (metric location):
  - <metric location>: <metric name>, for example:
  - Interface eth0: Bits in
  - Interface eth0: Bits out
- You may use the # if the metric location is just a number or index:
  - #0: CPU utilization
  - #1: CPU utilization
- Consider adding suffixes such as “per second”, “per hour”, etc., to describe the metric better.

https://www.zabbix.com/documentation/guidelines/doc



Passive (Polling)

- Zabbix agent
- Simple check (agent-less)
- SNMP agent (v1, v2, v3)
- IPMI agent
- JMX agent
- HTTP agent
- SSH agent (pass/key)
- Telnet agent
- Database monitor (ODBC)
- External check



Active (Trapping)

- Zabbix agent (active)
- SNMP trap
- Zabbix trapper
- HTTP agent if "Enable trapping" is set

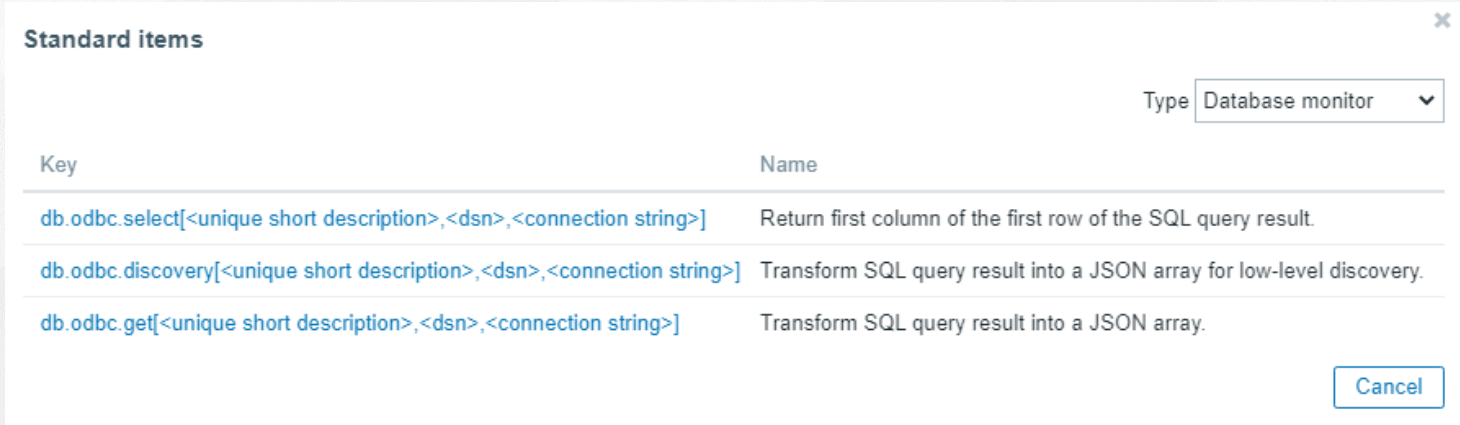
Other (processed internally)

- Zabbix internal
- Zabbix aggregated and calculated
- Dependent item

General syntax:

* Key: key[parameter1,parameter2,<parameter3>] Select

- Key
  - Predefined for some item types (Zabbix agent, Internal items, Simple checks, etc.)
  - Free form string for other types (SNMP, Zabbix trapper, HTTP agent, etc.)
  - Must be unique per host/template
- Parameters
  - Some parameters are mandatory and must be specified
  - The "<>" means optional parameter
- Quick reference in the frontend by pressing the [Select] button right to the item key field



https://www.zabbix.com/documentation/5.0/manual/config/items/itemtypes/zabbix_agent

Flexible	Non-flexible
net.tcp.listen[631]	agent.ping
system.hw.cpu[<cpu>,<info>]	system.boottime
vfs.file.contents[file,<encoding>]	vfs.fs.get

Examples:

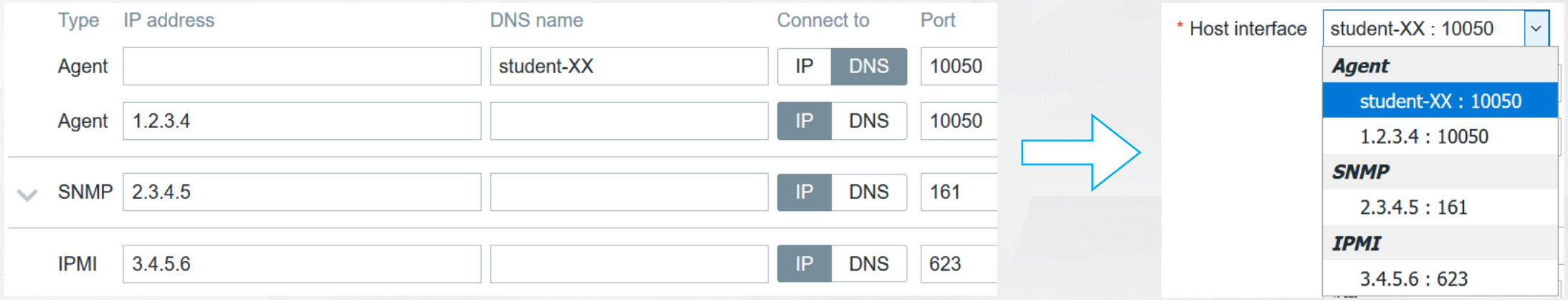
net.if.in[if,<mode>]		
net.if.in[eth0]	net.if.in[eth0,]	net.if.in[eth0,errors]
proc.cpu.util[<name>,<user>,<type>,<cmdline>,<mode>,<zone>]		
proc.cpu.util[zabbix_agentd]	proc.cpu.util[,root]	proc.cpu.util[,,,nginx]

Usage of quote marks:

Correct	Wrong
net.if.in[**"eth0"**,errors]	net.if.in[**"eth0,errors"**]
log[/var/log/messages,**"Error: [A-Za-z,.]"**]	log[/var/log/messages,**Error: [A-Za-z**,.]]

Host interface

- An agent interface is default, preselected and used when creating a new item
- This field is available when opening an item on the host level
- Some item types do not use it, for example: Zabbix agent (active), Calculated, etc.
- If multiple interfaces exist on a host, they will be available in the dropdown list



Type of the data as stored in the database

- Numeric (unsigned) - 64bit unsigned integer
- Numeric (float) - floating point number (Float64)
- Character - short text data (255 characters)
- Log - data with optional log related properties: timestamp, source, severity, eventid (64 KB)
- Text - text data (64 KB)

If a wrong data type is selected, the item will become unsupported

- Example: data 0.0125 (float) and type Numeric(unsigned)

Before being stored in the database, the text values get truncated to match the database value type limit.

If upgrading from older versions, the "history" table must be manually upgraded to Float64

Units are used for the numeric data only (unsigned/float)

- If set, K/M/G/T/P/E/Z/Y prefix fill be added
  - 5000 W -> 5 KW

- Special processing to display B, Bps, unixtime, uptime, s
  - 1024 B -> 1 KB
  - 125 uptime -> 00:02:05
  - 1589199730 unixtime -> 2020.05.11 12:22
  - 61 s -> 1m 1s

- Any unit can be prevented from being converted by using a < ! > prefix
  - 3500 !RPM -> 3500 RPM
  - 10000 !W -> 10000 W
  - 125 !uptime -> 125 uptime
  - 61 !s -> 61 s

Units are processed by the frontend to display raw data in the human-readable format.

