



Release 002

ZABBIX Manual v1.4

Review and Approval

	Name	Signature	Date
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For Project:			

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About this Manual

This manual is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. This manual is part of ZABBIX software. The latest version of the manual is available at <http://www.zabbix.com>.

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Please send an e-mail to sales@zabbix.com for more information.

Introduction

Purpose of this Document

The purpose of this document is to provide a comprehensive introduction and overview of ZABBIX, its architecture, the features it offers and their functions. This document contains all information necessary for the successful administration of ZABBIX.

What you should already know

No technical knowledge is required, although an understanding of UNIX is essential.

Who Should Use this Document

Anyone involved in installation and administration of ZABBIX, and anyone else wishing to get an insight into how it works.

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Glossary

TERM	DESCRIPTION
Active	Active refers to a mode that the ZABBIX Agent can run in. When running actively, the agent keeps track of what items to send to the server and at what intervals. The agent can poll the server at set intervals in order to keep track of what items it should be sending.
Active checker	Active checker gather operational information from the system where ZABBIX Agent is running, and report this data to the ZABBIX for further processing.
Action	An action is a response taken when a Trigger has been triggered. Actions can be configured to send messages to specific user groups as defined in ZABBIX, based on their Media Type settings, or execute remote commands.
Agent	Agent refers to the program that is run on hosts that want to be monitored. It is run as a service and can process both active and passive checks simultaneously.
Alerter	Alerter is a server process which is responsible for execution of actions (emails, sms, scripts).
Autoregistration	Autoregistration refers to a feature of ZABBIX that allows Hosts to automatically register themselves with the ZABBIX server. This is configured via the web interface by an administrator that defines a particular Hostname patter such as '*-linux' and define Items for that host based on a Template of items.
Event	An event is when a trigger is triggered.
Graphs	Graphs can refer to the simple graphs that are available for each numerical Item that is monitored, or it can refer to custom graphs which can be used to show several numerical Items in one graph.
Host	Host refers to the machine that is being monitored.
Housekeeper	Housekeeper refers to the service within the ZABBIX server that cleans the ZABBIX database of old actions, events, history, and trend data as defined by the user. Housekeeping of Actions and Events is defined in General settings. History and trend data is defined per item.
IT Services	IT Services refers to a feature within ZABBIX that allows users to define an SLA and have ZABBIX keep track of the expected SLA and actual SLA. IT Services are defined as groups of triggers and can be configured to calculate the minimum of a group or maximum of a group.

Item	Item refers to an individual item that is monitored on a host, such as load average or response time. Item can refer to an item obtained via the ZABBIX agent, SNMP, or other means. Items can be configured as float, 64-bit integers, character strings, or log values.
Location	Environment monitored by a single Node.
Map	Map refers to a feature of ZABBIX that allows users to create customized graphics via the web interface to create network maps and define links between Hosts on the map. Links can be configured to change color or style based on Triggers.
Master or Master Node	Master Node. Master Node may have one or several Slaves. Master Node can control configuration of the Slaves.
Media Type	Media Types are used to notify ZABBIX users when an Action has occurred. Media types can be via email or custom scripts. Media Types are configured globally to be made available to all Users, and then specified per User to allow certain Users to be notified via one media type, and other users to be notified via another media type.
Node	ZABBIX Server in distributed setup monitoring number of hosts.
Node ID	Node ID is an unique number which identifies Node. Each Node must have its own unique Node ID.
Node Watcher	ZABBIX Server process which takes care of inter-node communications.
Queue	Queue refers to the internal queue of items the ZABBIX server is monitoring. Based on the specified intervals of items the ZABBIX server maintains a queue to keep track of the items and when it should poll them.
Passive	Passive refers to a mode that the ZABBIX Agent can run in. When running passively, the agent waits for requests for items from the server and sends them back as requested. It should be noted that typically the agent runs in both modes, and the modes are defined by the Item when it is configured.
Pinger	Pinger - process checks for availability of hosts.
Poller	Poller - process is responsible for data gathering from the agent and processing item.
Screen	Screen refers to another customizable feature of ZABBIX which allows users to create custom pages within ZABBIX for displaying information. A screen can consist of graphs (custom), simple graphs, maps, or plain text such as the last 5 values of a particular item.

Server	Server refers to the program that is run on a centralized machine that has been deemed the “monitoring station”. The server is run as a service and is in charge of keeping track of all the configured hosts, items, actions, alerts, etc.
SLA	SLA refers to Service Level Agreement. These are typically used in contracts between companies and clients in order to define a certain level of service such as 99.5% availability of a particular Host.
Slave or Slave Node	Slave Node is linked to a Master Node. Slave Nodes reports to Master Node.
Template	A Template is a Host that has a defined set of Items, Triggers, etc. which Hosts can be linked to. This allows easier configuration of hosts and changes to hosts without having to change each individual host. Host Templates are no different from other hosts except that their status is set to ‘Template’ during configuration and as such no Host is actually monitored.
Timer	Timer - process is responsible for work of triggers and generates event.
Trapper	Trapper - process is responsible for processing values of the active checks received from the agent.
Trigger	A trigger is used to define constraints on items and provide notifications when these constraints are exceeded. For example, you could be monitoring load average on a specific host and want to know when load average exceeds 1.0. Triggers are very flexible and can allow for multiple constraints.
User	The ZABBIX web frontend can be configured to allow access to multiple users at varying levels of access. Users can be allowed anonymous access via the guest account and be allowed to view all available data but not modify any changes, or users can be given access to only view or modify specific sections of ZABBIX.
User parameter	User Parameter (UserParameter) refers to custom scripts defined in an agent’s configuration file. User parameters are defined by a key and command. The key refers to the item defined in the web interface and can be configured to accept arguments as sent by the server.
ZABBIX	ZABBIX Software
ZABBIX SIA	Latvian company that develops and provides support for ZABBIX.

References

The following publications provide further information on technical aspects of ZABBIX.

Internal documents

1. ZABBIX Manual v1.1

URL: <http://www.zabbix.com/manual/v1.1/index.php>

External References

- hdparm resources at <http://freshmeat.net/projects/hdparm/>
- Microsoft home page at <http://www.microsoft.com>
- MySQL home page at <http://www.mysql.com>
- Oracle home page at www.oracle.com
- PHP home page at <http://www.php.net>
- PostgreSQL home page at <http://www.postgresql.org>
- SQLite home page at <http://www.sqlite.org>
- Sqlora8 home page at <http://www.poitschke.de>
- SuSE Linux home page at <http://www.suse.com>
- Ubuntu Linux home page at <http://www.ubuntu.com>
- ZABBIX home page at <http://www.zabbix.com>

1. About

1.1. Revision History

Version	Date	Reason	Who
1.1 (alpha)	16/11/2004	Transforming to 1.1	Alexei Vladishev
1.1	25/10/2005	Misc improvements	Alexei Vladishev
1.4 (beta)	10/12/2006	Release of ZABBIX 1.3.1	Alexei Vladishev

1.2. Conventions

Document conventions

The ZABBIX Manual uses the typographical conventions shown in the following table.

Format	Definition
<code>file name</code>	Name of file or directory
bold text	Notes, important information, strong emphasis
<code>Shell commands</code>	Shell commands, paths, configuration files
<code>Constants</code>	Constants, configuration parameters
Note: Note	Notes, comments, additional details.

1.3. Distribution list

Author	Changes
Alexei Vladishev	Author and maintainer of the Manual.
Charlie Collins	Significant improvements of initial (LyX) versions of the document.
Shawn Marriott	Proofreading of the ZABBIX Manual v1.0.

1.4. Overview of ZABBIX

1.4.1. What is ZABBIX?

ZABBIX was created by Alexei Vladishev, and currently is actively developed and supported by ZABBIX SIA.

ZABBIX is an enterprise-class open source distributed monitoring solution.

ZABBIX is software that monitors numerous parameters of a network and the health and integrity of servers. ZABBIX uses a flexible notification mechanism that allows users to configure e-mail based alerts for virtually any event. This allows a fast reaction to server problems. ZABBIX offers excellent reporting and data visualisation features based on the stored data. This makes ZABBIX ideal for capacity planning.

ZABBIX supports both polling and trapping. All ZABBIX reports and statistics, as well as configuration parameters are accessed through a web-based front end. A web-based front end ensures that the status of your network and the health of your servers can be assessed from any location. Properly configured, ZABBIX can play an important role in monitoring IT infrastructure. This is equally true for small organisations with a few servers and for large companies with a multitude of servers.

ZABBIX is free of cost. ZABBIX is written and distributed under the GPL General Public License version 2. It means that its source code is freely distributed and available for the general public. Both free and commercial support is available and provided by ZABBIX Company.

1.4.2. What does ZABBIX offer?

ZABBIX offers:

- auto-discovery
- distributed monitoring
- support for both polling and trapping mechanisms
- server software for Linux, Solaris, HP-UX, AIX, Free BSD, Open BSD, OS X
- native high performance agents (client software for Linux, Solaris, HP-UX, AIX, Free BSD, Open BSD, OS X, Tru64/OSF1, Windows NT4.0, Windows 2000, Windows 2003, Windows XP)
- agent-less monitoring
- secure user authentication
- flexible user permissions
- web-based interface
- flexible e-mail notification of predefined events
- high-level (business) view of monitored resources

1.4.3. Why use ZABBIX?

- Open Source solution
- highly efficient agents for UNIX and WIN32 based platforms
- low learning curve
- high ROI. Downtimes are very expensive.
- low cost of ownership
- very simple configuration
- centralised monitoring system. All information (configuration, performance data) is stored in relational database
- high-level service tree
- very easy setup
- support for SNMP (v1,v2). Both trapping and polling.
- visualisation capabilities
- built-in housekeeping procedure

1.4.4. Users of ZABBIX

Many organisations of different size around the World rely on ZABBIX as primary monitoring platform.

1.5. Goals and Principles

1.5.1. Main Goals and Principles of ZABBIX Development

There are several goals ZABBIX is trying to achieve:

- become recognised Open Source monitoring tool
- create ZABBIX user group, which helps making the software even better
- provide high-quality commercial support

1.5.2. Main principles of ZABBIX development:

- be user friendly
- keep things simple
- use as few processing resources as possible
- react fast
- document every aspect of the software

1.6. Use of ZABBIX

1.6.1. Distributed monitoring

1.6.2. Auto-discovery

1.6.3. Pro-active monitoring

1.6.4. Monitoring of WEB applications

ZABBIX provides very efficient way of monitoring WEB applications. Both HTTP and HTTPS are supported.

1.6.5. Performance monitoring

One of most important uses of ZABBIX is performance monitoring. Processor load, number of running processes, number of processes, disk activity, status of swap space, and memory availability are some of the numerous system parameters ZABBIX is able to monitor.

ZABBIX provides a system administrator with timely information about performance of a server. In addition, ZABBIX can produce trend graphs to help identify bottlenecks in system performance.

1.6.6. Alerting users

Having performance monitoring is good, but it is almost useless without a powerful notification mechanism. With ZABBIX, an administrator can define virtually any possible condition for a trigger, using flexible expressions. Any time these expressions become true (or false), an alert will be emailed to any address defined by the administrator.

External programs can be used for user-defined notification methods such as SMS, phone notifications, etc.

ZABBIX can predict future behaviour of monitored parameters using Least Square Algorithm. This allows user to be notified even before system state achieves critical level. *Note: This functionality will be completed in future versions of ZABBIX*

1.6.7. Monitoring of log files

ZABBIX can be used for centralised monitoring of log files. *Note: This functionality will be completed in future versions of ZABBIX*

1.6.8. Integrity Checking

ZABBIX is capable of server integrity monitoring. All critical configuration files, binaries, kernel, scripts, and web server HTML pages can be monitored by ZABBIX so that the administrator can be alerted to modifications made to these files.

1.6.9. Logging services

All values of monitored parameters are stored in a database. The collected data can be used later for any purposes.

1.6.10. Capacity planning

Viewing trends of process load, disk usage, database activity, or other important metrics allows a system administrator to clearly see when the next hardware upgrade should be made.

1.6.11. Assuring and monitoring of SLA

ZABBIX is able to monitor Service Level Agreements (SLA). It also keeps SLA-related historical data that helps to identify and improve weak areas of an IT infrastructure.

1.6.12. High level view of IT resources and services

A High level service tree allows the creation of dependencies between various IT resources. Such representation enables the following questions to be answered:

What IT services depends on availability of resource X?

Example: If processor load is too high on server A, then these IT services will be affected: Oracle server, WEB banking, Online transaction processing, etc.

What resources specific IT service depends on?

Example: WEB portal may depend on the following resources:

processor load on server A

connection to ISP provider

disk space on volume /data on server A

availability of Oracle DB engine on server B

speed of execution of user requests

availability of Apache server on server C

etc etc

Such a dependency tree helps identify weak points in IT infrastructure.

Example: If several critical services offered by IT department depends on, for example, availability of disk space on some server, then it is time to think about

distribution of the volume across different servers or disk arrays to eliminate possible risks.

1.6.13. Other

- availability analysis
- graphical representation of collected information
- Network maps
- custom screens

2. Installation

2.1. How to Get ZABBIX

Check the ZABBIX Home Page at <http://www.zabbix.com> for information about the current version and for downloading instructions.

2.2. Requirements

2.2.1. Hardware Requirements

2.2.1.1. Memory Requirements

ZABBIX requires both physical and disk memory. 64 MB of physical memory and 128 MB of free disk memory could be a good starting point. However, the amount of required disk memory obviously depends on the number of hosts and parameters that are being monitored. If you're planning to keep a long history of monitored parameters, you should be thinking of at least a couple of gigabytes to have enough space to store the history in the database.

Each ZABBIX daemon process requires several connections to a database server. Amount of memory allocated for the connection depends on configuration of the database engine.

Remember, the more physical memory you have, the faster the database (and therefore ZABBIX) works!

2.2.1.2. CPU Requirements

ZABBIX and especially ZABBIX database may require significant CPU resources depending on number of monitored parameters and chosen database engine.

2.2.1.3. Examples of hardware configuration

The table provides several hardware configurations:

Name	Platform	CPU/Memory	Database	Monitored hosts
Small	Ubuntu Linux	P2 350MHz 256MB	MySQL MyISAM	20
Medium	Ubuntu	AMD Athlon	MySQL InnoDB	500

	Linux 64 bit	3200+ 2GB		
Large	Ubuntu Linux 64 bit	Intel Dual Core 6400 4GB	MySQL InnoDB or PostgreSQL	>1000

2.2.2. Supported Platforms

Due to security requirements and mission-critical nature of monitoring server, UNIX is the only operating system that can consistently deliver the necessary performance, fault tolerance and resilience. ZABBIX operates on market leading versions.

ZABBIX is tested on the following platforms:

- AIX
- FreeBSD
- HP-UX
- Linux
- Mac OS/X
- OpenBSD
- SCO Open Server
- Solaris

Note: ZABBIX may work on other Unix-like operating systems as well.

2.2.3. Software Requirements

ZABBIX is built around modern Apache WEB server, leading database engines, and the PHP scripting language.

The following software is required to run ZABBIX:

Apache

Version 1.3.12 or later required.

PHP

Version 4.3 or later required. The following modules must be installed: php-gd, php-bcmath, php-mysql or php-postgresql or php-sqlora8 or php-sqlite3.

One of the following database engines:

MySQL

Version 3.22 or later required.

Oracle

Version 9.2.0.4 or later required.

PostgreSQL

Version 7.0.2 or later required. Consider using PostgreSQL 8.x for much better performance.

SQLite

Version 3.3.5 or later required.

Note: ZABBIX may work on previous versions of Apache, MySQL, PostgreSQL as well.

WEB browser on client side

Support for HTML and PNG images required. MS Explorer (5.xx and 6.xx) and Mozilla 1.x work perfectly. Cookies and JavaScript must be enabled. Other browsers may work with ZABBIX as well.

2.2.4. Choice of database engine

ZABBIX supports four database engines:

- MySQL
- Oracle
- PostgreSQL
- SQLite

Each database engine has its own advantages. We cannot recommend one over another. Choice of database engine depends on the following aspects:

- how powerful is your hardware
- free or commercial database engine
- how busy is ZABBIX Server

The table can be used as a general recommendation on choice of database engine.

Usage of ZABBIX Server	Database engine of choice
Heavy duty Node/Standalone	MySQL InnoDB PostgreSQL
Light duty Node/Standalone	MySQL MyISAM PostgreSQL
Remote zero-admin Node	SQLite
Standalone light duty	MySQL MyISAM

2.2.5. Time synchronisation

It is very important to have precise system date on server with ZABBIX running. **timed** is one of most popular daemons that synchronises the host's time with the time of other machines.

2.3. Components

2.3.1. ZABBIX Components

ZABBIX consists of several major software components, the responsibilities of which are outlined below:

2.3.2. ZABBIX Server

This is the centre of the ZABBIX software. The Server can remotely check networked services (such as web servers and mail servers) using simple service checks, but it is also the central component to which the Agents will report availability and integrity information and statistics. The Server is the central repository in which all configuration, statistical and operational data are stored, and it is the entity in the ZABBIX software that will actively alert administrators when problems arise in any of the monitored systems.