Retrieve a new value for this item every N seconds

- Minimum update interval is 1 second
- Maximum allowed update interval is 86400 seconds (1 day)
- Time suffixes are supported, e.g. 30s, 1m, 2h, 1d
- Defaults to seconds if a suffix is not used
- Single user macro (variable) is supported
- Can be set to 0 (never checked)

Update interval cannot be set for the following item types

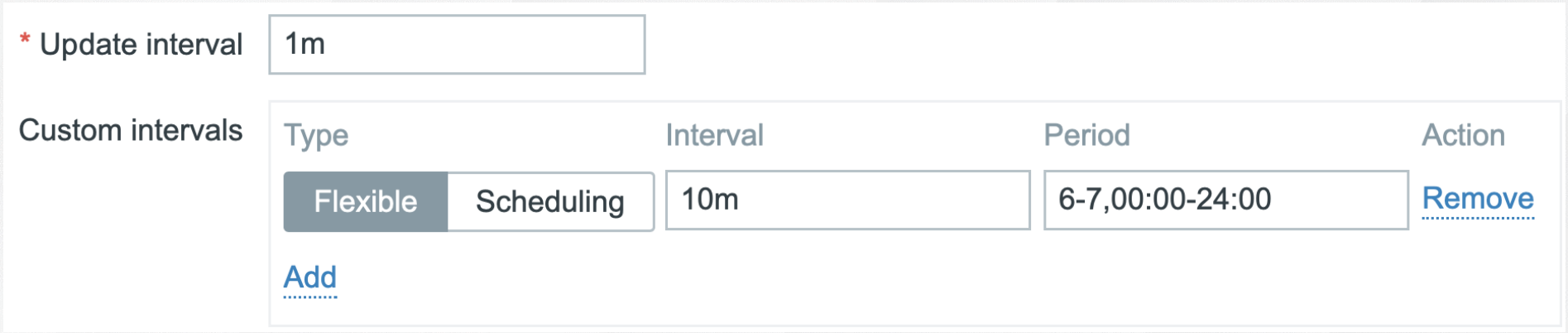
- Zabbix trapper
- SNMP trapper
- Dependent items

Passive item value can be collected immediately using the [Execute now] button.

https://www.zabbix.com/documentation/5.0/manual/appendix/suffixes

Flexible intervals

- Allows to override item update interval on a specific time period
- If multiple flexible intervals overlap, the smallest time is used
- Update interval of 0 can be used together with a flexible interval to emulate scheduling on a specific time of the day only

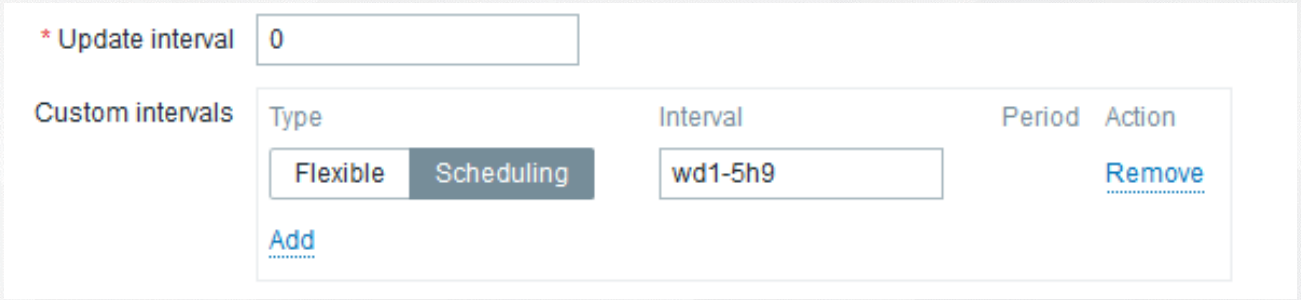


Not supported for the C-based Zabbix agent active checks

https://.../5.0/manual/config/items/item/custom_intervals#Flexible%20intervals

Can be used to collect values at the specific time

- A scheduling interval is defined as: md<filter>wd<filter>h<filter>m<filter>s<filter> where:
  - md - month days
  - wd - week days
  - h - hours
  - m - minutes
  - s - seconds



Examples:

- wd1-5h9 - every Monday till Friday at 9:00
- h9m/30;h10 - execute at 9:00, 9:30, 10:00
- h9-10m10-40/30 - execute at 9:10, 9:40, 10:10, 10:40
- md1wd1h9m30 - every 1st day of each month at 9:30 if it is Monday

Scheduled checks are executed in addition to the "Update interval" checks

Not supported for the C-based Zabbix agent active checks

https://...5.0/manual/config/items/item/custom_intervals#Scheduling_intervals

History and trends are two ways of storing collected data in Zabbix

- History keeps each collected value
- Trends keep averaged information on hourly basis and therefore are less resource-hungry

You can set for how many days history or trends will be kept

- In the item properties form
- When mass-updating items
- When setting up housekeeper tasks

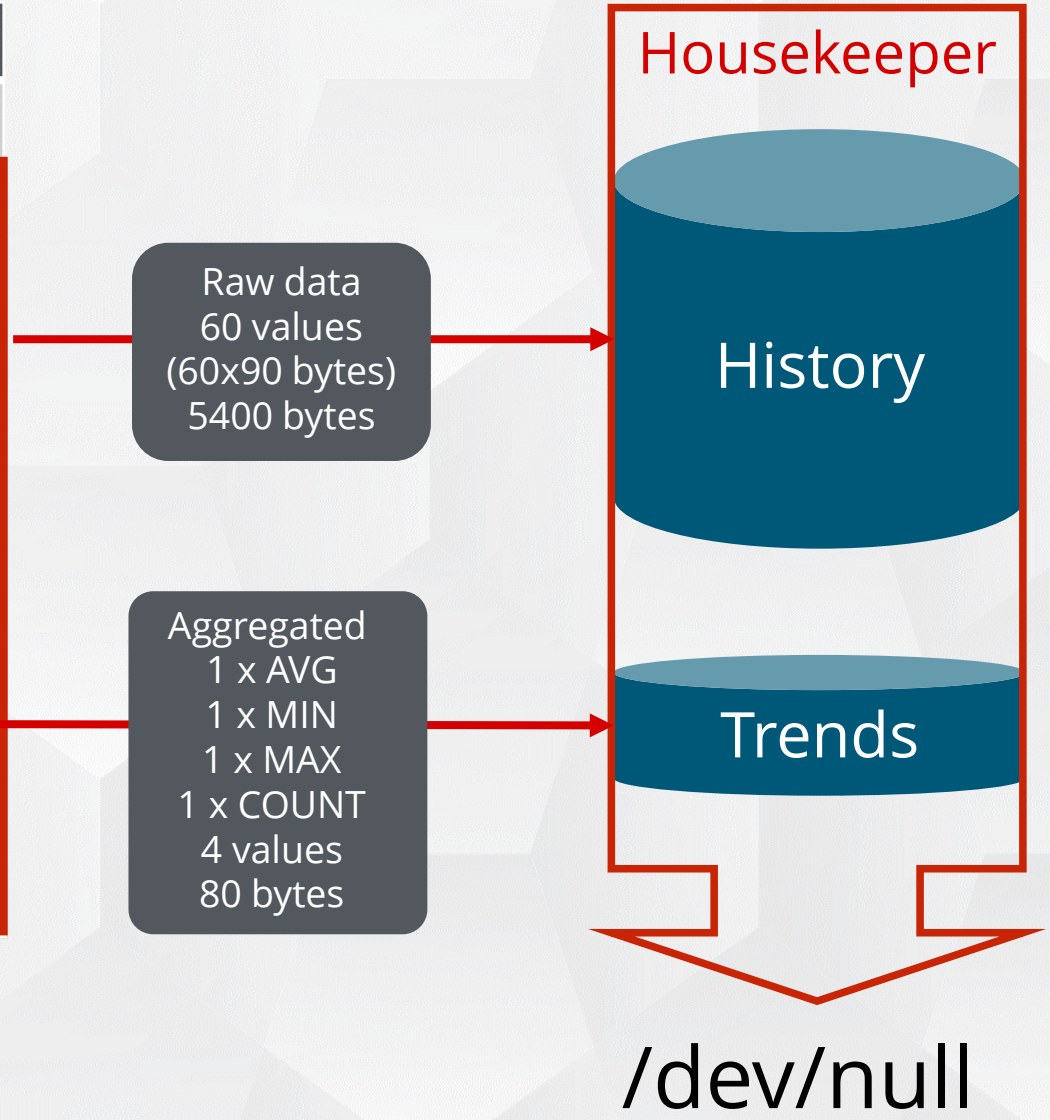
By default, the housekeeper removes older data once in an hour