ZABBIX can also perform agent-less monitoring and also monitor network devices using SNMP agents.

2.3.3. ZABBIX Agent

In order to actively monitor local resources and applications (such as harddrives, memory, processor statistics etc.) on networked systems, those systems must run the ZABBIX Agent. The Agent will gather operational information from the system on which it is running, and report these data to the ZABBIX for further processing. In case of failures (such as a harddisk running full, or a crashed service process), the ZABBIX Server can actively alert the administrators of the particular machine that reported the failure.

The ZABBIX Agents are extremely efficient because of use of native system calls for gathering statistical information.

2.3.4. The WEB Interface

In order to allow easy access to the monitoring data and then configuration of ZABBIX from anywhere and from any platform, the Web-based Interface is provided. The Interface is a part of the ZABBIX Server, and is usually (but not

necessarily) run on the same physical machine as the one running the ZABBIX Server.

Note: ZABBIX front-end must run on the same physical machine of SQLite is used.

2.4. Installation from Source

2.4.1. Software requirements

Building of ZABBIX server or agents from sources requires additional software.

The following software is required to compile ZABBIX:

One of the following database engines:

MySQL Headers and Libraries

Version 3.22 or later required.

Oracle Headers and Libraries

Sqlora8 headers and libraries are required.

PostgreSQL Headers and Libraries

Version 7.0.2 or later required. Consider using PostgreSQL 8.x for much better performance.

SQLite Headers and Libraries

Version 3.3.5 or later required.

Note: Usually provided as part of mysql-dev, postgresql-dev, sqlite3-dev packages.

NET-SNMP (or UCD-SNMP) library and header files

Required for SNMP support. Optional.

C Compiler

C compiler is required. GNU C compiler is the best choice for open platforms. Other (HP, IBM) C compilers may be used as well.

2.4.2. Structure of ZABBIX distribution

`doc`

The directory contains this Manual in different formats

`src`

The directory contains sources for all ZABBIX processes except frontends.

`src/zabbix_server`

The directory contains Makefile and sources for zabbix_server.

`src/zabbix_agent`

The directory contains Makefile and sources for zabbix_agent and zabbix_agentd.

`src/zabbix_sender`

The directory contains Makefile and sources for zabbix_sender.

`include`

The directory contains include ZABBIX files.

`misc`

`misc/init.d`

The directory contains start-up scripts for different platforms.

`misc/pinger`

The directory contains scripts for ICMP pinging, pinger.pl.

`frontends`

`frontends/php`

The directory contains sources for PHP frontend.

`create`

The directory contains SQL script for initial database creation.

`create/mysql`

MySQL database schema.

`create/postgresql`

PostgreSQL database schema.

[create/data](#)

Data for initial database creation.

[upgrades](#)

The directory contains upgrade procedures for different versions of ZABBIX.

2.4.3. ZABBIX Server

Server side

Step 1 Create the ZABBIX superuser account

This is the user the server will run as. For production use you should create a dedicated unprivileged account ('zabbix' is commonly used). Running ZABBIX as 'root', 'bin', or any other account with special rights is a security risk. Do not do it!

Note: ZABBIX server process (zabbix_server) is protected from being run under root account.

Step 2 Untar ZABBIX sources

```
shell> gunzip zabbix.tar.gz && tar -xvf zabbix.tar
```

Step 3 Create the ZABBIX database

ZABBIX comes with SQL scripts used to create the required database schema and also to insert a default configuration. There are separate scripts for MySQL and PostgreSQL.

For MySQL:

```
shell> mysql -u<username> -p<password>
mysql> create database zabbix;
mysql> quit;
shell> cd create/mysql
shell> cat schema.sql |mysql -u<username> -p<password> zabbix
```

```
shell> cd ../data
shell> cat data.sql |mysql -u<username> -p<password> zabbix
shell> cat images.sql |mysql -u<username> -p<password> zabbix
```

For PostgreSQL:

```
shell> psql -U <username>
psql> create database zabbix;
psql> \q
shell> cd create/postgresql
shell> cat schema.sql|psql -U <username> zabbix
shell> cd ../data
shell> cat data.sql|psql -U <username> zabbix
shell> cat images_pgsql.sql |psql -U <username> zabbix
```

For SQLite:

```
shell> cd create/sqlite
shell> cat schema.sql | sqlite3 /var/lib/sqlite/zabbix.db
shell> cd ../data
shell> cat data.sql | sqlite3 /var/lib/sqlite/zabbix.db
shell> cat images.sql | sqlite3 /var/lib/sqlite/zabbix.db
```

Note: The database will be automatically created if not exists.

Step 4 Configure and compile the source code for your system

The sources must be compiled for both the server (monitoring machine) as well as the clients (monitored machines). To configure the source for the server, you must specify which database will be used.

```
shell> ./configure --enable-server --with-mysql --with-net-snmp # for MySQL
```

or

```
shell> ./configure --enable-server --with-pgsql --with-net-snmp # for PostgreSQL
```

or

```
shell> ./configure --enable-server --with-oracle=/home/zabbix/sqlora8 --with-net-snmplib # for Oracle make
```

Note: Use flag `--with-oracle` to specify location of `sqlora8` library. The library is required for Oracle support. The library can be found at `libsqlora8` homepage

Note: Use flag `--enable-static` to statically link libraries. If you plan to distribute compiled binaries among different servers, you must use this flag to make these binaries work without required libraries. `--enable-static` does not work under Solaris. Flag `--with-ucd-snmplib` can be used instead of `--with-net-snmplib`. If no SNMP support required, both `--with-net-snmplib` and `--with-ucd-snmplib` may be skipped.

However, if you want to compile client binaries along with server binaries, run:

```
shell> ./configure --enable-server --enable-agent --with-mysqllib --with-net-snmplib
```

Parameter `--enable-static` may be used to force static linkage.

Step 5 Make and install everything

```
shell> make install
```

By default,

```
make install
```

will install all the files in `/usr/local/bin`, `/usr/local/lib` etc. You can specify an installation prefix other than `/usr/local` using `--prefix`

Step 6 Configure `/etc/services`

The step is not real requirement. However, it is recommended. On the client (monitored) machines, add the following lines to `/etc/services`:

```
zabbix_agent 10050/tcp
zabbix_trap 10051/tcp
```

Step 7 Configure `/etc/inetd.conf`

If you plan to use `zabbix_agent` instead of the recommended `zabbix_agentd`, the following line must be added:

```
zabbix_agent stream tcp nowait.3600 zabbix /opt/zabbix/bin/zabbix_agent
```

Restart `inetd`

```
shell> killall -HUP inetd
```

Modify default settings in configuration files

Step 8 Configure `/etc/zabbix/zabbix_agent.conf`

You need to configure this file for every host having `zabbix_agent` installed. The file should contain IP address of ZABBIX server. Connections from other hosts will be denied. You may take `misc/conf/zabbix_agent.conf` as example.

Step 9 Configure `/etc/zabbix/zabbix_agentd.conf`

You need to configure this file for every host with `zabbix_agentd` installed. The file should contain the IP address of the ZABBIX server. Connections from other hosts will be denied. You may take `misc/conf/zabbix_agentd.conf` as example.

Step 10 Configure `/etc/zabbix/zabbix_server.conf`

For small installations (up to ten monitored hosts), default parameters are sufficient. However, you should change default parameters to maximize performance from ZABBIX. See section [Performance tuning] for more details.

You may take misc/conf/zabbix_server.conf as example.

Step 11 Run server processes

Run zabbix_server on server side.

```
shell> cd bin
shell> ./zabbix_server
```

Step 12 Run agents

Run zabbix_agentd where necessary.

```
shell> cd bin
shell> ./zabbix_agentd
```

2.4.4. ZABBIX Agent

Client side

Step 1 Create the ZABBIX account

This is the user the agent will run as. For production use you should create a dedicated unprivileged account (“zabbix” is commonly used). ZABBIX agents have protection against running under root account.

Step 2 Untar ZABBIX sources

```
shell> gunzip zabbix.tar.gz && tar xvf zabbix.tar
```

Step 3 Configure and compile the source code for your system

The sources must be compiled for the client only.

To configure the source for the client:

```
shell> ./configure --enable-agent
```

Note: Use flag `--enable-static` to statically link libraries. If you plan to distribute compiled binaries among different servers, you must use this flag to make these binaries work without required libraries.

Step 4 Build agent

```
shell> make
```

Copy created binaries from `bin/` to `/opt/zabbix/bin` or any other directory. Other common directories are `/usr/local/bin` or `/usr/local/zabbix/bin`.

Step 5 Configure `/etc/services`

The step is not real requirement. However, it is recommended.

On the client (monitored) machines, add the following lines to `/etc/services`:

```
zabbix_agent 10050/tcp
```

```
zabbix_trap 10051/tcp
```

Step 6 Configure `/etc/inetd.conf`

If you plan to use `zabbix_agent` instead of the recommended `zabbix_agentd`, the following line must be added:

```
zabbix_agent stream tcp nowait.3600 zabbix /opt/zabbix/bin/zabbix_agent
```

Restart `inetd`

```
shell> killall -HUP inetd
```

Step 7 Configure `/etc/zabbix/zabbix_agent.conf`

You need to configure this file for every host having `zabbix_agent` installed. The file should contain IP address of ZABBIX server. Connections from other hosts will be denied. Note, that no end of line character should present in the file.

You may take `misc/conf/zabbix_agent.conf` as example.

Step 8 Configure `/etc/zabbix/zabbix_agentd.conf`

You need to configure this file for every host with `zabbix_agentd` installed. The file should contain IP address of ZABBIX server. Connections from other hosts will be denied. You may take `misc/conf/zabbix_agentd.conf` as example.

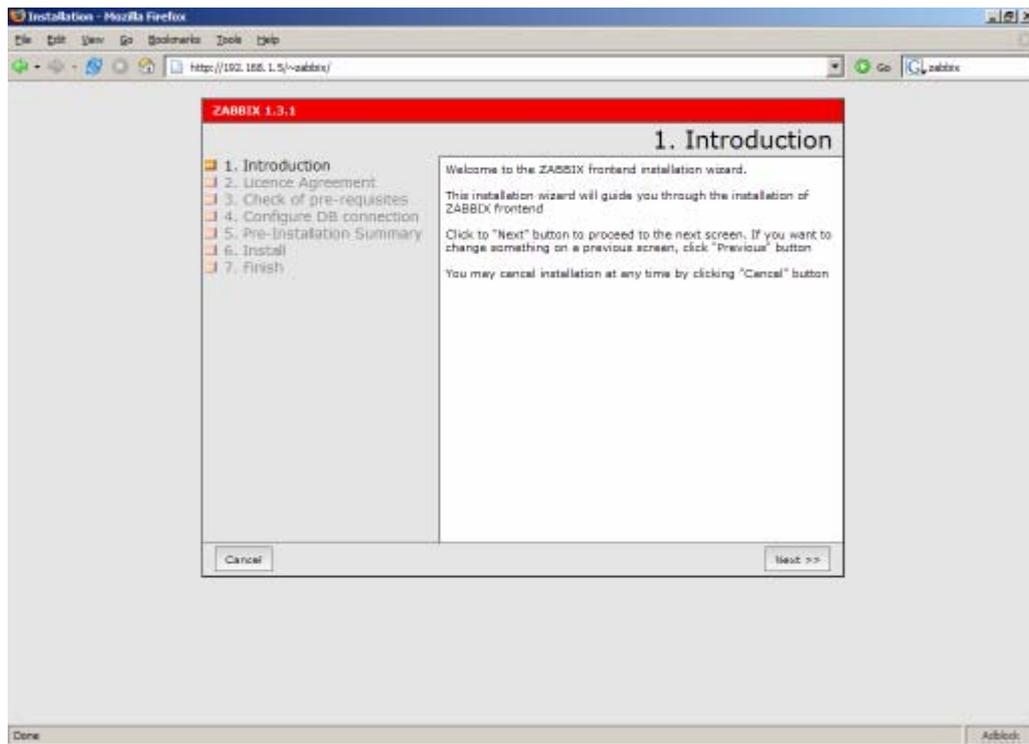
Step 9 Run `zabbix_agentd` on all monitored machines

```
shell> /opt/zabbix/bin/zabbix_agentd
```

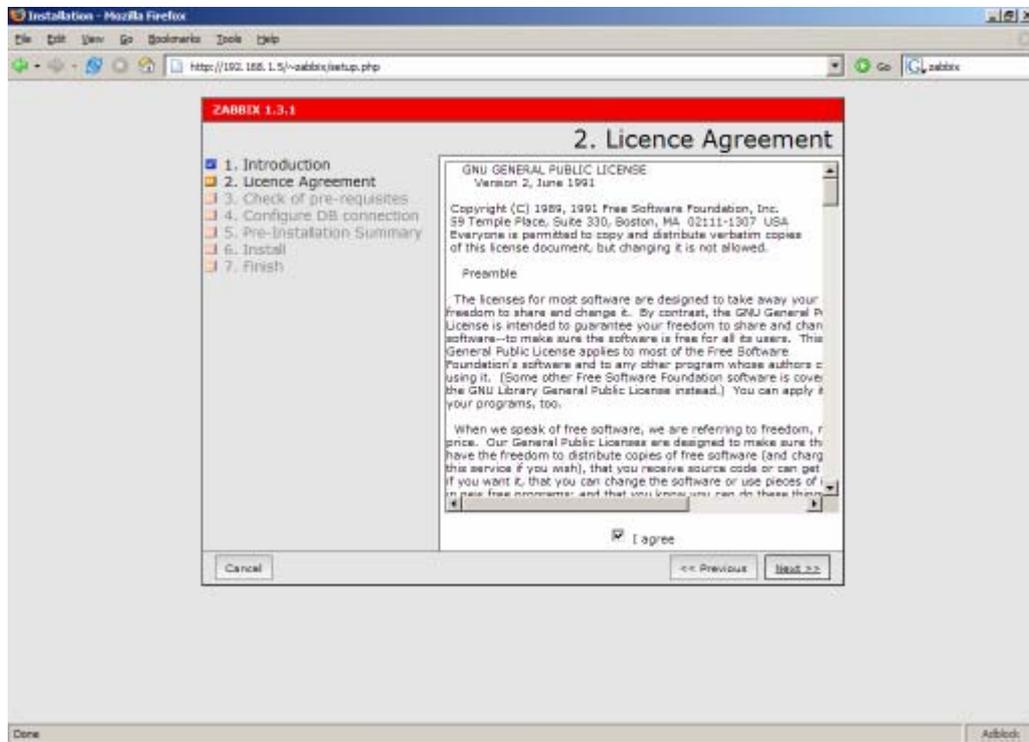
Note: You should not run `zabbix_agentd` if you have chosen to use `zabbix_agent`!

2.4.5. ZABBIX WEB Interface

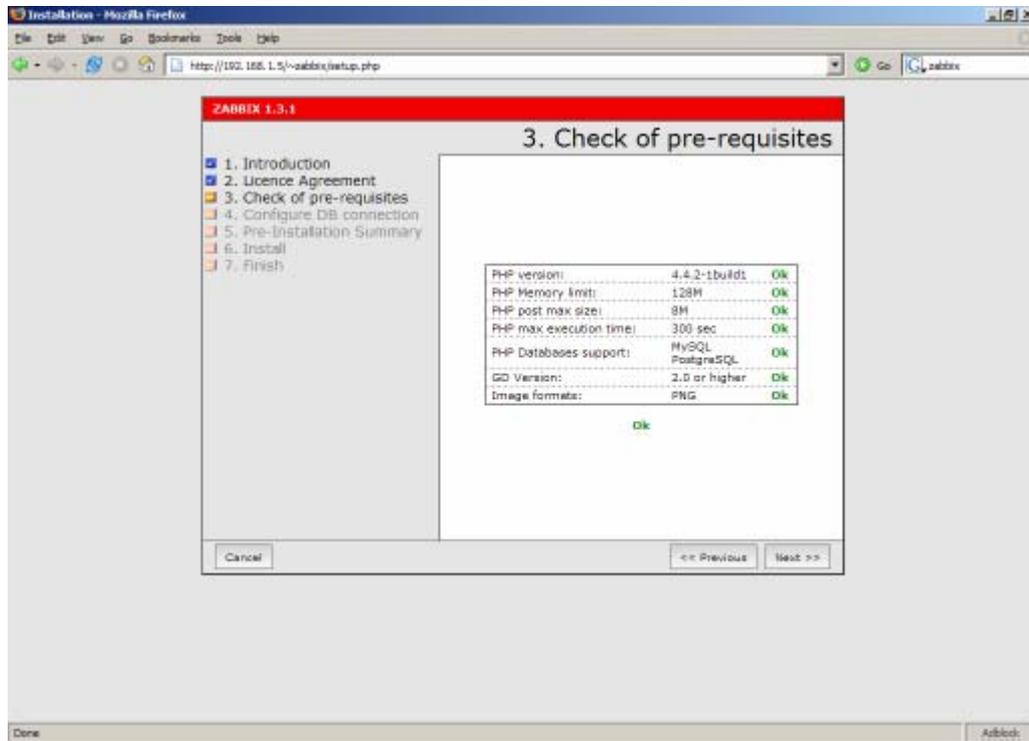
Step 1 Point your browser to ZABBIX URL.