If History is set to "Do not keep history"

- The item will update only dependent items and inventory
- Related triggers won't be evaluated

HISTORY AND TRENDS

Used space on /	
Timestamp	Value
2020-04-21 18:59:02	3493412002
2020-04-21 18:58:02	3493322752
.....	.....
2020-04-21 18:06:02	3492265206
2020-04-21 18:05:02	3492260286
2020-04-21 18:04:02	3492254730
2020-04-21 18:03:02	3492252312
2020-04-21 18:02:02	3492251478
2020-04-21 18:01:02	3492249912
2020-04-21 18:00:02	3492249600

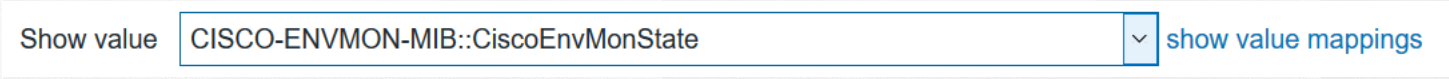


https://www.zabbix.com/documentation/5.0/manual/config/items/history_and_trends

Visualise or decode values in the human-readable format

- Used almost everywhere in the frontend and in notifications
- Matched numerical value can be represented as a string

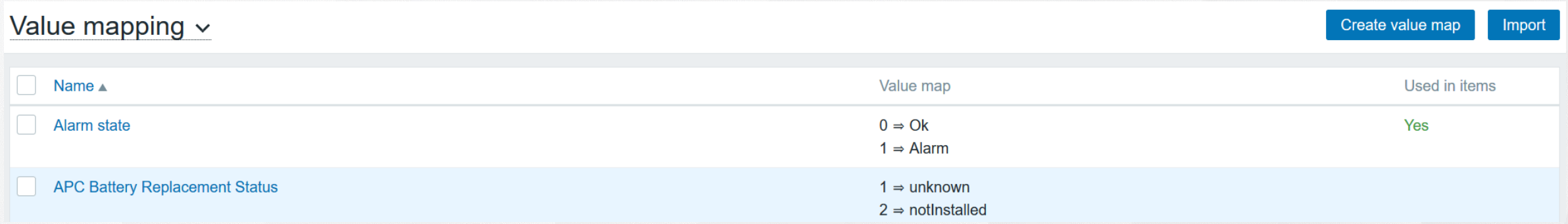
Configuration > Hosts > {host} > Items > [Create New] or edit existing



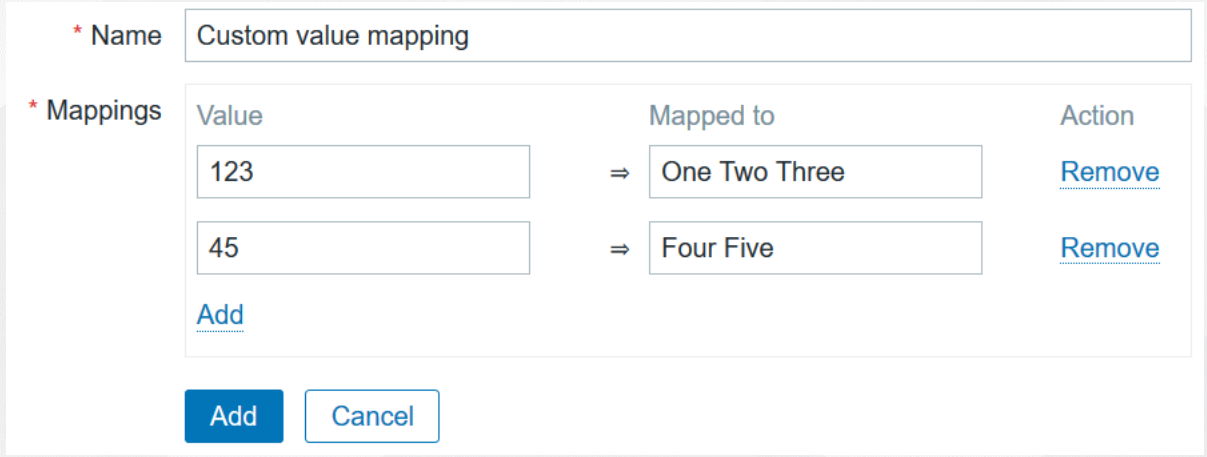
Example: Monitoring > Latest data

	net.cisco.c2911	**Fans** (5 Items)		
☐		Fan 1: Fan status	2018-05-21 17:39:04	normal (1)
☐		Fan 2: Fan status	2018-05-21 17:39:04	normal (1)
☐		Fan 3: Fan status	2018-05-21 17:39:04	shutdown (4)

To create a new or modify an existing value map, go to Administration > General > Value mapping



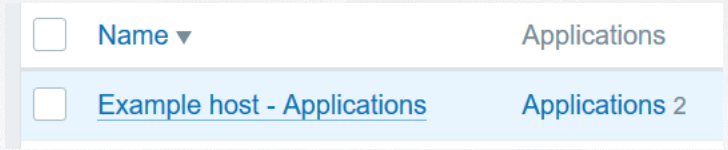
Click [Create value map]

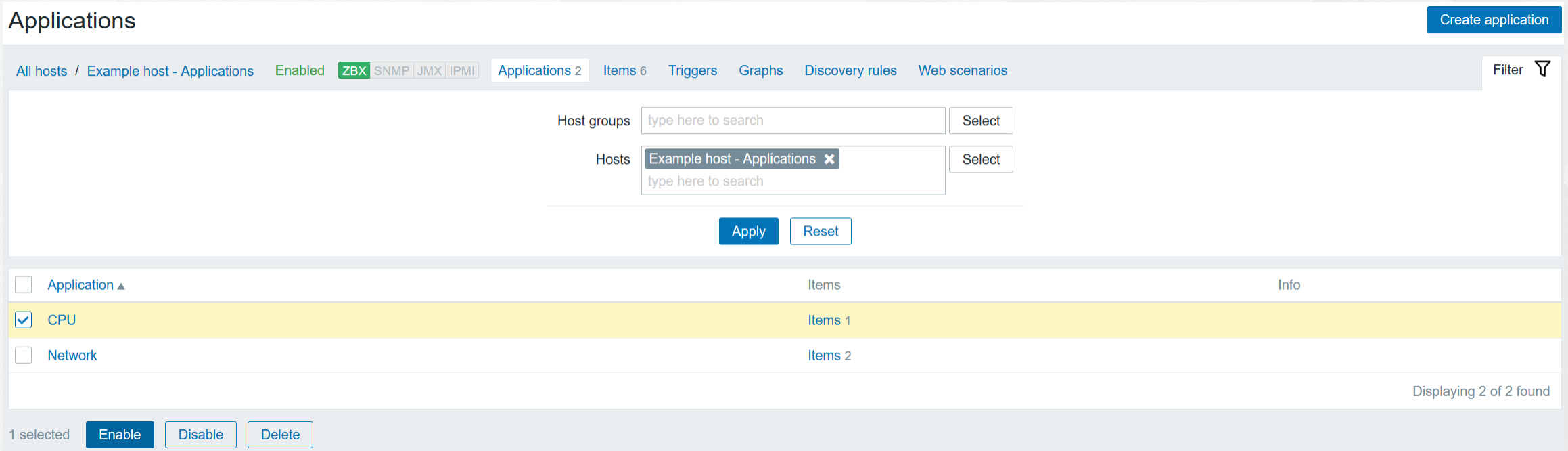


https://www.zabbix.com/documentation/5.0/manual/config/items/mapping

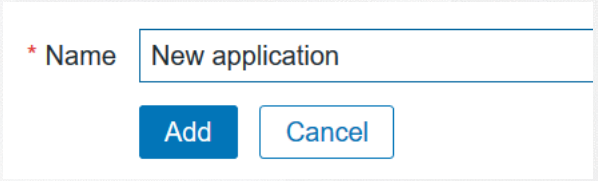
Applications are used for logical sorting and grouping of items

Configuration > Hosts > {host} > Applications

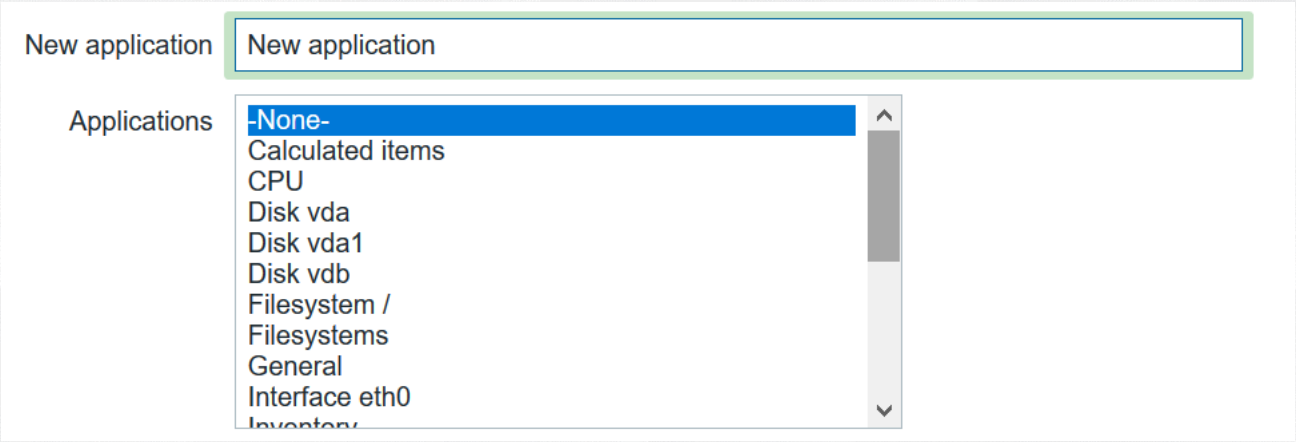




Configuration > Hosts > {host} > Applications > [Create new application]



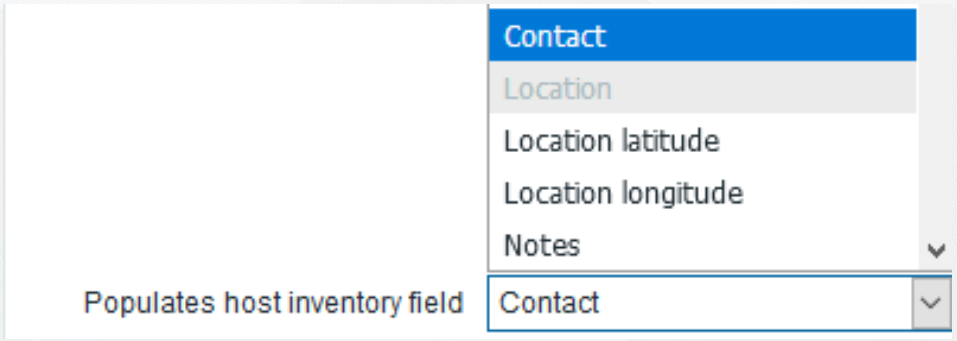
The same can be done during creating/modifying an item



https://www.zabbix.com/documentation/5.0/manual/config/items/applications

Select a host inventory field that the item value will populate

- Grayed out if another item on the host/template is using the field



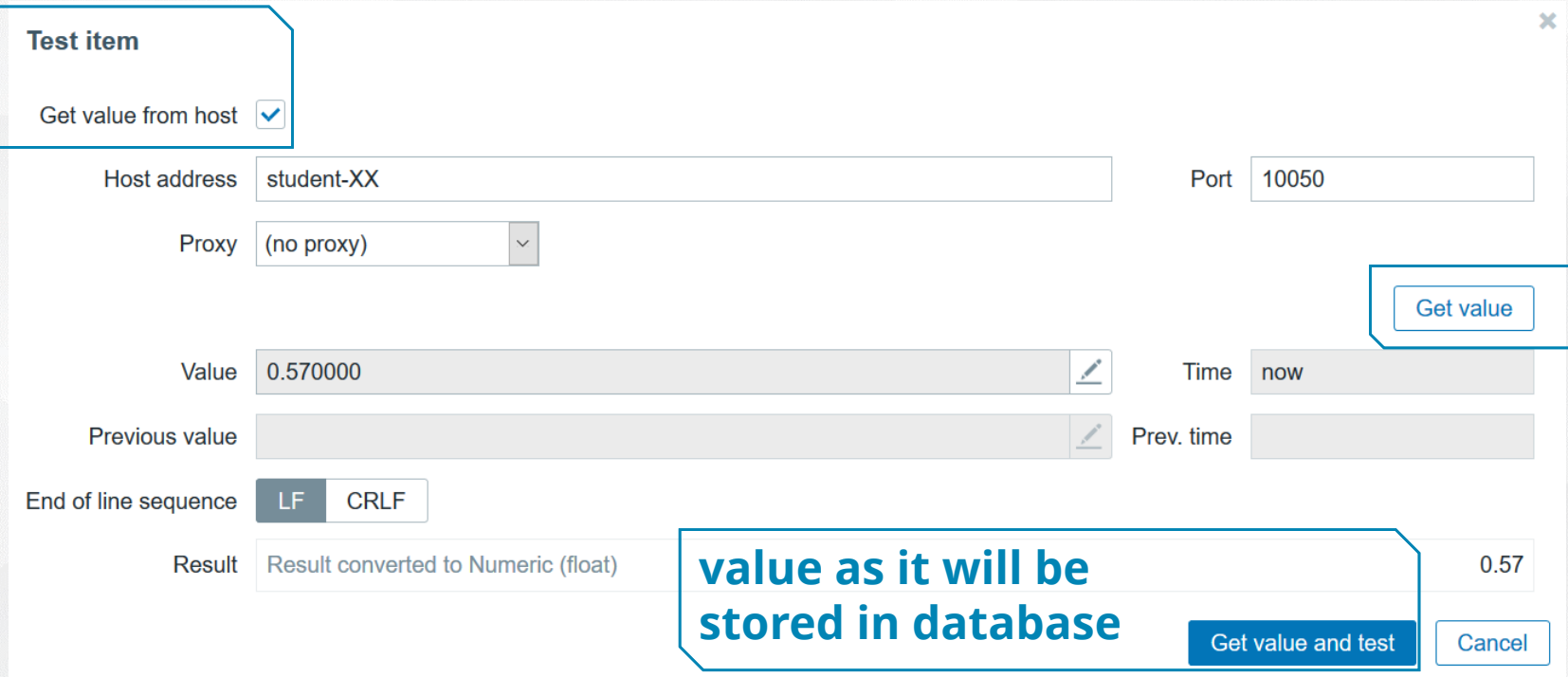
- This will work if an automatic inventory population is enabled for the host
- This field is not available if the Type of information is set to "Log"