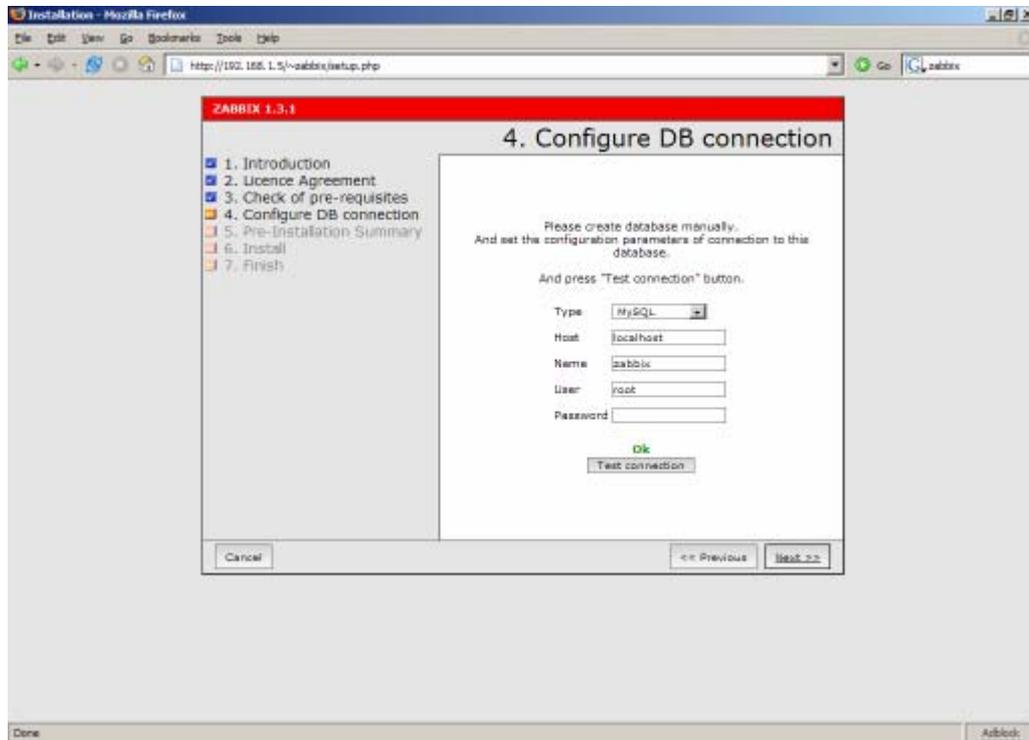
Step 2 Read and accept GPL v2.



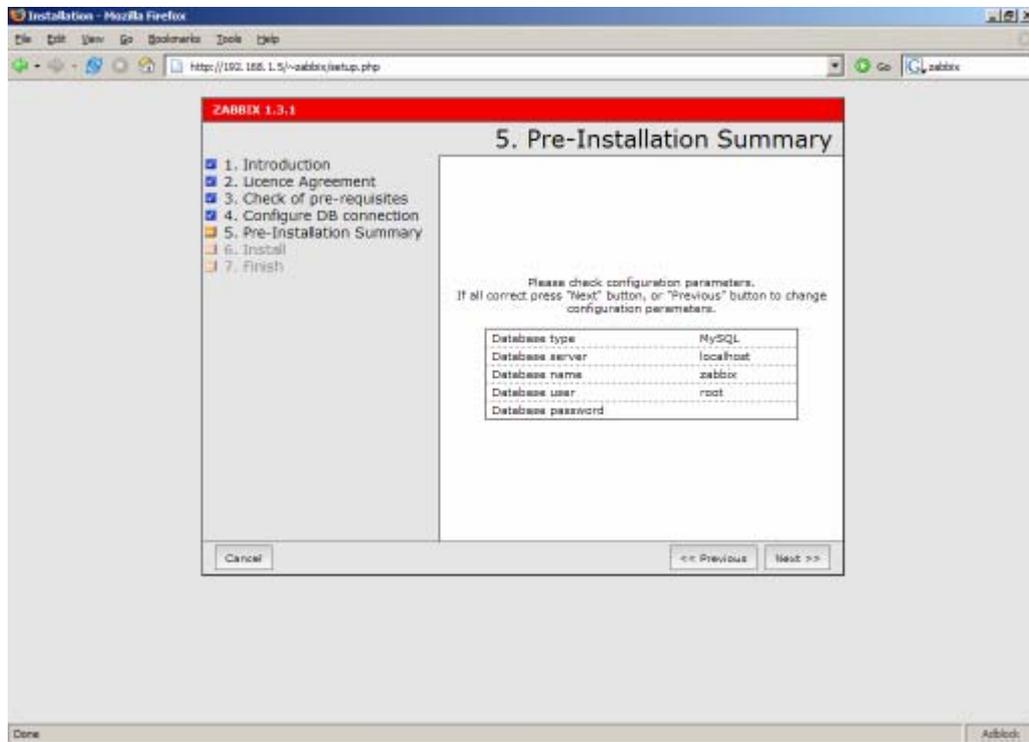
Step 3 Make sure that all software pre-requisites are met.



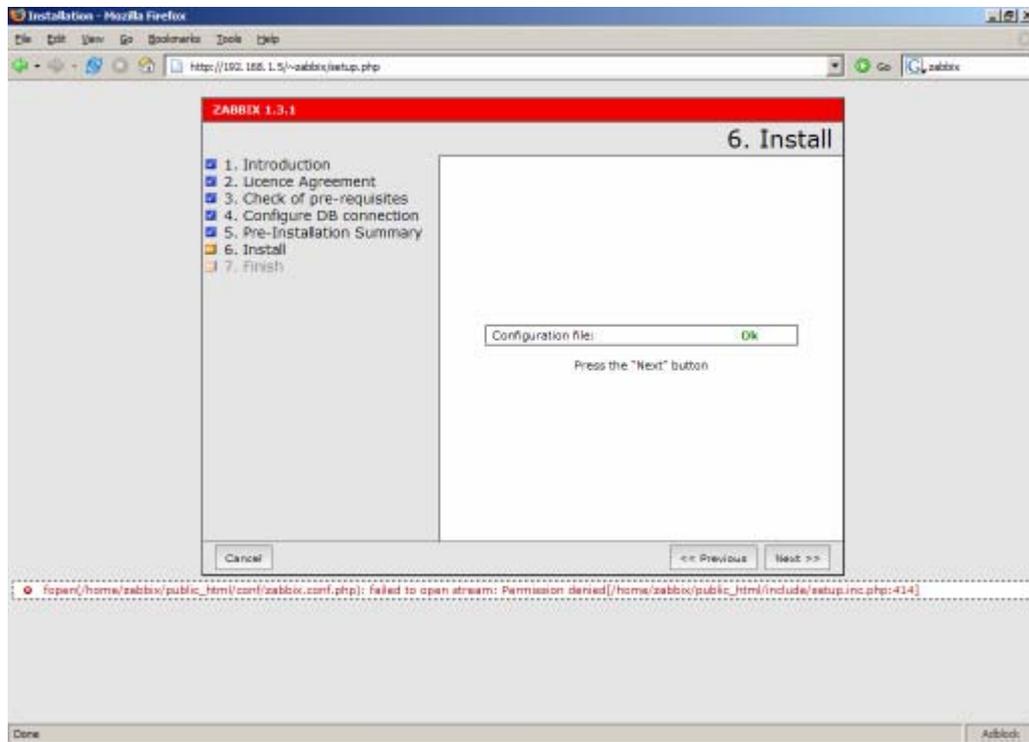
Step 4 Configure database settings. ZABBIX database must already be created.



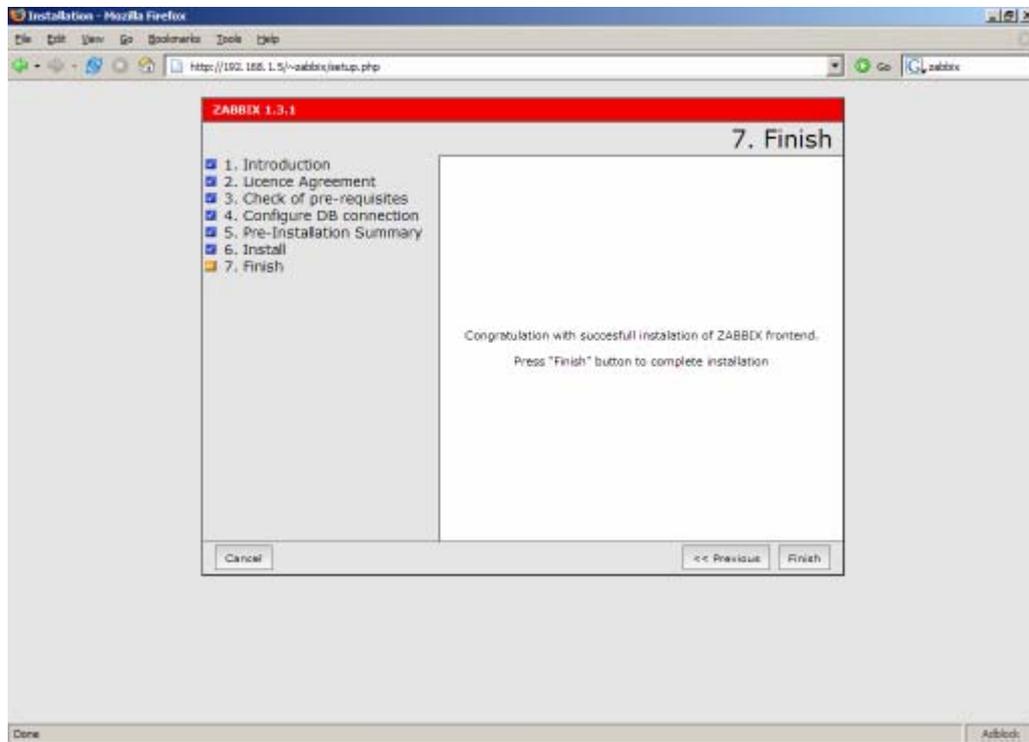
Step 5 See summary of settings.



Step 6 Download configuration file and place it under conf/.



Step 7 Check if everything is fine.



Step 9 For distributed monitoring only!

If used in a distributed environment you have to run:

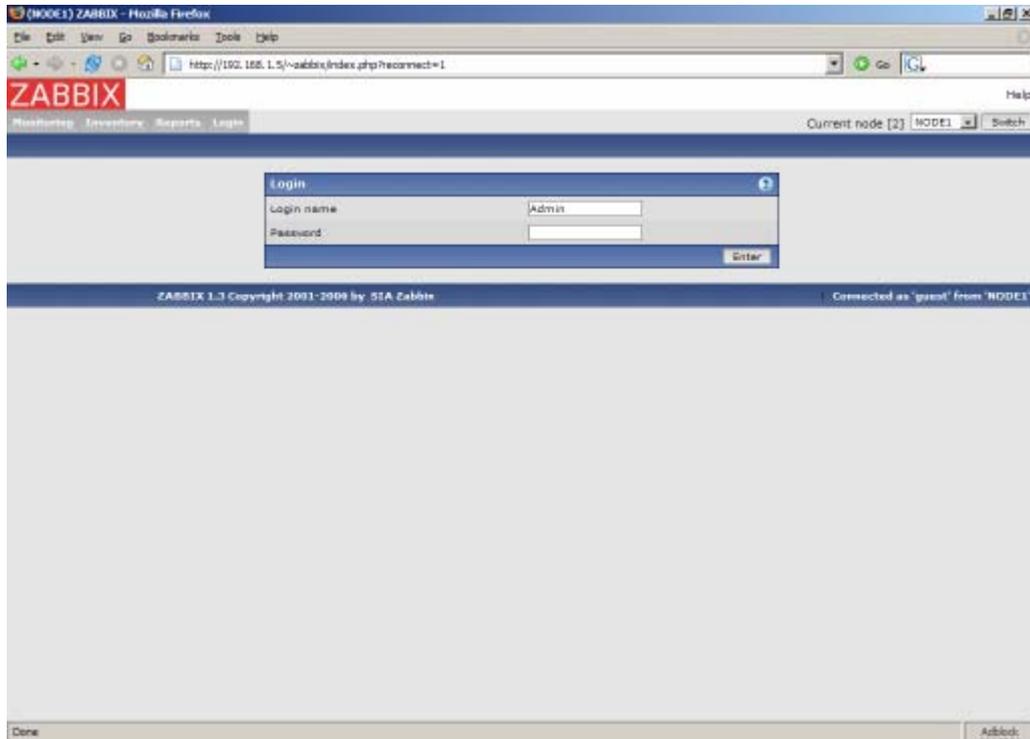
```
shell> ./zabbix_server -n <nodeid>
```

where Node ID is an unique Node identifier. For example:

```
shell> ./zabbix_server -n 1
```

This will convert database data for use with Node ID '1' and also adds a node.

Step 10 ZABBIX frontend is ready! Default username is 'Admin' with no password.



2.5. Upgrading

The upgrade procedure is quite simple. New binaries and frontend should be installed according to latest installation instructions. In order to update database structure, the following steps should be performed.

The upgrade process can take from 0 seconds (if no patches required) to several hours. Note that before applying database patches, all ZABBIX processes must be stopped.

Database upgrade is usually required for upgrade from one major stable release to another. For example, from 1.1.x to 1.4.x.

For production installations a database backup is required!

2.5.1. Database upgrade

Go to the upgrades/dbpatches directory. In this directory are subdirectories named according to a version upgrade (e.g. 1.0beta3_to_1.0beta4). Enter the directory corresponding to your upgrade (if you are upgrading through multiple versions, you will need to apply the upgrades one at a time). Depending on which database you use:

```
shell> cd mysql; cat patch.sql |mysql zabbix -u<username> -p<password>
```

or

```
shell> cd postgresql; cat patch.sql|psql -U <username> zabbix
```

Do not forget to upgrade PHP front-end files.

Finally, read version specific notes below for any extra procedures and useful information.

3. ZABBIX Processes

3.1. ZABBIX Server

ZABBIX Server is a central process of ZABBIX software. ZABBIX Server can be started by executing:

```
shell> cd bin
shell> ./zabbix_server
```

ZABBIX Server runs as a daemon process.

ZABBIX Server accepts the following command line parameters:

```
-c --config <file>    specify configuration file, default is
                      /etc/zabbix/zabbix_server.conf
-h --help             give this help
-v --version          display version number
```

In order to get this help run:

```
shell> zabbix_server -h
```

Example of command line parameters:

```
shell> zabbix_server -c /usr/local/etc/zabbix_server.conf
shell> zabbix_server --help
shell> zabbix_server -v
```

The configuration file contains parameters for **zabbix_server**. The file must exist and it should have read permissions for user 'zabbix'. Supported parameters:

Parameter	Mandatory	Default value	Description
AlertScriptsPath	No	/home/zabbix/bin	Location of scripts for user-defined media types.
DBHost	Yes	-	Database name. Usually

Parameter	Mandatory	Default value	Description
			'zabbix'.
DBName	Yes	-	Database name. Usually 'zabbix'.
DBSocket	No	-	DB socket name. Used for non-TCP connection to MySQL database. Example: /tmp/mysql.sock
DBPassword	No	NULL	Database password. If password is not used, then this parameter must be commented.
DBUser	No	NULL	User name for connecting to the database.
DebugLevel	No	3	Debug level, one of 0 – none 1 – critical 2 – errors 3 – warnings 4 – debug
DisableHousekeeping	No	0	If set to 1, housekeeper will be disabled.
FpingLocation	No	/usr/sbin/fping	Location of ICMP pinger. It must have setuid flag set.
HousekeepingFrequency	No	1	The parameter defines how often the daemon must perform housekeeping procedure (in hours). If PostgreSQL is used set the value to 24 as it will perform command VACUUM.
ListenIP	No	-	Interface to listen by trapper processes. Trapper will listen to all interfaces if this parameter is not set.
ListenPort	No	10051	Port number to listen by trapper processes.
LogFile	No	-	Name of log file. If not set, syslog is used.
NodeID	No	0	Unique NodeID (0-999). Must be '0' or missing for standalone ZABBIX Server.