https://www.zabbix.com/documentation/5.0/manual/config/hosts/inventory

It is possible to test the item while creating/modifying it

- Item key and connection parameters must be set properly
- In the item configuration form, press the [Test] button
- Values are processed by the frontend and not saved to the database

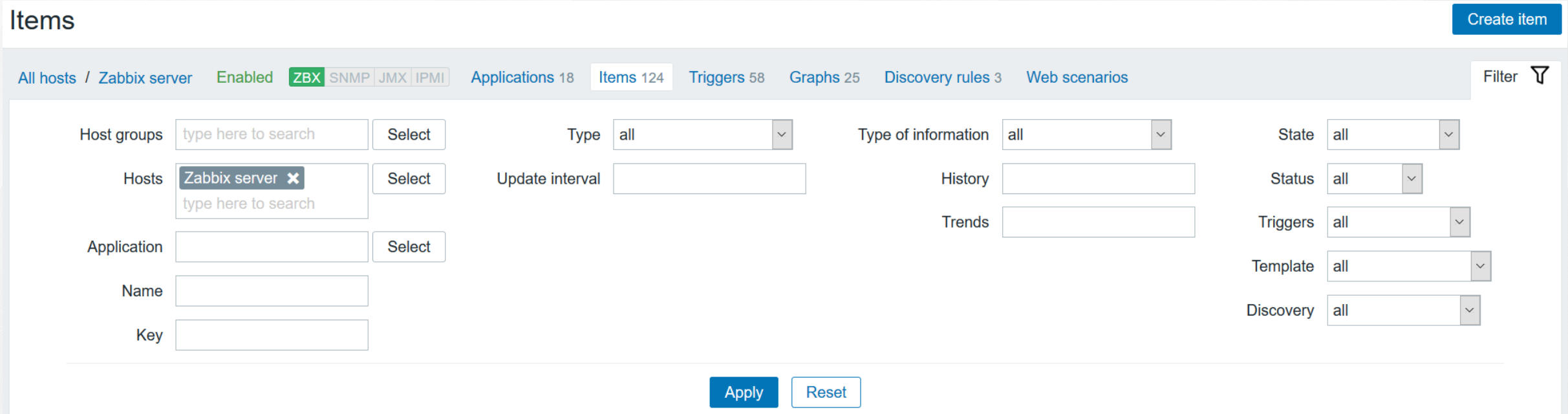
If unselected allows manual input



Available only for passive items!

Configuration > Hosts > Items

- Find items from multiple hosts, host groups
- Find unsupported items
- Further drill down by sub-filters



Configuration > Hosts > Items

Select multiple items in the list and press [Mass update]

	Wizard	Name ▾	Triggers	Key	Interval	History	Trends	Type
☐	•••	Total memory	Triggers 1	vm.memory.size[total]	1m	7d	365d	Zabbix agent
☑	•••	System uptime	Triggers 1	system.uptime	30s	2w	0d	Zabbix agent
☑	•••	System name	Triggers 1	system.hostname	1h	2w		Zabbix agent
☑	•••	Available memory	Triggers 1	vm.memory.size[available]	1m	7		

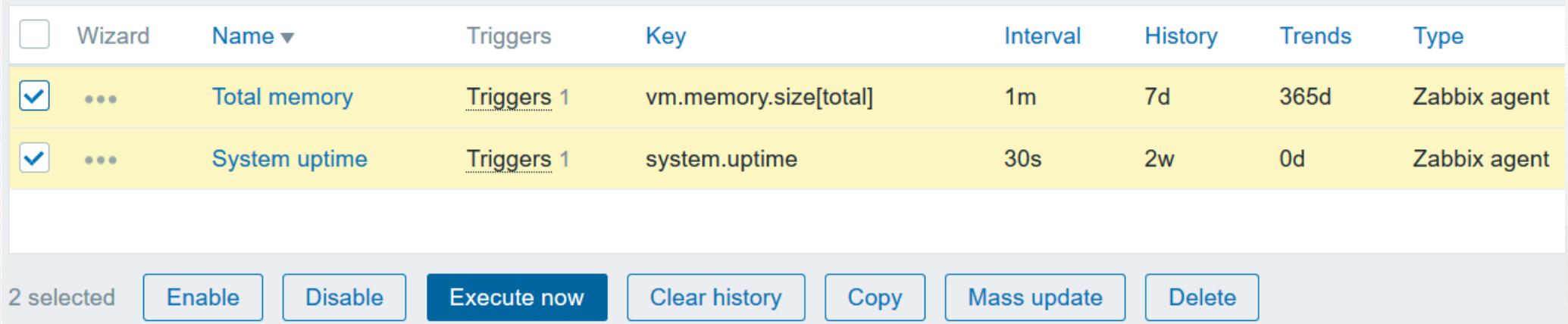
3 selected | Enable | Disable | Execute now | Clear history | Copy | Mass update | Delete

Item | Preprocessing

Type	☐	Original
Host interface	☐	Original
JMX endpoint	☐	Original
URL	☐	Original
Request body type	☐	Original
Request body	☐	Original

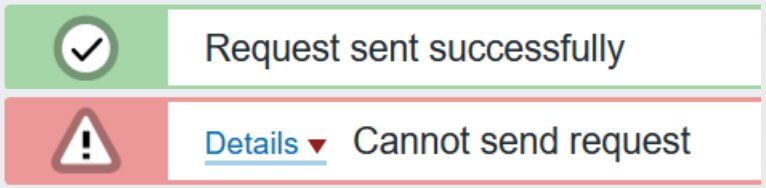
To execute a passive check immediately, press [Execute now]

- In an existing item (or a discovery rule) configuration form
- For selected items/rules in the list of items/discovery rules



Successfull execution will return a green message

Red message - something is wrong (check the Details)