Parameter	Mandatory	Default value	Description
PidFile	No	<code>/tmp/zabbix_server.pid</code>	Name of file to store PID
PingerFrequency	No	30	ZABBIX server ping servers once per PingerFrequency seconds (1-3600).
SenderFrequency	No	30	The parameter defines how often the daemon must try to send alerts (in seconds)
StartPollers	No	5	Number of pollers to start (0-255).
StartPollersUnreachable	No	5	Number of pollers for unreachable hosts to start (0-255).
StartTrappers	No	5	Number of trappers to start (0-255)
Timeout	No	5	Do not spend more than Timeout seconds on retrieving requested value (1-255) Note: Example of the configuration file can be found at <code>misc/conf/zabbix_server.conf</code>
TrapperTimeout	No	5	Do not spend more than Timeout seconds on processing of traps (1-255)
UnavailableDelay	No	60	How often try to connect to unavailable host
UnreachableDelay	No	15	How often try to connect to unreachable host
UnreachablePeriod	No	45	If a host was unreachable for more than UnreachablePeriod seconds, change host status to Unavailable

3.2. ZABBIX Agent (UNIX, standalone daemon)

ZABBIX UNIX Agent runs on a host being monitored. The agent provides host's performance and availability information for ZABBIX Server.

ZABBIX Agent processes items of type 'ZABBIX Agent' or 'ZABBIX Agent (active)'.

ZABBIX Agent can be started by executing:

```
shell> cd bin
shell> ./zabbix_agentd
```

ZABBIX Agent runs as a daemon process.

ZABBIX Agent accepts the following command line parameters:

```
-c --config <file>    specify configuration file, default is
                      /etc/zabbix/zabbix_agentd.conf
-h --help             give this help
-v --version          display version number
-p --print            print supported metrics and exit
-t --test <metric>   test specified metric and exit
```

In order to get this help run:

```
shell> zabbix_agentd -h
```

Example of command line parameters:

```
shell> zabbix_agentd -c /usr/local/etc/zabbix_agentd.conf
shell> zabbix_agentd -help
shell> zabbix_agentd -print
shell> zabbix_agentd -t "system.cpu.load[all,avg1]"
```

The configuration file contains configuration parameters for **zabbix_agentd**. The file must exist and it should have read permissions for user 'zabbix'. Supported parameters:

Parameter	Mandatory	Default value	Description
DebugLevel	No	3	Debug level:

Parameter	Mandatory	Default value	Description
			0 – none 1 – critical 2 – errors 3 – warnings 4 – debug
DisableActive	No	0	Disable processing of active checks. The agent will not connect to ZABBIX server to get list of active items.
EnableRemoteCommands	No	0	Enable remote commands. ZABBIX server will be able to send commands for execution by the agent.
Hostname	No	System's hostname.	Unique host name. The hostname is used for active checks only.
ListenIP	No	-	IP address to bind agent to. Useful if the host has multiple interfaces.
ListenPort	No	10050	Port number to listen.
LogFile	No	-	Name of log file. If not set, syslog is used.
NoTimeWait	No	-	Experimental parameter. If set, no sockets in TIME_WAIT state will exist. Works on FreeBSD.
PidFile	No	/tmp/zabbix_agentd.pid	Name of PID file.
RefreshActiveChecks	No	120	The agent will refresh list of active checks once per 120 (default) seconds.
Server	Yes	-	Comma-delimited list of IP addresses of ZABBIX servers. Connections from other IP addresses will be rejected.
ServerPort	No	10051	The agent will connect to this server port for processing active checks.
StartAgents	No	5	Number of agents to start.
Timeout	No	3	Do not spend more than

Parameter	Mandatory	Default value	Description
			Timeout seconds on getting requested value (1-255). The agent does not kill timeouted User Parameters processes!
UserParameter	No	-	User-defined parameter to monitor. There can be several user-defined parameters. Value has form , Example:UserParameter=users,who wc -l Note: Example of the configuration file can be found at misc/conf/zabbix_agentd.conf.

3.3. ZABBIX Agent (UNIX, Inetd version)

The file contains configuration parameters for **zabbix_agent**. The file must exist and it should have read permissions for user 'zabbix'. Supported parameters:

Parameter	Mandatory	Default value	Description
Server	Yes	-	Comma-delimited list of IP addresses of ZABBIX servers. Connections from other IP addresses will be rejected.
Timeout	No	3	Do not spend more that Timeout seconds on getting requested value (1-255). The agent does not kill timeouted User Parameters processes!
UserParameter	No	-	User-defined parameter to monitor. There can be several user-defined parameters. Example:UserParameter=users,who wc -l

Note: Example of the configuration file can be found at `misc/conf/zabbix_agent.conf`

3.4. ZABBIX Agent (Windows)

ZabbixW32 is ZABBIX agent for Win32 systems. It will work on Windows NT 4.0, Windows 2000, and Windows XP. ZabbixW32 doesn't work on other Windows platforms.

3.4.1. Installation

Installation is very simple and includes 3 steps:

- Unpack ZabbixW32.exe
- Create configuration file `c:/zabbix_agentd.conf` (it has the same syntax as UNIX agent).
- Run this command to install ZABBIX as a service.

ZabbixW32.exe install

If you wish to use configuration file other than `c:\zabbix_agentd.conf`, you should use the following command for service installation:

```
ZabbixW32.exe --config <your_configuration_file> install
```

Full path to configuration file should be specified.

Now you can use Control Panel to start agent's service or run:

ZabbixW32.exe start

Note: Windows NT 4.0 note. ZabbixW32 uses PDH (Performance Data Helper) API to gather various system information, so PDH.DLL is needed. This DLL is not supplied with Windows NT 4.0, so you need to download and install it by yourself. Microsoft Knowledge Base article number 284996 describes this in detail and contains a download link. You can find this article at <http://support.microsoft.com/default.aspx?scid=kb;en-us;284996>

3.4.2. Usage

Command line syntax:

```
zabbixw32 [options] [command]
```

Where possible commands are:

check-config

Check configuration file and exit

standalone

Run in standalone mode

start

Start ZABBIX Win32 Agent service

stop

Stop ZABBIX Win32 Agent service

install

Install ZABBIX Win32 Agent as service

remove

Remove previously installed ZABBIX Win32 Agent service

install-events

Install ZABBIX Win32 Agent as event source for Event Log. This is done automatically when service is being installed.

* remove-events

Remove ZABBIX Win32 Agent event source. This is done automatically when service is being removed.

* help

Display help information

* version

Display version information

And possible options are:

* --config <file>

Specify alternate configuration file (default is C:\zabbix_agentd.conf)

The file contains configuration parameters for ZabbixW32. Supported parameters:

Parameter	Mandatory	Default value	Description
Alias	No	-	Sets the alias for parameter. It can be useful to substitute long and complex parameter name with a smaller and simpler one. For example, if you wish to retrieve paging file usage in percents from the server, you may use parameter "perf_counter[\Paging File(_Total)\% Usage]", or you may define an alias by adding the following line to configuration file: Alias = pg_usage:perf_counter[\Paging File(_Total)\% Usage] After that you can use

Parameter	Mandatory	Default value	Description
			parameter name "pg_usage" to retrieve the same information. You can specify as many "Alias" records as you wish. Please note that aliases cannot be used for parameters defined in "PerfCounter" configuration file records.
DebugLevel	No	-	The parameter has no effect.
ListenPort	No	10050	Port number to listen.
LogFile	No	-	Name of log file. If not set, syslog is used.
LogUnresolvedSymbols	No	-	Controls logging of unresolved symbols during agent startup. Values can be strings 'yes' or 'no' (without quotes).
MaxCollectorProcessingTime	No	100	Sets maximum acceptable processing time of one data sample by collector thread (in milliseconds). If processing time will exceed specified value, warning message will be written to the log file.
NoTimeWait	No	-	The parameter has no effect.
PerfCounter	No	-	<p><parameter_name>,"<perf_counter_path>",<period></p> <p>Defines new parameter <parameter_name> which is an average value for system performance counter <perf_counter_path> for the specified time period <period> (in seconds).</p> <p>For example, if you wish to receive average number of processor interrupts per second for last minute, you can define new parameter "interrupts" as following:</p> <p>PerfCounter =</p>

Parameter	Mandatory	Default value	Description
			interrupts,"\\Processor(0)\\Interrupts/sec",60 Please note double quotes around performance counter path. Samples for calculating average value will be taken every second.
PidFile	No	-	The parameter has no effect.
Server	Yes	-	Comma-delimited list of IP addresses of ZABBIX servers. Connections from other IP addresses will be rejected.
StartAgents	No	-	The parameter has no effect.
UserParameter	No	-	User-defined parameter to monitor. There can be several user-defined parameters. Value has form <key>,<shell command>. Do not use spaces around pipe (!) characters! Example:UserParameter=test ,echo 1

3.5. ZABBIX Sender (UNIX)

3.6. ZABBIX Get (UNIX)

ZABBIX UNIX Get is a process which communicates with ZABBIX Agent and retrieves required information.

The utility is usually used for troubleshooting of ZABBIX Agents.

ZABBIX Get can be started by executing:

```
shell> cd bin
shell> ./zabbix_get -s127.0.0.1 -p10050 -k"system.cpu.load[all,avg1]"
```

ZABBIX Get accepts the following command line parameters:

- p --port <port number> Specify port number of agent running on the host. Default is 10050.
- s --host <host name or IP> Specify host name or IP address of a host.
- k --key <key of metric> Specify metric name (key) we want to retrieve.
- h --help Give this help.
- v --version Display version number.

In order to get this help run:

```
shell> zabbix_get -h
```

4. Configuration

4.1. Development Environment

Ubuntu Linux is used as a primary development platform for ZABBIX.

Four servers are used for test purposes:

- Debian Linux 2.1, Intel PII/350Mhz, 192MB, IDE
- SuSe 8.1, Intel P4/1.6Mhz, 512MB, IDE
- Ubuntu 6.06, AMD Athlon 64 3200+, 2GB, SATA
- Ubuntu 6.10, Intel Core2 6400 2.13 GHz, 2GB, SATA

If you have difficulties choosing between Linux and other OS, go for the following Linux distributions, you will get better support:

- Debian Linux
- RedHat Linux
- SuSE Linux
- Ubuntu Linux

4.2. General Configuration

4.2.1. Housekeeper

The Housekeeper is a periodical process which is executed by ZABBIX Server. The process removes outdated information and information deleted by user.

Configuration parameters:

Parameter	Description
Do not keep actions older than (in days)	This parameter defines how many days of executed actions (emails, SMS, etc) history ZABBIX will keep in the database. Older actions will be removed.
Do not keep events older than (in days)	This parameter defines how many days of events history ZABBIX will keep in the database. Older events

Parameter	Description
	will be removed.

4.2.2. Images

ZABBIX images are stored in the database. There are two types of images:

- Icon
- Background

Icons are used in for displaying System Map elements.

Backgrounds are used as background images of System Maps.

Image attributes:

Parameter	Description
Name	Unique name of an image.
Type	Either Icon or Background
Upload	Name of local file (PNG, JPEG) to be uploaded to ZABBIX

4.2.3. Value mapping

Value maps are used to create a mapping between numeric values and string representations.

For example, an item which has value '0' or '1' can use value mapping to represent the values in human readable form:

'0' => 'Not Available'

'1' => 'Available'

Note: Value mapping can be used only for items having type 'Unsigned integer'.

Value mappings are used for representation of data in both ZABBIX front-end and information sent by email/SMS/whatever.

Parameters of a value mapping:

Parameter	Description
Name	Unique name of set of value mappings.
Mapping	Set of mappings.

Parameter	Description
New mapping	Single mapping for addition.

4.2.4. Working time

Working time is system-wide parameter which defines working time.

This is used for graphs. Working time is displayed as a white background, while non-working time is displayed as grey.

Working time has the following format:

dd-dd, hh:mm-hh:mm;dd-dd, hh:mm-hh:mm,...

FORMAT	DESCRIPTION
dd	Day of week: 1 – Monday, 2 – Tuesday ,... , 7 – Sunday
hh	Hours: 00-24
mm	Minutes: 00-59

Empty format is equal to 01-07,00:00-23:59

For example:

1-5,09:00-18:00

1-5,09:00-18:00;6-7,10:00-16:00

4.3. Actions

ZABBIX reacts to events by executing actions. An action can be defined for any event or set of events generated by ZABBIX.

ZABBIX supports two types of actions:

- Send message
- Remote command(s)

Action attributes:

Parameter	Description
Action type	Type of action: Send message, Execute command

Parameter	Description
Source	Source of event. Currently only one is supported: Trigger
Conditions	List of conditions for activation of the action.
Send message to	Send message either to User group or Single user .
Group	User group. The message will be sent to all users of this group.
User	The message will be sent to this user.
Subject	Subject of the message. The subject may contain macros as well.
Message	The message itself. The message may contain macros.
Repeat	Send repeat messages. ZABBIX stops sending repeated messages if the trigger changes its status.
Number of repeats	Number of repeated messages to send.
Delay between repeats	Delay (in seconds) before sending next repeat message.
Status	Action status: Enabled, Disabled .

4.3.1. Action conditions

An action is executed only in case if an event matches defined set of conditions.

The following conditions can be defined:

Condition type	Supported operators	Description
Host group	=, <>	Compare against Host Group having a trigger which generated event. = - event came from this Host Group <> - event did not come from this Host Group
Host	=, <>	Compare against Host having a trigger which generated event. = - event came from this Host <> - event did not come from this Host
Trigger	=, <>	Compare against Trigger which generated event.

Condition type	Supported operators	Description
		= - event generated by this Trigger <> - event generated by other Trigger
Trigger name	like, not like	Compare against Trigger Name which generated event. like – String can be found in Trigger Name. Case sensitive. not like – String cannot be found in Trigger Name. Case sensitive.
Trigger severity	=, <>, >=, <=	Compare about Trigger Severity. = - equal to trigger severity <> - not equal to trigger severity >= - more or equal to trigger severity <= - less or equal to trigger severity
Trigger value	=	Compare against Trigger Value. = - equal to trigger value (ON or OFF)
Time period in	in	Even is in time period. in – event time matches the time period Time period is given in format: dd-dd, hh:mm-hh:mm; dd-dd, hh:mm:hh:mm; ...

Trigger value:

- Trigger changes status from FALSE to TRUE (trigger value is TRUE)
- Trigger changes status from TRUE to FALSE (trigger value is FALSE)

Note: Status change FALSE->UNKNOWN->TRUE is treated as FALSE->TRUE, and TRUE->UNKNOWN->FALSE as TRUE->FALSE.

Action is executed if ALL conditions having different types match an event.

If an action contains several conditions of the same type, at least one condition with this type must be true.

For example this set of conditions:

Host group = Oracle servers

Host group = MySQL servers

Trigger name like 'Database is down'

Trigger name like 'Database is unavailable'

is evaluated as

(Host group = Oracle servers **or**

Host group = MySQL servers) **and**

(Trigger name like 'Database is down' **or**

Trigger name like 'Database is unavailable')

4.3.2. Macros for messages

ZABBIX supports number of macros which may be used in messages.

The following macros are supported:

MACRO	DESCRIPTION
{DATE}	Current date in yyyy.mm.dd. format.
{EVENT.ID}	Numeric event ID which triggered this action.
{HOSTNAME}	Hostname of first item of the trigger which caused a notification.
{IPADDRESS}	IP address of first item of the trigger which caused a notification.
{STATUS}	Alias for {TRIGGER.STATUS}.
{TIME}	Current time in hh:mm:ss.
{TRIGGER.ID}	Numeric trigger ID which triggered this action.
{TRIGGER.KEY}	Key of first item of the trigger which caused a notification.
{TRIGGER.NAME}	Name (description) of the trigger.
{TRIGGER.SEVERITY}	Trigger severity. For example, 'Disaster'.
{TRIGGER.STATUS}	Trigger state. ON - if trigger is in TRUE state, OFF - if trigger is in FALSE state.

{host:key.func(param)} Simple macros as used in trigger expressions.

Example 1 Subject: {TRIGGER.NAME}; {TRIGGER.STATUS}

Message subject will be replaced by something like:

'Processor load is too high on server zabbix.zabbix.com: ON'

Example 2 Message: Processor load is:
{zabbix.zabbix.com:system.cpu.load[,avg1].last(0)}

The message will be replaced by something like:

'Processor load is: 1.45'

4.4. Applications

Application is asset of host items. For example, application 'MySQL Server' may contain all items which are related to the MySQL server: availability of MySQL, disk space, processor load, transactions per second, number of slow queries, etc.

An item may be linked with one or more applications.

Application are used in ZABBIX front-end to group items.

4.5. Graphs

User-defined graphs allow the creation of complex graphs. These graphs can be easily accessed via the menu item "Graphs".

4.6. Medias

Media is a delivery channel for ZABBIX alerts. None, one or more media types can be assigned to user.

4.6.1. EMAIL

Email notification

4.6.2. SCRIPT

Custom script. ZABBIX passes three command line parameters to the script: Recipient, Subject and Message.

4.6.3. GSM Modem

Custom script. ZABBIX passes three command line parameters to the script: Recipient, Subject and Message.

4.7. Hosts

Host attributes:

Parameter	Description
Name	Unique host name. The name must be unique within ZABBIX Node. If no IP address is given, the name is used as a DNS name for accessing host ZABBIX or SNMP agent or performing Simple Checks.
Groups	List of host groups the host belongs to.
New group	Assign new host group.
Use IP address	Use IP address instead of host name. It is recommended as it won't require any dependency on DNS servers and it works faster.
IP address	IP address.
Port	Port number of ZABBIX Agent running on this host. If no ZABBIX agent is used, the port is ignored. Use standard ZABBIX port number 10050.
Status	Monitored – the host is monitored Not monitored – the host is not monitored
Link with templates	Link host with one or many templates.
Use profile	Use host profile.