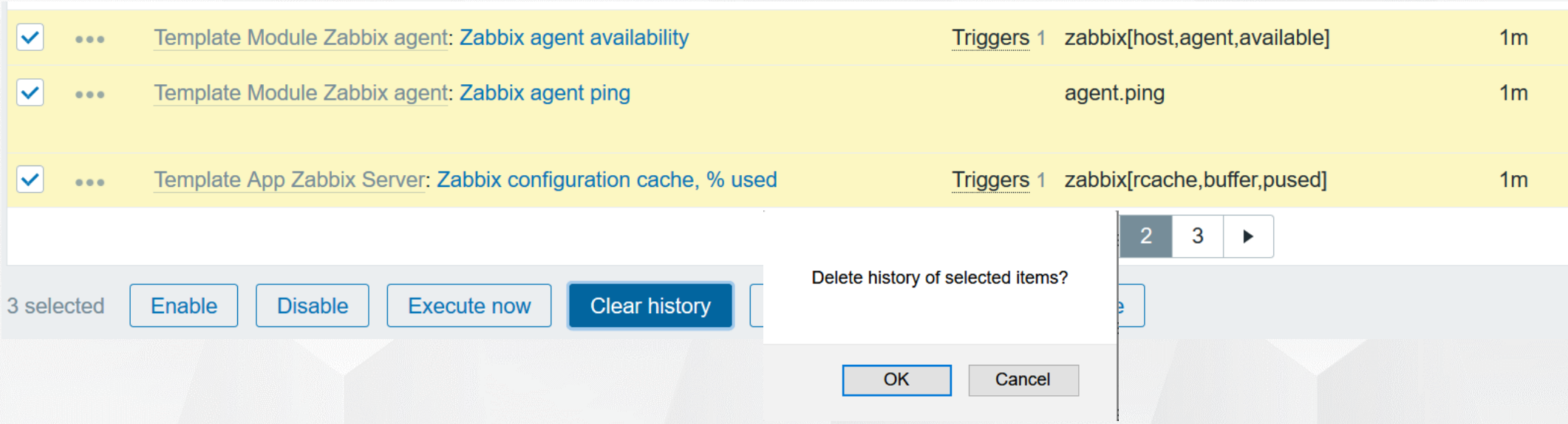


This functionality is supported for passive checks only.

https://www.zabbix.com/documentation/5.0/manual/config/items/check_now

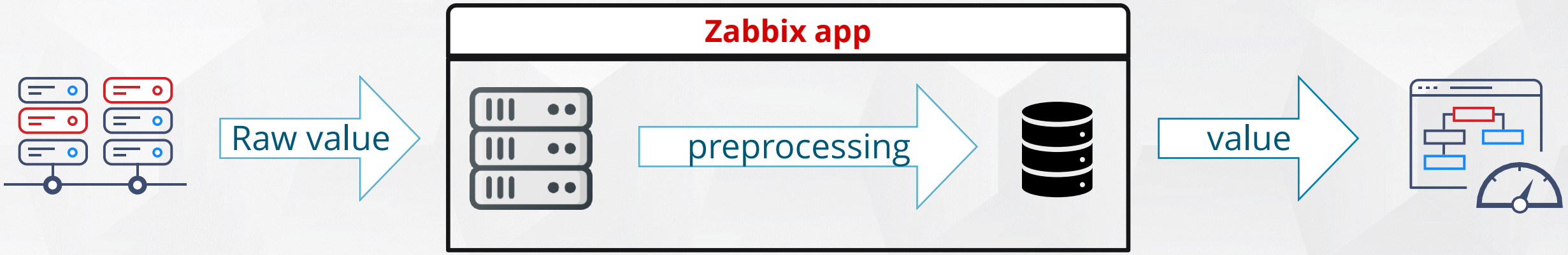
Configuration > Hosts > {host} > Items

- Single item deletion from an item configuration form
- Multiple items deletion by selecting many items



The history clean up starts immediately and might take a long time!

Preprocessing

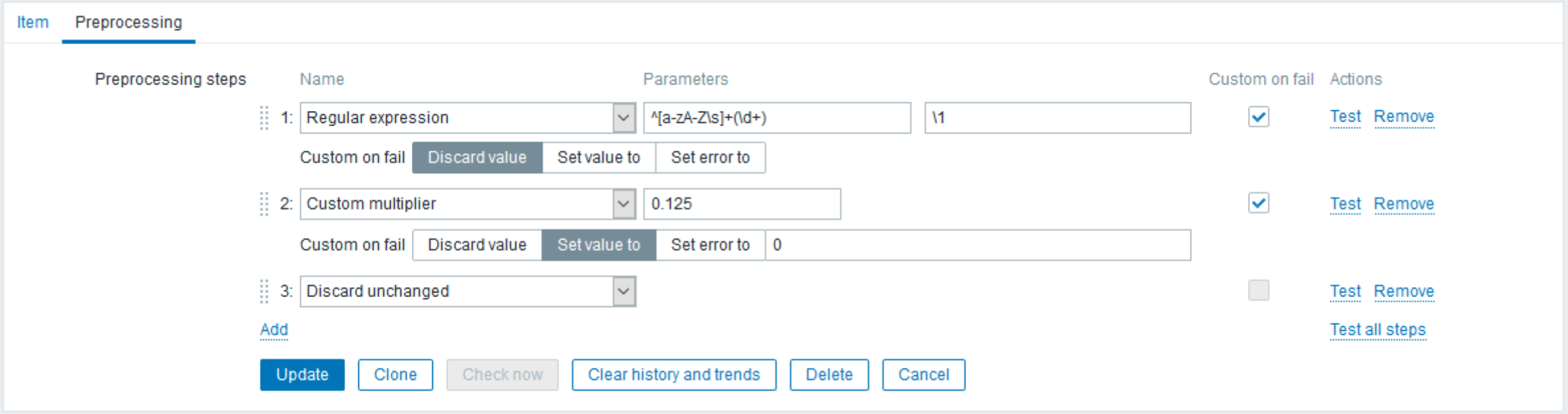



```
{"CPU":
{"load": {
        "value": 11.95
}}}
```

1) JSON path: $.CPU.load.value
2) Multiply: 100

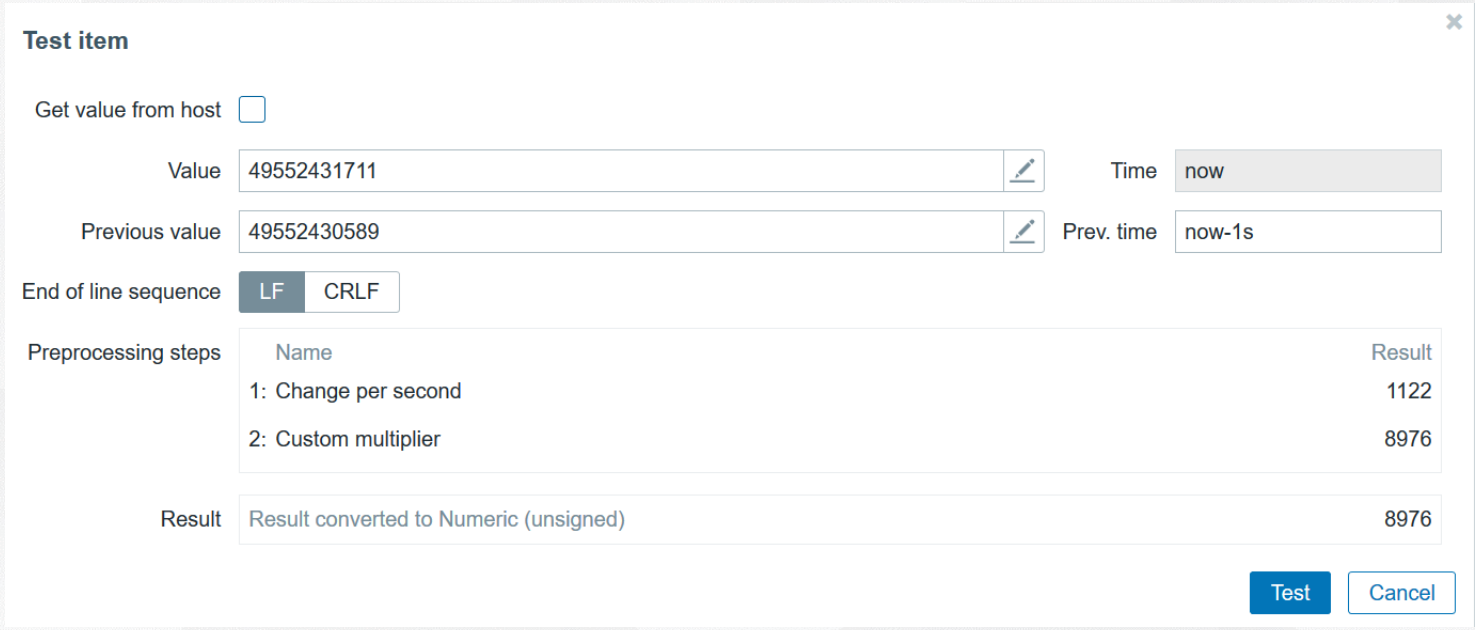
1195

Transformation rules for received values

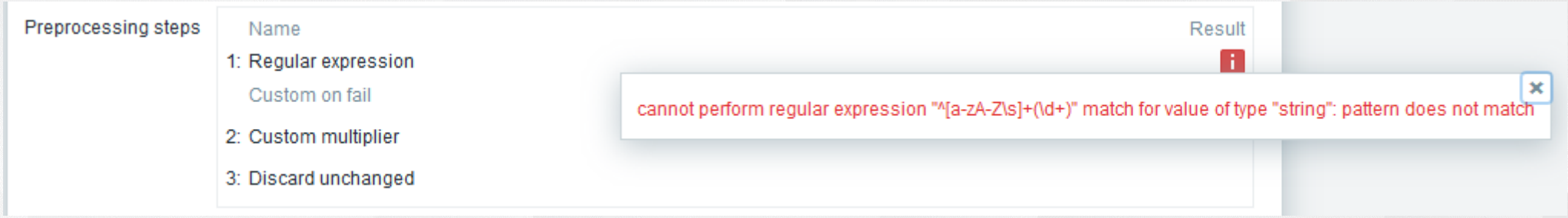


- Multiple transformations are possible
- Each type has its own set of parameters
- Custom on fail allows to discard/override value or an error
- Testing for all steps or a single step

Testing multiple steps



If some step fails - an error will give a clue about what's wrong



- Transformations are executed in the order in which they are defined
- The order can be changed by dragging and dropping
- All preprocessing is done by Zabbix server and proxies
- An item will become unsupported if any of the preprocessing steps fails
- It is possible to react on errors and introduce recovery options

Don't change stored data	[!] Change stored data
Units	Data type (different history table)
Value mapping	Preprocessing

https://www.zabbix.com/documentation/5.0/manual/config/items/preprocessing

Text	Regular expression	Match regex pattern and customize output		
	Threads_cached 0 Threads_connected 39	Threads_connected.(\d*)		39
	Replace	Find the search string and replace it with another (or nothing).		
	UP	Search string: Up; Replacement: 1		1
	Trim	Removes provided symbols on both sides (right/left)		
	C 36 C	Parameters: C		36
	Right trim	Removes provided symbols on the right side		
	C 36 C	Parameters: C		C 36
	Left trim	Removes provided symbols on left side		
	C 36 C	Parameters: C		36 C
Arithmetic	Custom multiplier	Value * multiplier		
	88	Parameters: 0.125		11
Change	Simple change	Value - previous value (used for counters)		
	21	Prev_value: 11		10
	Change per second	Value - previous value / time - previous time		
	Value: now=21, prev=11 Time: now=1582207687,prev=1582207682	(21-11)/(1582207687-1582207682)		2 vps

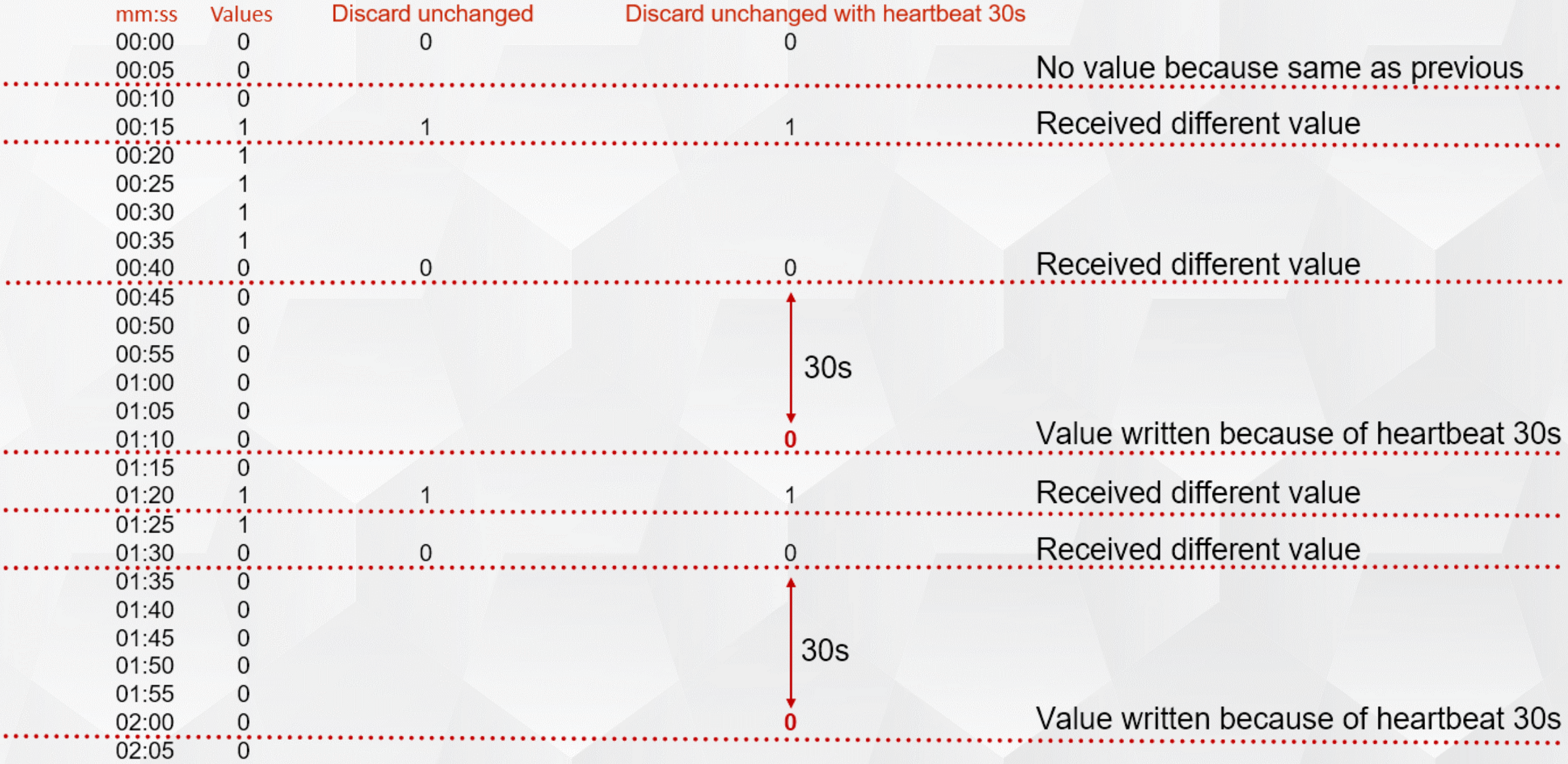
Numeral systems	Boolean to decimal	Convert the value from boolean format to decimal. Textual representation is translated into either 0 or 1	
	TRUE/FALSE, up/down	=>	1/0
	Octal to decimal		
	2322	=>	1234
	Hexadecimal to decimal		
	4D2	=>	1234
Structured data	XML Xpath	Extract value or fragment from XML data using XPath functionality.	
	<book category="cooking"> <title>Zabbix manual</title> <price>30.00</price></book>	number(/book/price)	30
	JSON Path		
	{"store": {"bicycle": { "color": "red", "price": 19.95}}}	$.store.bicycle.price	19.95
	CSV to JSON	Convert CSV file data into JSON format	
	"parameter", "value" diameter, 12	,“	[{"\"parameter\"":"diameter"," \"value\"":" 12"}]