4.8. Host templates

Use of templates is an excellent way of making maintenance of ZABBIX much easier.

A template can be linked to a number of hosts. Item, triggers and graphs of the template will be automatically added to the linked hosts. Change definition of a template item (trigger, graphs) and the change will be automatically applied to the hosts.

Host template attributes:

Parameter	Description
Name	Unique template (host) name. The name must be unique within ZABBIX Node.
Groups	List of host groups the template belongs to.
New group	Assign new host group to the template.
Link with template	Used to create hierarchical templates.

4.9. Host groups

Host group may have zero, one or more hosts.

Host group attributes:

Parameter	Description
Group name	Unique host group name. The name must be unique within ZABBIX Node.
Hosts	List of hosts of this group.

4.10. Items

Flexible and non-flexible parameters

Flexible parameter is parameter which accepts argument. For example, `vfs.fs.free[*]` is flexible parameter. `*` is any string that will be passed as argument of the parameter. `vfs.fs.free[/]`, `vfs.fs.free[/opt]` - correct definitions.

String between `[]` may contain the following characters:

0-9a-zA-Z.:(),_[space]

4.10.1. Supported by Platform

Please consult ZABBIX Manual for Windows parameters. The table is valid for ZABBIX 1.1beta3 and higher.

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Max OS/X
agent.ping		X	X	X	X	X	X	X	X	?
agent.varision		X	X	X	X	X	X	X	X	?
kernel.maxfiles		?	X	X	X	-	-	-	-	?
kernel.maxproc		?	-	-	X	X	-	-	-	?
net.if.collisions[if]		?	X	X	X	X	-	-	-	?
net.if.in[if<,mode>]		?	X	X	-	X	-	-	-	?
mode	bytes	?	X	X	-	X	-	-	-	-
	packets	?	X	X	-	X	-	-	-	-
	errors	?	X	X	-	X	-	-	-	-
	dropped	?	X	X	-	-	-	-	-	-
net.if.out[if<,mode>]		?	X	X	-	X	-	-	-	?
mode	bytes	?	X	X	-	X	-	-	-	-
	packets	?	X	X	-	X	-	-	-	-

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Max OS/X
	errors	?	X	X	-	X	-	-	-	-
	dropped	?	X	X	-	-	-	-	-	-
net.tcp.dns[ip,zone]		?	X	X	X	X	X	X	X	?
net.tcp.listen[port]		?	-	-	X	X	-	-	-	?
net.tcp.port[<ip,>port]		X	X	X	X	X	X	X	X	X
net.tcp.service.perf[service<,ip><,port>]		?	X	X	X	X	X	X	X	?
net.tcp.servic es[service<,ip><,port>]		?	X	X	X	X	X	X	X	?
proc.mem[<name><,user><,mode>]		?	X	X	-	X	-	X	X	?
mode	sum	?	X	X	-	X	-	X	X	?
	avg	?	X	X	-	X	-	X	X	?
	max	?	X	X	-	X	-	X	X	?
	min	?	X	X	-	X	-	X	X	?
proc.num[<name><,user><,state>]		?	X	X	-	X	-	X	X	?
state	all	?	X	X	-	X	-	X	X	?
	sleep	?	X	X	-	X	-	X	X	?
	zomb	?	X	X	-	X	-	X	X	?
	run	?	X	X	-	X	-	X	X	?
system.cpu.intr		?	X	X	X	X	-	-	-	?
system.cpu.load[<cpu> <,mode>]		X	X	X	-	X	X	-	-	?
mode	avg1	?	X	X	-	X	X	-	-	?

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Max OS/X
	avg5	?	X	X	-	X	X	-	-	?
	avg15	?	X	X	-	X	X	-	-	?
system.cpu.switches		?	-	-	X	X	-	-	-	?
system.cpu.util[<cpu><,type><,mode>]		X	-	X	X	X	-	-	-	?
type	user	?	-	X	X	X	X	-	-	?
	nice	?	-	X	X	-	X	-	-	?
	idle	?	-	X	X	X	X	-	-	?
	system	?	-	X	X	-	X	-	-	?
	kernel	?	-	-	-	X	X	-	-	?
	wait	?	-	-	-	X	X	-	-	?
mode	avg1	?	X	X	-	-	X	-	-	?
	avg5	?	X	X	-	-	X	-	-	?
	avg15	?	X	X	-	-	X	-	-	?
system.run[command<,mode>]		X	X	X	X	X	X	X	X	X
mode	wait	X	X	X	X	X	X	X	X	X
	nowait	X	X	X	X	X	X	X	X	X
system.hostname		X	X	X	X	X	X	X	X	X
system.localtime		?	X	X	-	X	X	X	X	?
system.swap.in[<swap><,type>]		?	-	X	-	X	-	-	-	?
type	count	?	-	-	-	X	-	-	-	?
	pages	?	-	-	-	X	-	-	-	?
system.swap.out[<swap><,type>]		?	-	X	-	X	-	-	-	?

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Max OS/X
type	count	?	-	-	-	X	-	-	-	?
	pages	?	-	-	-	X	-	-	-	?
system.swap.size[<swap><,type>]		X	X	X	X	X	-	-	X	?
mode	free	?	X	X	X	X	-	-	X	?
	total	?	X	X	X	X	-	-	X	?
system.uname		X	X	X	X	X	X	X	X	?
system.uptime		?	X	X	-	X	-	-	-	?
system.users.num		?	X	X	-	X	X	X	X	?
vfs.dev.read[device<,type><,mode>]		?	X	X	X	X	?	?	?	?
type	sectors	?	X	X	-	-	-	-	-	?
	operations	?	X	X	-	X	-	-	-	?
	bytes	?	-	-	-	X	-	-	-	?
	ops	?	-	-	X	-	-	-	-	?
	bps	?	-	-	X	-	-	-	-	?
mode	avg1	?	-	-	X	-	-	-	-	?
	avg5	?	-	-	X	-	-	-	-	?
	avg15	?	-	-	X	-	-	-	-	?
vfs.dev.write[device<,type><,mode>]		?	X	X	X	X	?	?	?	?
type	sectors	?	X	X	-	-	-	-	-	?
	operations	?	X	X	-	X	-	-	-	?

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Max OS/X
	bytes	?	-	-	-	X	-	-	-	?
	ops	?	-	-	X	-	-	-	-	?
	bps	?	-	-	X	-	-	-	-	?
mode	avg1	?	-	-	X	-	-	-	-	?
	avg5	?	-	-	X	-	-	-	-	?
	avg15	?	-	-	X	-	-	-	-	?
vfs.file.cksum[file]		X	X	X	X	X	X	X	X	?
vfs.file.exists[file]		?	X	X	-	X	X	X	X	?
vfs.file.md5sum[file]		X	X	X	X	X	X	X	X	?
vfs.file.regexp[file, user]		?	X	X	-	X	X	X	X	?
vfs.file.regmatch[file, user]		?	X	X	-	X	X	X	X	?
vfs.file.size[file]		X	X	X	-	X	X	X	X	?
vfs.file.time[file,<,mode>]		?	X	X	X	X	X	X	X	?
mode	modify	?	X	X	X	X	X	X	X	?
	access	?	X	X	X	X	X	X	X	?
	change	?	X	X	X	X	X	X	X	?
vfs.file.inode[fs,<,mode>]		?	X	X	X	X	X	X	X	?
mode	total	?	X	X	X	X	X	X	X	?
	free	?	X	X	X	X	X	X	X	?
	used	?	X	X	X	X	X	X	X	?
	pfree	?	X	X	X	X	X	X	X	?
	pused	?	X	X	X	X	X	X	X	?
vfs.file.size[fs,<,mode>]		?	X	X	X	X	X	X	X	?

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Max OS/X
mode	total	?	X	X	X	X	X	X	X	?
	free	?	X	X	X	X	X	X	X	?
	used	?	X	X	X	X	X	X	X	?
	pfree	?	X	X	X	X	X	X	X	?
	puused	?	X	X	X	X	X	X	X	?
vm.memory.size[fs,<,mode>]		X	X	X	X	X	X	X	?	?
mode	total	?	X	X	X	X	X	X	X	?
	free	?	X	X	X	X	X	X	X	?
	shared	?	X	X	X	-	X	X	-	?
	buffers	?	X	X	X	-	X	X	-	?
	cached	?	X	X	X	-	X	X	-	?

4.10.2. ZABBIX Agent

Flexible and non-flexible parameters

Flexible parameter is parameter which accepts argument. For example, `vfs.fs.free[*]` is flexible parameter. `*` is any string that will be passed as argument of the parameter. `vfs.fs.free[/]`, `vfs.fs.free[/opt]` - correct definitions.

String between `[]` may contain the following characters:

`0-9a-zA-Z. : , () _ / [space]`

List of supported parameters

ZABBIX AGENT

Key	Description	Return value	Parameters	Comments
agent.ping	Check the agent usability.	Always return '1'.	-	Can be used as a TCP ping.
agent.version	Version of ZABBIX Agent.	String	-	Example of returned value: 1.3.2
kernel.maxfiles	Maximum number of opened file supported by OS.	Number of files. Integer.		
kernel.maxproc	Maximum number of processes supported by OS.	Number of processes. Integer.		
net.if.collisions[if]	Out-of-window collision.	Number of collisions. Integer.	if - interface	
net.if.in[if <,mode>]	Network interface incoming statistic.	Integer.	if - interface mode – bytes number of bytes (default) packets number of packets errors number of errors dropped number of dropped packets	
net.if.out[if <,mode>]	Network interface outgoing statistic.	Integer.	if - interface mode – bytes number of bytes (default) packets number of packets errors number of errors dropped number of dropped packets	Examples: net.if.out[eth0,errors] net.if.out[eth0] You may use this key with Delta (speed per second) in order to get bytes per second statistics.

Key	Description	Return value	Parameters	Comments
net.tcp.dns[ip, zone]	Checks if DNS service is up.	0 - DNS is down 1 - DNS is up	ip - IP address of DNS server zone - zone to test the DNS	Example: net.tcp.dns[127.0.0.1, zabbix.com]
net.tcp.listen[port]	Checks if this port is in LISTEN state.	0 - it is not 1 - it is in LISTEN state	port - port number	Example: net.tcp.listen[80]
net.tcp.port[<ip>, port]	Check, if it is possible to make TCP connection to port number port.	0 - cannot connect 1 - can connect	ip - IP address(default is 127.0.0.1) port - port number	Example: net.tcp.port[,80] can be used to test availability of WEB server running on port 80. Old naming: check_port[*]
net.tcp.service[service <,ip> <,port>]	Check if service is running and accepting TCP connections.	0 - service is down 1 - service is running 2 - timeout connecting to the service	service - one of ssh, service.ntp, ldap, smtp, ftp, http, pop, nntp, imap, tcp ip - IP address (default is 127.0.0.1) port - port number (by default standard service port number is used)	Example: net.tcp.service[ftp,,45] can be used to test availability of FTP server on TCP port 45. Old naming: check_service[*]
net.tcp.service.perf[service <,ip> <,port>]	Check performance of service	0 - service is down sec - number of seconds spent while connecting to the service	service - one of ssh, service.ntp, ldap, smtp, ftp, http, pop, nntp, imap, tcp ip - IP address (default is 127.0.0.1) port - port number (by default standard service port number is used)	Example: net.tcp.service.perf[ssh] can be used to test speed of initial response from SSH server. Old naming: check_service[*]
proc.mem[<name> <,user> <,mode><,cmdline>]	Memory used by process name running under user	Memory used by process.	name - process name user - user name (default is all users) mode - one of avg, max, min, sum (default)	Example: proc.mem[,root] - memory used by all processes running under user "root". proc.mem[zabbix_ser

Key	Description	Return value	Parameters	Comments
			cmdline - filter by command line	<p>ver,zabbix] - memory used by all processes zabbix_server running under user zabbix</p> <p>proc.mem[,oracle,max,oracleZABBIX] - memory used by most memory hungry process running under oracle having oracleZABBIX in its command line</p>
proc.num [<name> <user> <state><cmdline>]	Number of processes name having state running under user	Number of processes.	<p>name - process name</p> <p>user - user name (default is all users)</p> <p>state - one of all (default), run, sleep, zomb</p> <p>cmdline - filter by command line</p>	<p>Example:</p> <p>proc.num[,mysql] - number of processes running under user mysql</p> <p>proc.num[apache2,www-data] - number of apache2 running under user www-data</p> <p>proc.num[,oracle,sleep,oracleZABBIX] - number of processes in sleep state running under oracle having oracleZABBIX in its command line</p>
system.cpu.intr	Device interrupts.	Integer.		
system.cpu.load [<cpu> <mode>]	CPU(s) load.	Processor load. Float.	<p>cpu - CPU number (default is all CPUs)</p> <p>mode - one of avg1 (default),avg5 (average within 5 minutes), avg15</p>	<p>Example:</p> <p>system.cpu.load[]</p> <p>Note that returned value is not percentage.</p> <p>Old naming: system.cpu.loadX</p>
system.cpu.switches	Context switches.	Switches count.		Old naming: system[switches]
system.cpu.util [<cpu> <type>]	CPU(s) utilisation.	Processor load in percents	cpu - CPU number (default is all CPUs)	Old naming: system.cpu.idleX,

Key	Description	Return value	Parameters	Comments
<,mode>]			type - one of idle, nice, user (default), system mode - one of avg1 (default), avg5 (average within 5 minutes), avg15	system.cpu.niceX, system.cpu.systemX, system.cpu.userX
system.run[command<,mode>]	Run specified command on the host.	Text result of the command	command - command for execution mode - one of wait (default, wait end of execution), nowait (do no wait)	Example: system.run[ls -l /] - detailed file list of root directory. Note: To enable this functionality, agent configuration file must have EnableRemoteCommands=1 option.
system.hostname	Return host name.	String value		Example of returned value www.zabbix.com
system.localtime	System local time.	Time in seconds.		
system.swap.in[<device><,type>]	Swap in.	Swap statistics	device - swap device (default is all), type - one of count (default, number of swapins), pages (pages swapped in)	Example: system.swap.in[,bytes] Old naming: swap[in]
system.swap.out[<device><,type>]	Swap in.	Swap statistics	device - swap device (default is all), type - one of count (default, number of swapouts), pages (pages swapped out)	Example: system.swap.out[,pages] Old naming: swap[out]
system.swap.size[<device><,mode>]	Swap space.	Number of bytes or percentage	device - swap device (default is all), type - one of free (default, free swap space), total (total swap space), pfree (free	Example: system.swap.size[,pfree] - percentage of free swap space Old naming:

Key	Description	Return value	Parameters	Comments
			swap space, percentage), pused (used swap space, percentage)	system.swap.free, system.swap.total
system.uname	Returns detailed host information.	String value		Example of returned value: <i>FreeBSD localhost 4.4-RELEASE FreeBSD 4.4-RELEASE #0: Tue Sep 18 11:57:08 PDT 2001 murray@builder.FreeBSD.org: /usr/src/sys/compile/GENERIC i386</i>
system.uptime	System's uptime in seconds.	Number of seconds		Use Units s or uptime to get readable values.
system.users.num	Number of users connected.	Number of users		Command who is used on agent side.
vfs.dev.read[device <,type>]	Disk read statistics.	Numeric value	device - disk device (default is all), type - one of sectors (default), operations	Example: vfs.dev.read[,operations] Old naming: io[*]
vfs.dev.write[device <,type>]	Disk write statistics.	Numeric value	device - disk device (default is all), type - one of sectors (default), operations	Example: vfs.dev.write[,operations] Old naming: io[*]
vfs.file.cksum[file]	Calculate file check sum	File check sum calculated by algorithm used by UNIX cksum.	file - full path to file	Example of returned value: <i>1938292000</i> Example: vfs.file.cksum[/etc/passwd]
vfs.file.exists[file]	Check if file exists	0 - file does not exist 1 - file exists	file - full path to file	Example: vfs.file.exists[/tmp/application.pid]
vfs.file.md5sum[file]	File's MD5 check sum	MD5 hash of the file. Can be used only for files less than 64MB, unsupported otherwise.		Example of returned value: <i>b5052decb577e0fffd622d6ddc017e82</i> Example: vfs.file.md5sum[/etc/zabbix/zabbix_agentd.c

Key	Description	Return value	Parameters	Comments
				onf]
vfs.file.regexp [file, regexp]	Find string in a file	Matched string	file - full path to file, regexp - GNU regular expression	Example: vfs.file.regexp[/etc/passwd,zabbix]
vfs.file.regmatch [file, regexp]	Find string in a file	0 - expression not found 1 - found	file - full path to file, regexp - GNU regular expression	Example: vfs.file.regexp[/var/log/app.log,error]
vfs.file.size [file]	File size	Size in bytes.	file - full path to file	File must have read permissions for user zabbix Example: vfs.file.size[/var/log/syslog]
vfs.file.time [file<, mode>]	File time information.	Number of seconds.	file - full path to file mode - one of modify (default, modification time), access - last access time, change - last change time	Example: vfs.file.time[/etc/passwd,modify]
vfs.fs.inode [fs<,mode>]	Number of inodes	Numeric value	fs - filesystem, mode - one of total (default), free, used, pfree (free, percentage), pused (used, percentage)	Example: vfs.fs.inode[/,pfree] Old naming: vfs.fs.inode.free[*], vfs.fs.inode.pfree[*], vfs.fs.inode.total[*]
vfs.fs.size [fs<,mode>]	Disk space	Disk space in KB	fs - filesystem, mode - one of total (default), free, used, pfree (free, percentage), pused (used, percentage)	In case of a mounted volume, disk space for local file system is returned. Example: vfs.fs.size[/tmp,free] Old naming: vfs.fs.free[*], vfs.fs.total[*], vfs.fs.used[*], vfs.fs.pfree[*], vfs.fs.pused[*]
vm.memory.size [<mode>]	Memory size	Memory size in bytes	mode - one of total (default), shared, total, buffers, cached	Old naming: vm.memory.buffers, vm.memory.cached, vm.memory.free, vm.memory.shared, vm.memory.total
web.page.get [host,<path>,<port>]	Get content of WEB page	host - hostname, path - path to	WEB page source as text	Returns EOF on fail.

Key	Description	Return value	Parameters	Comments
<code>]</code>		HTML document (default is /), port - port number (default is 80)		Example: web.page.get[www.zabbix.com,index.php,80]
<code>web.page.perf[host,<path>,<port>]</code>	Get timing of loading full WEB page	Time in seconds	host - hostname, path - path to HTML document (default is /), port - port number (default is 80)	Example: web.page.perf[www.zabbix.com,index.php,80]
<code>web.page.regexp[host, <path>, <port>, <regex>, <length>,]</code>	Get first occurrence of regex in WEB page	Matched string	host - hostname, path - path to HTML document (default is /), port - port number (default is 80), regex - GNU regular expression, length - number of characters to return	Returns EOF on fail. Example: web.page.get[www.zabbix.com, index.php, 80, OK, 2]

Linux-specific note. ZABBIX agent must have read-onle access to filesystem `/proc`. Kernel patches from www.grsecurity.org limit access rights of non-privileged users.

WIN32-SPECIFIC PARAMETERS

This section contains description of parameter supported by ZABBIX WIN32 agent only.

Key	Description	Return value	Comments
<code>agent[avg_collector_time]</code>	Average time spent by collector thread on each sample processing for last minute.	Time in milliseconds	
<code>agent[max_collector_time]</code>	Maximum time spent by collector thread on each sample processing for last minute.	Time in milliseconds	
<code>agent[accepted_requests]</code>	Total number of requests accepted by agent for	Number of requests	

Key	Description	Return value	Comments
	processing.		
agent[rejected_requests]	Total number of requests rejected by agent for processing.	Number of requests	
agent[timed_out_requests]	Total number of requests timed out in processing.	Number of requests	
agent[accept_errors]	Total number of accept() system call errors.	Number of system calls	
agent[processed_requests]	Total number of requests successfully processed by agent.	Number of requests	
agent[failed_requests]	Total number of requests with errors in processing.	Number of requests	These requests generated ZBX_ERROR return code
agent[unsupported_requests]	Total number of requests for unsupported parameters.	Number of requests	These requests generated ZBX_UNSUPPORTED return code
perf_counter[*]	Value of any performance counter, where parameter is the counter path.	Value of the counter	Performance Monitor can be used to obtain list of available counters. Note that this parameter will return correct value only for counters that require just one sample (like \System\Threads). It will not work as expected for counters that require more than one sample - like CPU utilisation.
service_state[*]	State of service. Parameter is service name.	0 - running 1 - paused 2 - start pending 3 - pause pending 4 - continue pending 5 - stop pending 6 - stopped 7 - unknown 255 - SCM communication	Parameter must be real service name as it seen in service properties under "Name:", not service display name!

Key	Description	Return value	Comments
		error	
proc_info[<process>:<attribute>:<type>]	Different information about specific process(es).	<process> - process name (same as in proc_cnt[] parameter) <attribute> - requested process attribute.	The following attributes are currently supported: vmsize - Size of process virtual memory in Kbytes wkset - Size of process working set (amount of physical memory used by process) in Kbytes pf - Number of page faults ktime - Process kernel time in milliseconds utime - Process user time in milliseconds io_read_b - Number of bytes read by process during I/O operations io_read_op - Number of read operation performed by process io_write_b - Number of bytes written by process during I/O operations io_write_op - Number of write operation performed by process io_other_b - Number of bytes transferred by process during operations other than read and write operations io_other_op - Number of I/O operations performed by process, other than read and write operations gdiobj - Number of GDI objects used by process userobj - Number of USER objects used by process <type> - representation type (meaningful when more than one process with the same name exists). Valid values are: min - minimal value among all processes named <process> max - maximal value among all processes named <process> avg - average value for all processes named <process> sum - sum of values for all processes named <process> Examples: 1. In order to get the amount of physical memory taken by all Internet Explorer processes, use the following parameter: proc_info[iexplore.exe:wkset:sum] 2. In order to get the average number of page faults for Internet Explorer processes, use the following parameter: proc_info[iexplore.exe:pf:avg] Note: All io_xxx,gdiobj and userobj attributes available only on Windows 2000 and later versions of Windows, not on Windows NT 4.0.

4.10.3. SNMP Agent

SNMP parameters

ZABBIX must be configured with SNMP support in order to be able to retrieve data provided by SNMP agents.

The following steps have to be performed in order to add monitoring of SNMP parameters:

Step 1 Create a host for the SNMP device.

Enter an IP address and a port of 161. Set the host Status to NOT MONITORED. You can use the host.SNMP template which would automatically add set of items. However, the template may not be compatible with the host.

Step 2 Find out the SNMP string of the item you want to monitor.

After creating the host, use 'snmpwalk' (part of ucd-snmp/net-snmp software which you should have installed as part of the ZABBIX installation) or equivalent tool:

```
shell> snmpwalk <host or host IP> public
```

This will give you a list of SNMP strings and their last value. If it doesn't then it is possible that the SNMP 'community' is different to the standard public in which case you will need to find out what it is. You would then go through the list until you find the string you want to monitor, e.g. you wanted to monitor the bytes coming in to your switch on port 3 you would use:

```
interfaces.ifTable.ifEntry.ifOctetsIn.3 = Counter 32: 614794138
```

You should now use the snmpget command to find the OID for interfaces.ifTable.ifEntry.ifInOctets.3:

```
shell> snmpget -On 10.62.1.22 interfaces.ifTable.ifEntry.ifOctetsIn.3
```

where the last number in the string is the port number you are looking to monitor. This should give you something like the following:

```
.1.3.6.1.2.1.2.2.1.10.3 = Counter32: 614794138
```

again the last number in the OID is the port number.

3COM seem to use port numbers in the hundreds, e.g. port 1=port 101, port 3=port 103, but Cisco use regular numbers, e.g. port 3=3

Step 3 Create an item for monitoring.

So, now go back to ZABBIX and click on Items, selecting the SNMP host you created earlier. Depending on whether you used a template or not when creating your host you will have either a list of SNMP items associated with your host or just a new item box. We will work on the assumption that you are going to create the item yourself using the information you have just gathered using `snmpwalk` and `snmpget`, so enter a plain English description in the 'Description' field of the new item box. Make sure the 'Host' field has your switch/router in it and change the 'Type' field to "SNMPv1 agent" (I had difficulty with SNMPv2 agent so I don't use it). Enter the community (usually public) and enter the numeric OID that you retrieved earlier in to the 'SNMP OID' field being sure to include the leading dot, i.e. .1.3.6.1.2.1.2.2.1.10.3

Enter the 'SNMP port' as 161 and the 'Key' as something meaningful, e.g. SNMP-InOctets-Bps. Choose the Multiplier if you want one and enter an 'update interval' and 'keep history' if you want it to be different from the default. Set the 'Status' to MONITORED, the 'Type of information' to NUMERIC and the 'Store value' to DELTA (important otherwise you will get cumulative values from the SNMP device instead of the latest change).

Now ADD the item and go back to the hosts area of ZABBIX. From here set the SNMP device to be MONITORED and check in LATEST VALUES for your SNMP data!

Example:

Community: public

Oid: 1.2.3.45.6.7.8.0 (or .1.2.3.45.6.7.8.0)

Key: <Unique string to be used as reference to triggers>

Note that OID can be given in either numeric or string form. However, in some cases, string OID must be converted to numeric representation. Utility `snmpget` may be used for this purpose:

```
shell> snmpget -On localhost public
enterprises.ucdavis.memory.memTotalSwap.0
```

Monitoring of SNMP parameters is possible if either `-with-net-snmp` or `-with-ucd-snmp` flag was specified while configuring ZABBIX sources.

4.10.4. Simple checks

Simple checks

Simple checks are normally used for agent-less monitoring or for remote checks of services. Note that ZABBIX Agent is not needed for simple checks. ZABBIX Server is responsible for processing of simple checks (making external connections, etc).

All simple check accepts two optional parameters:

`ip` - IP address. Default value is 127.0.0.1

`port` - Port number. If missing, standard default service port is used.

Examples of using simple checks:

```
ftp,127.0.0.1,155
http,11.22.33.44
http_perf,11.22.33.44,8080
```

List of supported simple checks:

Key	Description	Return value
icmpping	Checks if server is accessible by ICMP ping	0 – ICMP ping fails 1 – ICMP ping successful
icmppingsec	Return ICMP ping response time	Number of seconds
ftp,<ip>,<port>	Checks if FTP server is running and accepting connections	0 – FTP server is down 1 – FTP server is running 2 – timeout
http,<ip>,<port>	Checks if HTTP server is running and accepting connections	0 – HTTP server is down 1 – HTTP server is running 2 – timeout
imap,<ip>,<port>	Checks if IMAP server is running and accepting connections	0 – IMAP server is down 1 – IMAP server is running 2 – timeout
nntp,<ip>,<port>	Checks if NNTP server is running and accepting connections	0 – NNTP server is down 1 – NNTP server is running 2 – timeout
pop,<ip>,<port>	Checks if POP	0 – POP server is down

Key	Description	Return value
	server is running and accepting connections	1 – POP server is running 2 – timeout
smtp,<ip>,<port>	Checks if SMTP server is running and accepting connections	0 – SMTP server is down 1 – SMTP server is running 2 – timeout
ssh,<ip>,<port>	Checks if SSH server is running and accepting connections	0 – SSH server is down 1 – SSH server is running 2 – timeout
tcp,<ip>,<port>	Checks if TCP service is running and accepting connections	0 – TCP service is down 1 – TCP service is running 2 – timeout
ftp_perf,<ip>,<port>	Checks if FTP server is running and accepting connections	0 – FTP server is down Otherwise number of millisecond spent connecting to FTP server.
http_perf,<ip>,<port>	Checks if HTTP (WEB) server is running and accepting connections	0 – HTTP (WEB) server is down Otherwise number of millisecond spent connecting to HTTP server.
imap_perf,<ip>,<port>	Checks if IMAP server is running and accepting connections	0 – IMAP server is down Otherwise number of millisecond spent connecting to IMAP server.
nntp_perf,<ip>,<port>	Checks if NNTP server is running and accepting connections	0 – NNTP server is down Otherwise number of millisecond spent connecting to NNTP server.
pop_perf,<ip>,<port>	Checks if POP server is running and accepting connections	0 – POP server is down Otherwise number of millisecond spent connecting to POP server.
smtp_perf,<ip>,<port>	Checks if SMTP	0 – SMTP server is down

Key	Description	Return value
>	server is running and accepting connections	Otherwise number of millisecond spent connecting to SMTP server.
ssh_perf,<ip>,<port>	Checks if SSH server is running and accepting connections	0 – SSH server is down Otherwise number of millisecond spent connecting to SSH server.

4.10.5. Internal Checks

Internal checks allow monitoring of internals of ZABBIX. Internal checks are calculated by ZABBIX Server.

Key	Description	Comments
zabbix[history]	Number of values stored in table HISTORY	Do not use if MySQL InnoDB, Oracle or PostgreSQL is used!
zabbix[history_str]	Number of values stored in table HISTORY_STR	Do not use if MySQL InnoDB, Oracle or PostgreSQL is used!
zabbix[items]	Number of items in ZABBIX database	
zabbix[items_unsupported]	Number of unsupported items in ZABBIX database	
zabbix[log]	Stores warning and error messages generated by ZABBIX server.	Character. Add item with this key to have ZABBIX internal messages stored.
zabbix[queue]	Number of items in the Queue.	
zabbix[trends]	Number of values stored in table TRENDS	Do not use if MySQL InnoDB, Oracle or PostgreSQL is used!
zabbix[triggers]	Number of	

Key	Description	Comments
	triggers in ZABBIX database	

4.10.6. Aggregated checks

Aggregate checks does not require any agent running on a host being monitored. ZABBIX server collects aggregate information by doing direct database queries.

Syntax of aggregate item's key

```
groupfunc('Host group', 'Item key', 'item func', 'parameter')
```

Supported group functions:

GROUP FUNCTION	DESCRIPTION
grpavg	Average value
grpmax	Maximum value
grpmin	Minimum value
grpsum	Sum of values

Supported item functions:

ITEM FUNCTION	DESCRIPTION
avg	Average value
count	Number of values
last	Last value
max	Maximum value
min	Minimum value
sum	Sum of values

Examples of keys for aggregate items:

Example 1 Total disk space of host group 'MySQL Servers'.

```
grpsum('MySQL Servers', 'vfs.fs.size[/,total]', 'last', '0')
```

Example 2 Average processor load of host group 'MySQL Servers'.

```
grpavg('MySQL Servers', 'system.cpu.load[,avg1]', 'last', '0')
```

Example 3 Average (5min) number of queries per second for host group 'MySQL Servers'

```
grpavg('MySQL Servers', 'mysql.qps', 'avg', '300')
```

4.11. Triggers

Trigger is defined as a logical expression and represents system state.

Trigger attributes:

Parameter	Description
Name	Trigger name. The name may contain macros.
Expression	Logical expression used for calculation of trigger state.
The trigger depends on	List of triggers the trigger depends on.
New dependency	Add new dependency.
Severity	Trigger severity.
Comments	Text field used to provide more information about this trigger. May contain instructions for fixing specific problem, contact detail of responsible staff, etc.
URL	If not empty, the URL is used in the screen 'Status of Triggers'.
Disabled	Trigger can be disable if required.

Expression is recalculated every time ZABBIX server receives new value, if this value is part of this expression. The expression may have the following values:

VALUE	DESCRIPTION
TRUE	Normally means that something happened. For example, processor load is too high.
FALSE	This is normal trigger state.

UNKNOWN

In this case, ZABBIX cannot evaluate trigger expression. This may happen because of several reasons:

- server is unreachable
- trigger expression cannot be evaluated
- trigger expression has been recently changed

4.11.1. Expression for triggers

The expressions used in triggers are very flexible. You can use them to create complex logical tests regarding monitored statistics.

The following operators are supported for triggers:

OPERATOR	DEFINITION
-	Arithmetical minus
+	Arithmetical plus
/	Division
*	Multiplication
>	More than
<	Less than
=	Is equal. The operator is defined as: $A=B \Leftrightarrow (A>B-0.000001) \& (A<B+0.000001)$
#	Not equal. The operator is defined as: $A=B \Leftrightarrow (A<B-0.000001) (A>B+0.000001)$
	Logical OR
&	Logical AND

The following functions are supported:

FUNCTION	DEFINITION
abschange	Returns absolute difference between last and previous values.

FUNCTION	DEFINITION
avg	Average value for period of time. Parameter defines length of the period in seconds.
delta	Same as max()-min()
change	Returns difference between last and previous values.
count	Number of successfully retrieved values for period of time in seconds.
date	Returns current date in YYYYMMDD format. For example: 20031025
dayofweek	Returns day of week in range of 1 to 7. Mon – 1, Sun – 7.
diff	Returns: <ul style="list-style-type: none">▪ 1 – last and previous values differ▪ 0 - otherwise
fuzzytime	Returns 1 if timestamp does not differ from ZABBIX server time for more than N seconds. Normally used with system.localtime.
last	Last (most recent) value. Parameter is ignored.
max	Maximal value for period of time. Parameter defines length of the period in seconds.
min	Minimal value for period of time. Parameter defines length of the period in seconds.
nodata	Returns: <ul style="list-style-type: none">▪ 1 – if no data received during period of time in seconds. The period should not be less than 30 seconds.▪ 0 - otherwise
now	Returns number of seconds since the Epoch (00:00:00 UTC, January 1, 1970).
prev	Returns previous value. Parameter is ignored.
str	Find string in last (most recent) values. Parameter defines string to find. Case sensitive! Can be used for items having type STRING only. Returns: <ul style="list-style-type: none">▪ 1 – found▪ 0 – otherwise
sum	Sum of values for period of time. Parameter defines length of the period in seconds.