Custom scripts	JavaScript		JavaScript function with a single parameter 'value' and user provided function body. Example: to perform Fahrenheit to Celsius conversion	
	68		return (value - 32) * 5 / 9	20
Validation	In range Matches regular expression Does not match regex Check for error in JSON Check for error in XML Check for error using regular expression		Multiple ways how to check received value. + *Custom on fail* => override value/error	
	20		min=10, max=21	20
Throttling	Discard unchanged Discard unchanged with heartbeat		Discard a value if it's same as previous one. Received one is not saved in the database.	
	v1=0, v2=0, v3=0		v2 and v3 => discarded	v1=0

Prometheus	Prometheus pattern	Extract required data from Prometheus metrics.
	cpu1{cpu="cpu-u",host="host1"} 1.19	cpu1{cpu="cpu-u"} 0.19
	Prometheus to JSON	Convert required Prometheus metrics to JSON.

	cpu1{cpu="cpu-u",host="host1"} 1.19	[
		{
		"name": "cpu1",
		"value": "0.19",
		"line_raw": "cpu1{cpu=\"cpu-u\",host=\"host1\"} 0.19",
		"labels": {
		"cpu": "cpu-u",
		"host": "host1"
		},
		"type": "untyped"
		}
		]

PREPROCESSING - THROTTLING



Most common reasons, why an item becomes "Not supported"

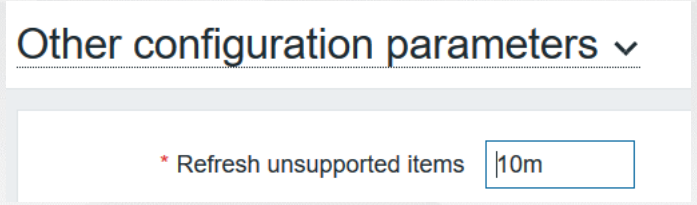
- Item key is not found
- Item key does not allow parameters
- Timeout during metric collection
- Value is not available | wrong value type | too small or too large
- No permissions | wrong credentials
- Failed preprocessing steps

Not supported items are rechecked

- Every 10 minutes by default
- By pressing [Execute now]

Administration > General > Other

- Define a refresh rate of the "Not supported" item checks



Not supported items will negatively affect performance of Zabbix server

Data collection

Agent-less monitoring

Availability and performance of remote services

- Syntax
  - net.tcp.service[service,<ip>,<port>]
  - net.udp.service[service,<ip>,<port>]
  - net.tcp.service.perf[service,<ip>,<port>]
- Examples
  - net.tcp.service[ftp]
  - net.tcp.service[ssh,,1022]
  - net.tcp.service.perf[http,,8080]

Creates a TCP connection and expects specific response for

- sftp, imap, ldap, nntp, pop, smtp, ssh, telnet

Creates a TCP connection without expecting and sending anything

- http, tcp

Host accessibility by ICMP

Uses fping

- Full path in the server configuration file
- Correct suid/permission settings
- SELinux can prevent Zabbix from running fping
- Uses fping defaults (depends on the platform)

Source IP settings (the first default interface)

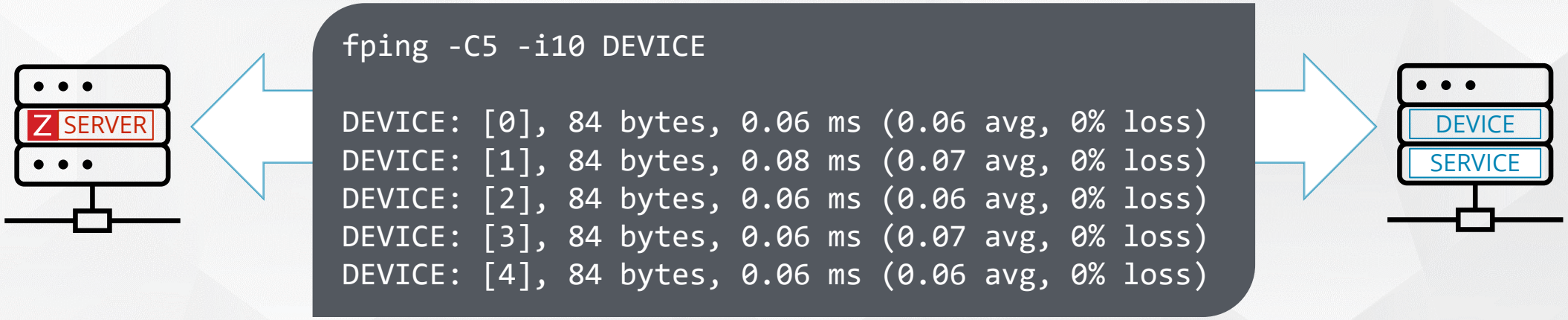
IPv6 supported by fping6 in most distributions

Supported item keys:

icmpping[<target>,<packets>,<interval>,<size>,<timeout>]
icmppingloss[<target>,<packets>,<interval>,<size>,<timeout>]
icmppingsec[<target>,<packets>,<interval>,<size>,<timeout>,<mode>]

Example key: icmpping[,5,10]

How it works (under the hood):



- fping
  - -C n count of pings to send, report results in the verbose format
  - -i n interval between sending ping packets (in milliseconds)

https://www.zabbix.com/documentation/5.0/manual/config/items/itemtypes/simple_checks

PRACTICAL SETUP

1. Create new:
   1) Host: training.lan
      - Visible name: Training Resources
      - Add to group: Training/Servers
      - Interface: DNS name training.lan
   2) Applications:
      - Simple check, Service
   3) Items:
      - ICMP ping
      - Service Web performance
      - Service NTP availability
   4) Add/assign new items to the corresponding applications
2. Make sure that the items are receiving data and the results are displayed in a human-readable format

Advanced task: Introduce throttling for the NTP item with 1h heartbeat. Why?!

QUESTIONS?

Time for a break :)