FUNCTION	DEFINITION
time	Returns current time in HHMMSS format. Example: 123055

Note: Note that all above functions (except diff and str) cannot be used for non-numeric parameters!

The following constants are supported for triggers:

CONSTANT	DEFINITION
<number>	Positive float number. Examples: 0, 1, 0.15, 123.55
<number><K M G>	K – 1024*N M – 1024+1024*N G – 1024*1024*1024*N Examples: 2K, 4G, 0.5M

A simple useful expression might look like:

```
{<server>:<key>.<function>( <parameter> )}<operator><const>
```

Parameter must be given even for those functions, which ignore it. Example: last(0)

Example 1 Processor load is too high on www.zabbix.com

```
{www.zabbix.com: system.cpu.load[all,avg1].last(0)}>5)
```

'www.zabbix.com: system.cpu.load[all,avg1]' gives a short name of the monitored parameter. It specifies that the server is 'www.zabbix.com' and the key being monitored is 'system.cpu.load[all,avg1]'. By using the function 'last()', we are referring to the most recent value. Finally, '>5' means that the trigger is true whenever the most recent processor load measurement from www.zabbix.com is greater than 5.

Example 2 www.zabbix.com is overloaded

```
( {www.zabbix.com: system.cpu.load[all,avg1].last(0)}>5 ) | ( {www.zabbix.com: system.cpu.load[all,avg1].min(600)}>2 )
```

The expression is true when either the current processor load is more than 5 or the processor load was more than 2 during last 10 minutes.

Example 3 /etc/passwd has been changed

Use of function `diff`:

```
{www.zabbix.com: vfs.file.cksum[/etc/passwd].diff(0)}>0
```

The expression is true when the previous value of checksum of `/etc/passwd` differs from the most recent one.

Similar expressions could be useful to monitor changes in important files, such as `/etc/passwd`, `/etc/inetd.conf`, `/kernel`, **etc**.

Example 4 Someone downloads a big file for the internet

Use of function `min`:

```
{www.zabbix.com: net.if.in[eth0,bytes].min(300)}>100K
```

The expression is true when number of received bytes on `eth0` is more than 100 KB within last 5 minutes.

Example 5 Both nodes of clustered SMTP server are down

Note use of two different hosts in one expression:

```
{smtp1.zabbix.com:net.tcp.service[smtp].last(0)}=0&({smtp2.zabbix.com:net.tcp.service[smtp].last(0)}=0)
```

The expression is true when both SMTP servers are down on both `smtp1.zabbix.com` and `smtp2.zabbix.com`.

Example 6 ZABBIX agent needs to be upgraded

Use of function `str()`:

```
{zabbix.zabbix.com:agent.version.str(beta8)}=0
```

The expression is true if ZABBIX agent has version `beta8` (presumably `1.0beta8`).

Example 7 Server is unreachable

```
{zabbix.zabbix.com:status.last(0)}=2
```

Note: The 'status' is a special parameter which is calculated if and only if corresponding host has at least one parameter for monitoring. See description of 'status' for more details.

Example 8 No heart beats within last 3 minutes

Use of function `nodata()`:

```
{zabbix.zabbix.com:tick.nodata(180)}=1
```

'tick' must have type 'ZABBIX trapper'. In order to make this trigger work, item 'tick' must be defined. The host should periodically send data for this parameter using `zabbix_sender`. If no data is received within 180 seconds, the trigger value becomes TRUE.

Example 9 CPU activity at night time

Use of function `time()`:

```
({zabbix: system.cpu.load[all,avg1].nodata(180)}=1)&({zabbix:  
system.cpu.load[all,avg1].time(0)}>000000)&({zabbix:  
system.cpu.load[all,avg1].time(0)}<060000)
```

The trigger may change its status to true, only at night (00:00-06:00) time.

4.11.2. Trigger dependencies

[To be finished]

4.12. Screens

ZABBIX screens allow grouping of various information for quick access and display on one screen. Easy-to-use screen builder makes creation of the screens easy and intuitive.

The following elements can be used for screen building:

- * simple graphs
- * user-defined graphs
- * maps

Number of elements in each screen is unlimited.

4.13. IT Services

IT Services are intended for those who want to get a high-level (business) view of monitored infrastructure. In many cases, we are not interested in low-level details, like lack of disk space, high processor load, etc. What we are interested is availability of service provided by our IT department. We can also be interested in identifying weak places of IT infrastructure, SLA of various IT services, structure of existing IT infrastructure, and many other information of higher level.

ZABBIX IT Services provides answers to all mentioned questions.

IT Services is hierarchy representation of monitored data.

A very simple IT Service structure may look like:

```
IT Service
|
|-Workstations
||
| |-Workstation1
||
| |-Workstation2
|
|-Servers
```

Each node of the structure has attribute status. The status is calculated and propagated to upper levels according to selected algorithm. Triggers create lowest level of the IT Services. [To be finished...]

User permissions

All ZABBIX users access the ZABBIX application through the Web-based front end. Each ZABBIX user is assigned a unique user identity and a password. All user passwords are encrypted and stored on the ZABBIX database. Users can not use their user id and password to log directly into the UNIX server unless they have also been set up accordingly to UNIX. Communication between the Web Server and the user's browser can be protected using SSL.

Access permissions on screen within the menu may be set for each user. By default, no permissions are granted on a screen when user is registered to the ZABBIX.

Note that the user is automatically disconnected after 30 minutes of inactivity.

[To be finished...]

4.14. User permissions

[To be finished ...]

4.15. Utilities

4.15.1. Start-up scripts

The scripts are used to automatically start/stop ZABBIX processes during system's start-up/shutdown.

The scripts are located under directory `misc/init.d`.

4.15.2. `snmptrap.sh`

The script is used to receive SNMP traps. The script must be used in combination with `snmptrapd`, which is part of package `net-snmp`.

Configuration guide:

- Install `snmptrapd` (part of `net-snmp` or `ucd-snmp`)
- Edit `snmptrapd.conf`.

Add this line:

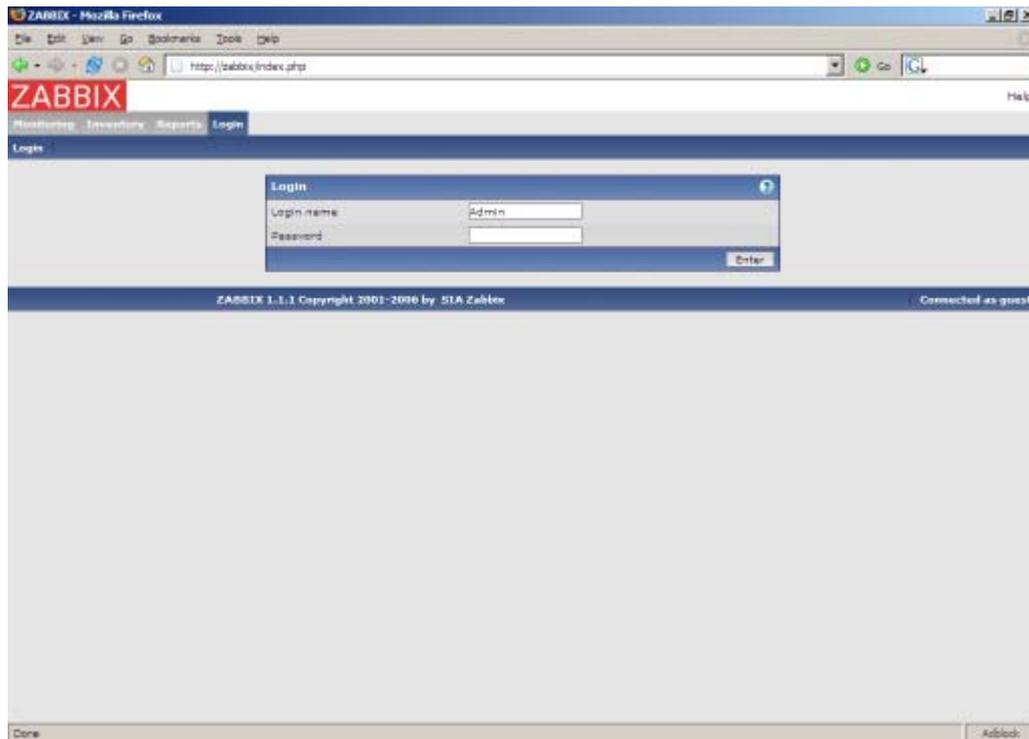
```
traphandle default /bin/bash /home/zabbix/bin/snmptrap.sh
```

- Copy `misc/snmptrap/snmptrap.sh` to `~zabbix/bin`
- Edit `snmptrap.sh` to configure some basic parameters
- Add special host and trapper (type "string") item to ZABBIX. See `snmptrap.sh` for the item's key.
- Run `snmptrapd`

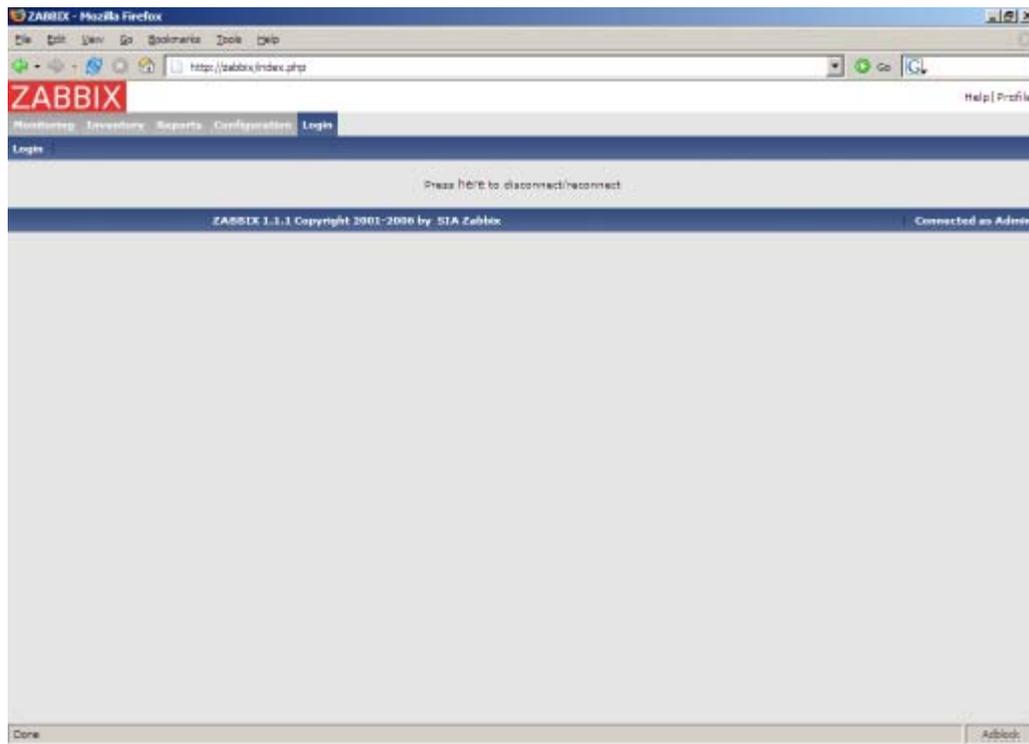
5. Quick Start Guide

5.1. Login

This is Welcome ZABBIX screen. When installed use user name "Admin" with no password to connect as ZABBIX superuser.

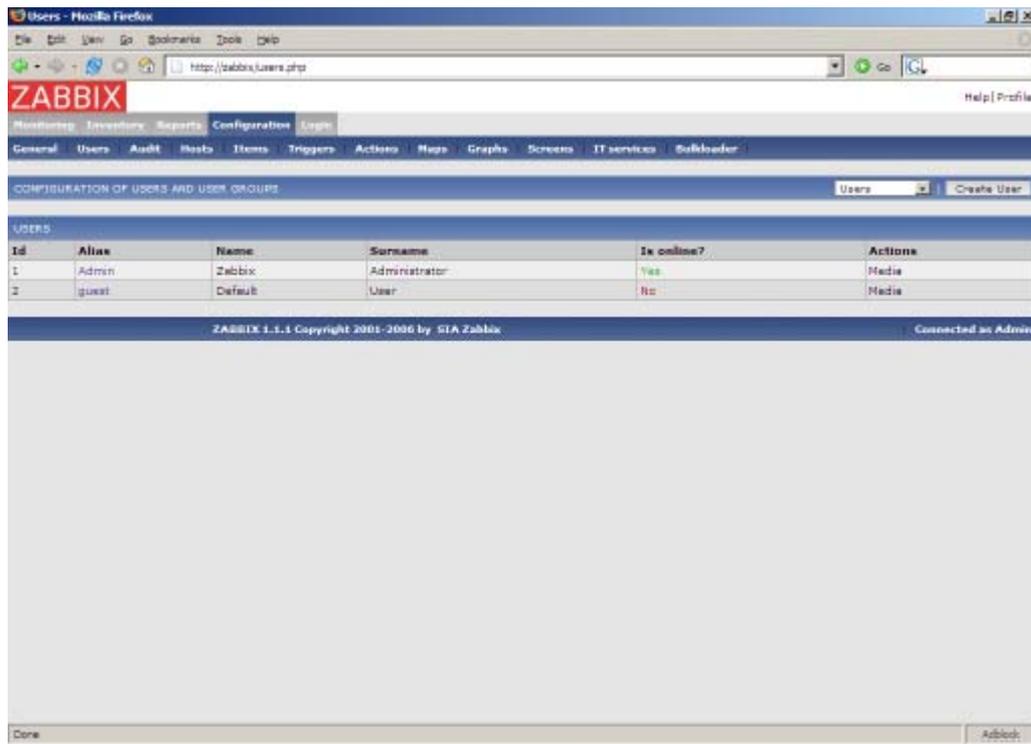


When logged in, you will see "Connected as Admin" and access to "Configuration" area will be granted:

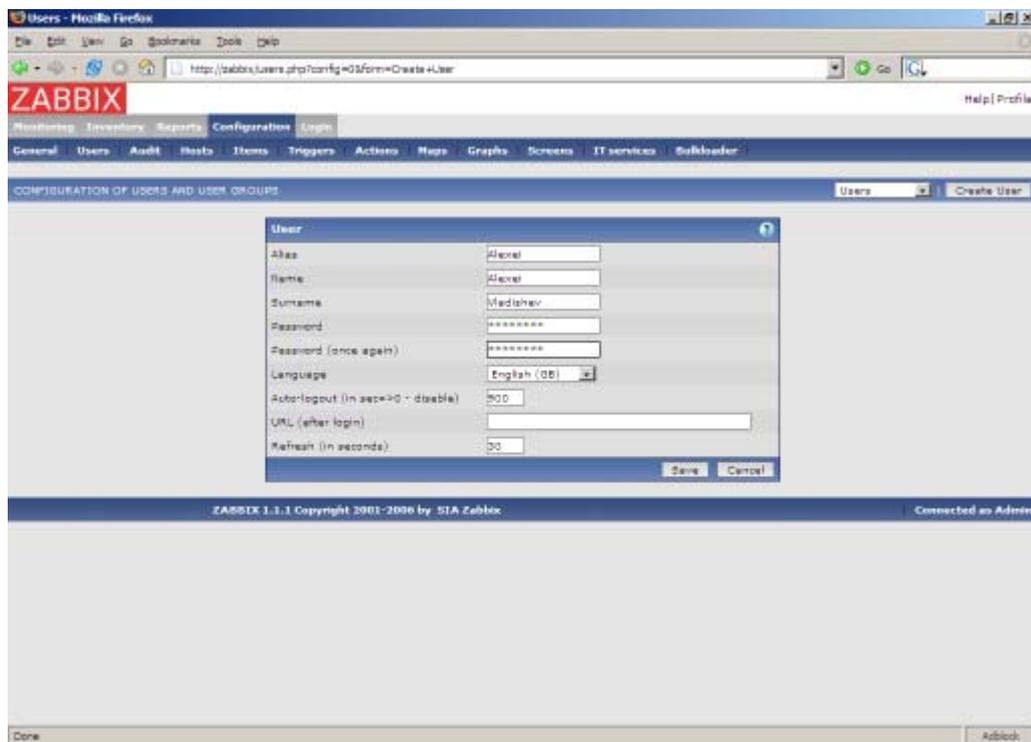


5.2. Add user

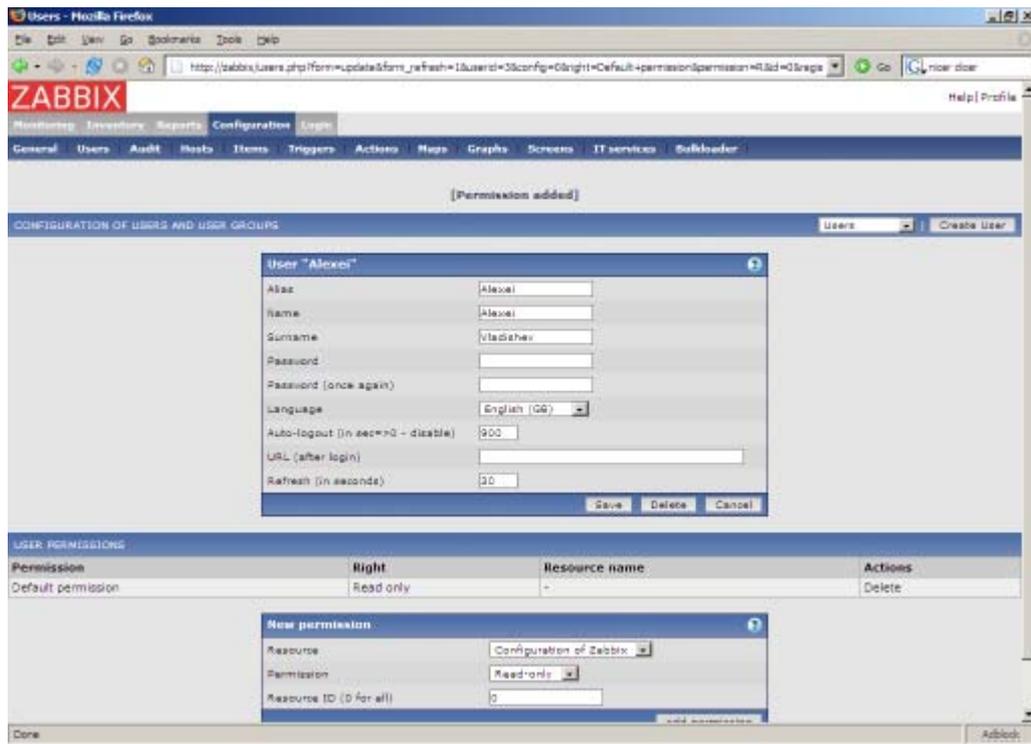
After initial installation, ZABBIX has only two users defined. User "Admin" is ZABBIX superuser. User "Admin" has all permissions. User "guest" is a special default user. If an user does not log in, the user will be granted with "guest" permissions. By default, "guest" has only read-only permissions.



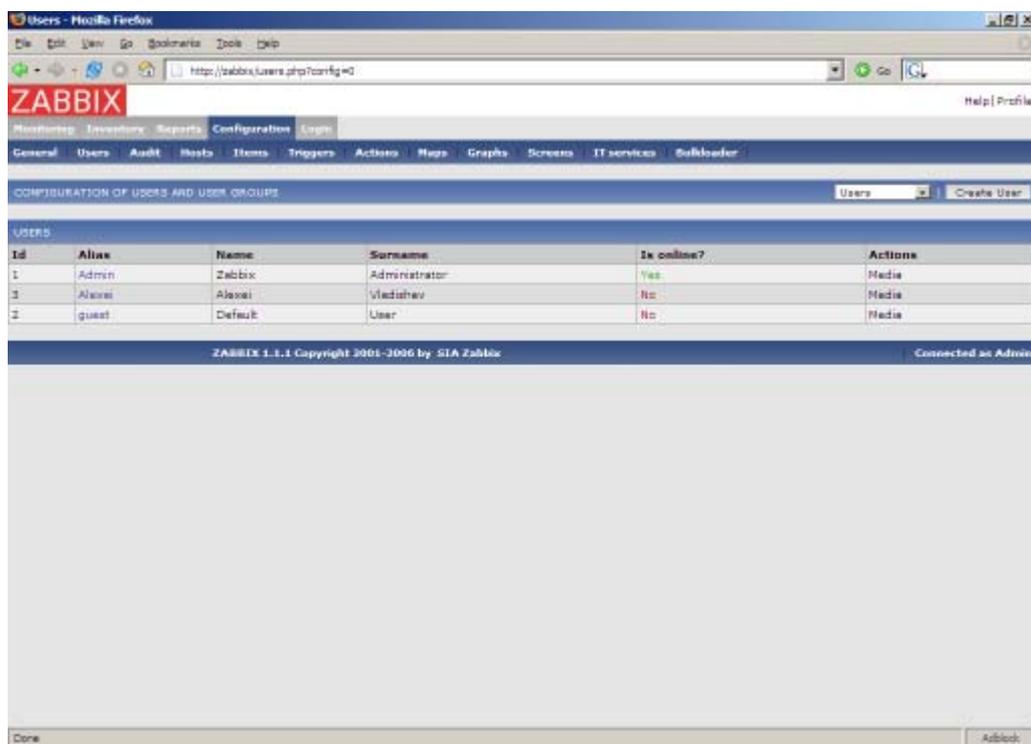
In order to add new user, press "Create user".



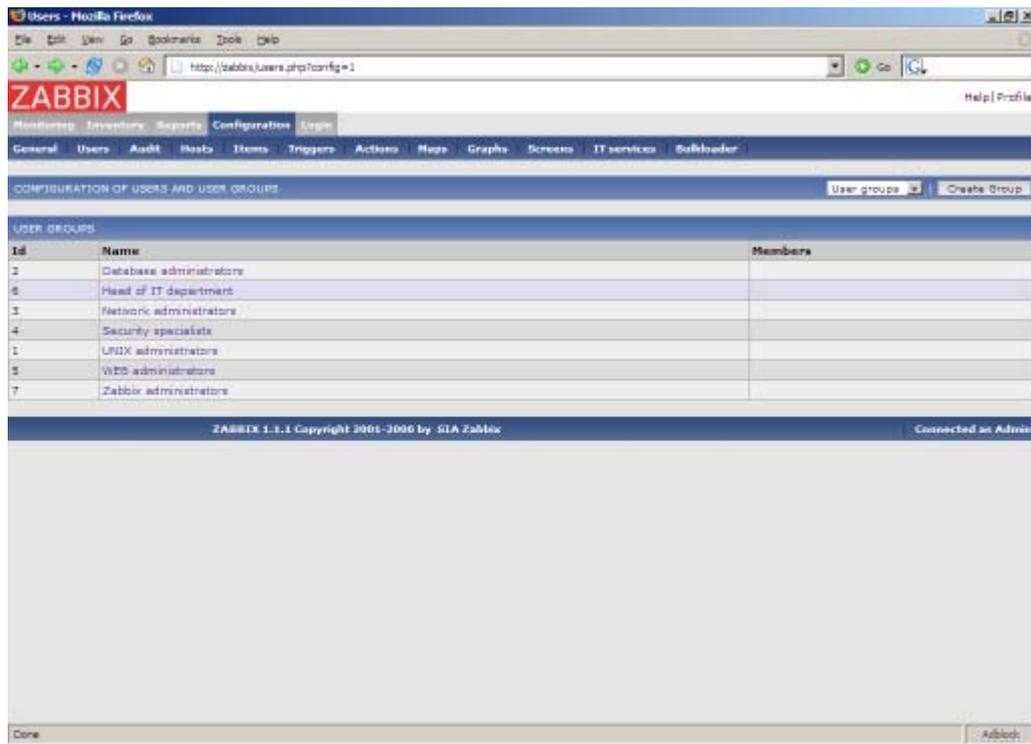
By default, new user has no permissions. Grant user rights.



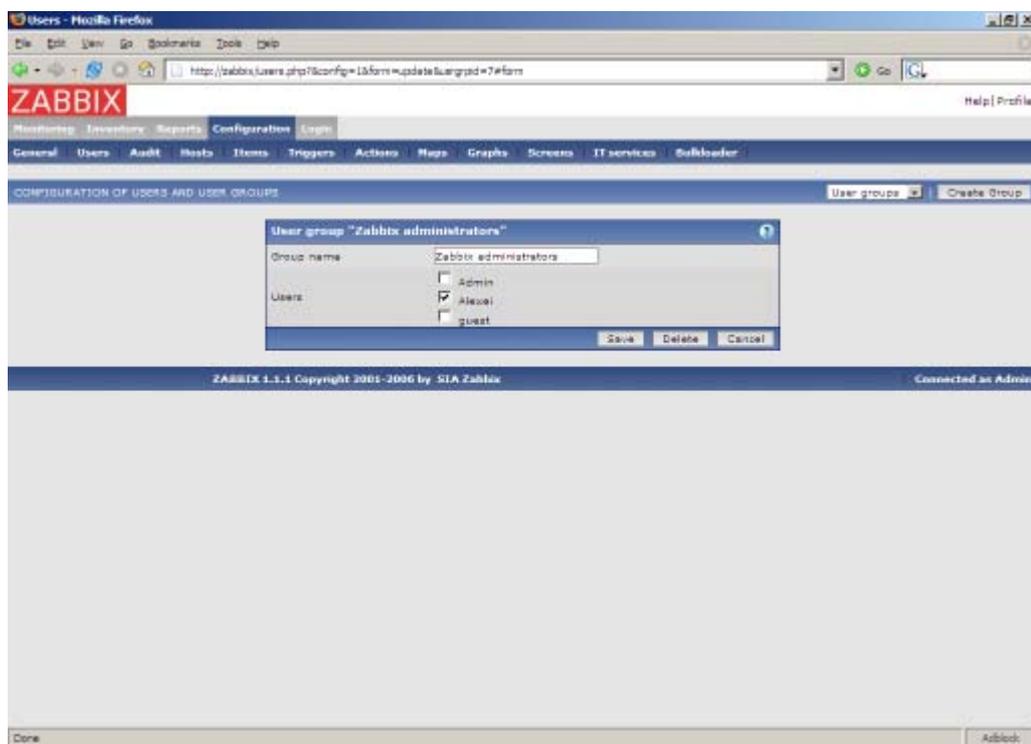
The user is added.



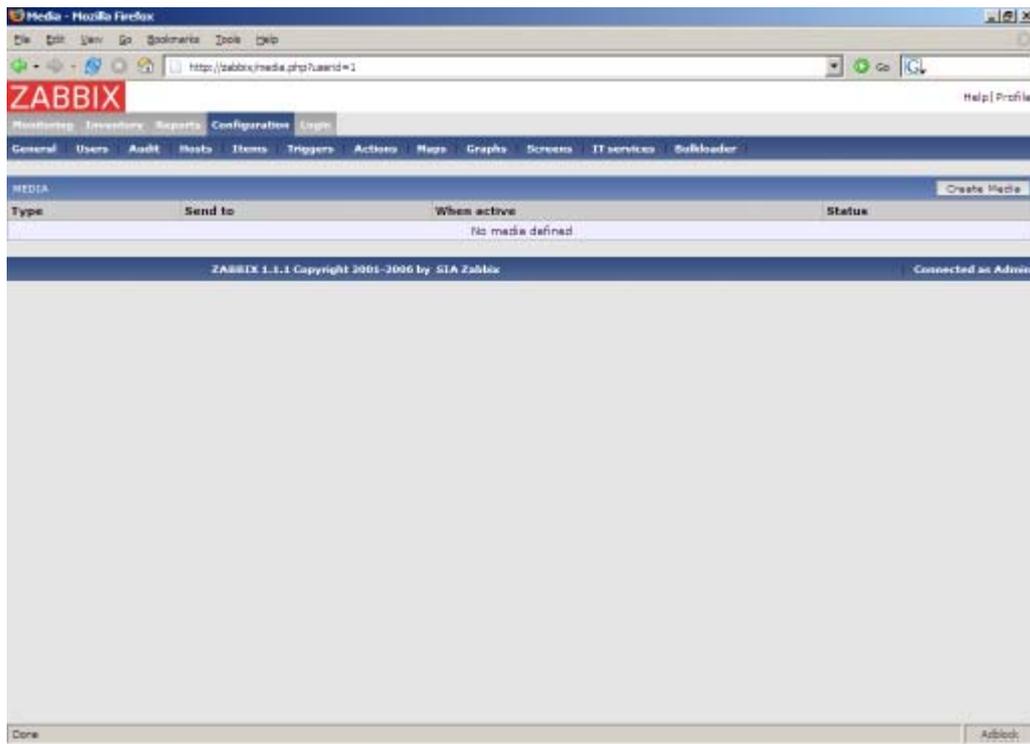
Select "user groups" from drop-down to edit user group membership.



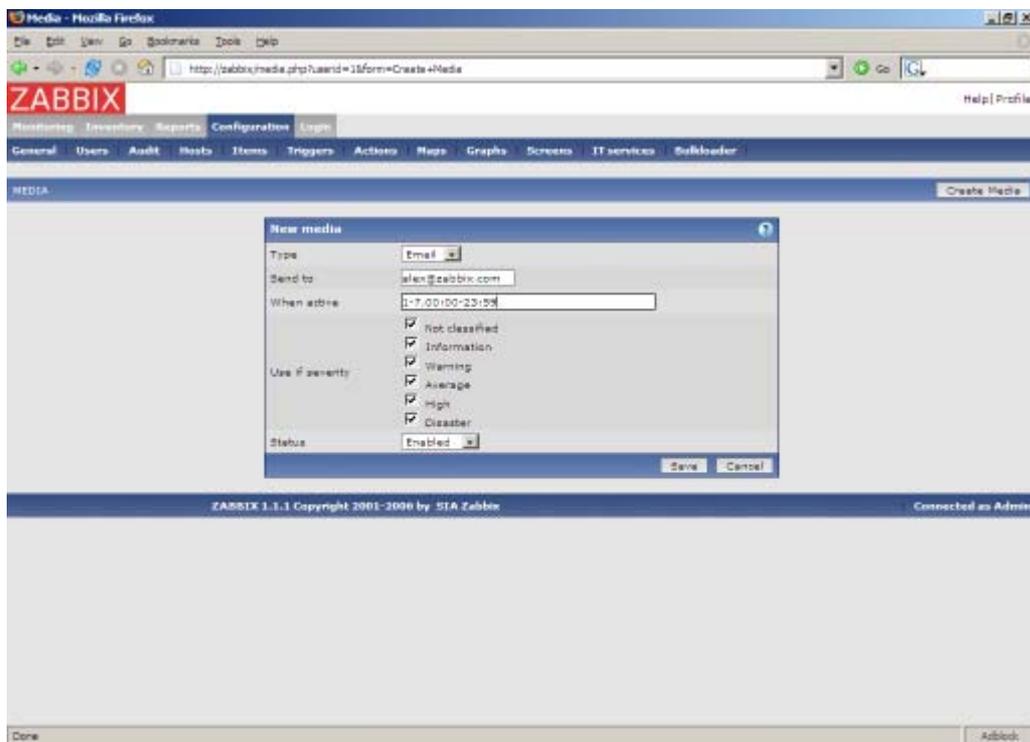
Click on a group to change membership of the group.



Assign notification methods (medias) to the user. No medias assigned yet.



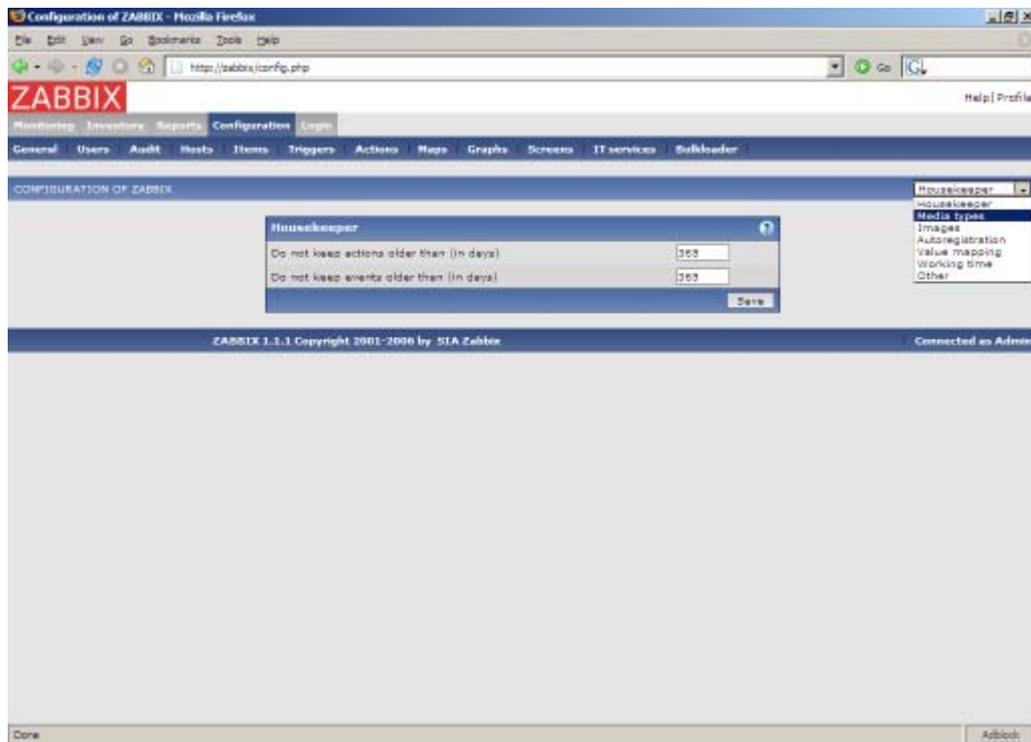
Configure email address, list of severities for which the media will be active.



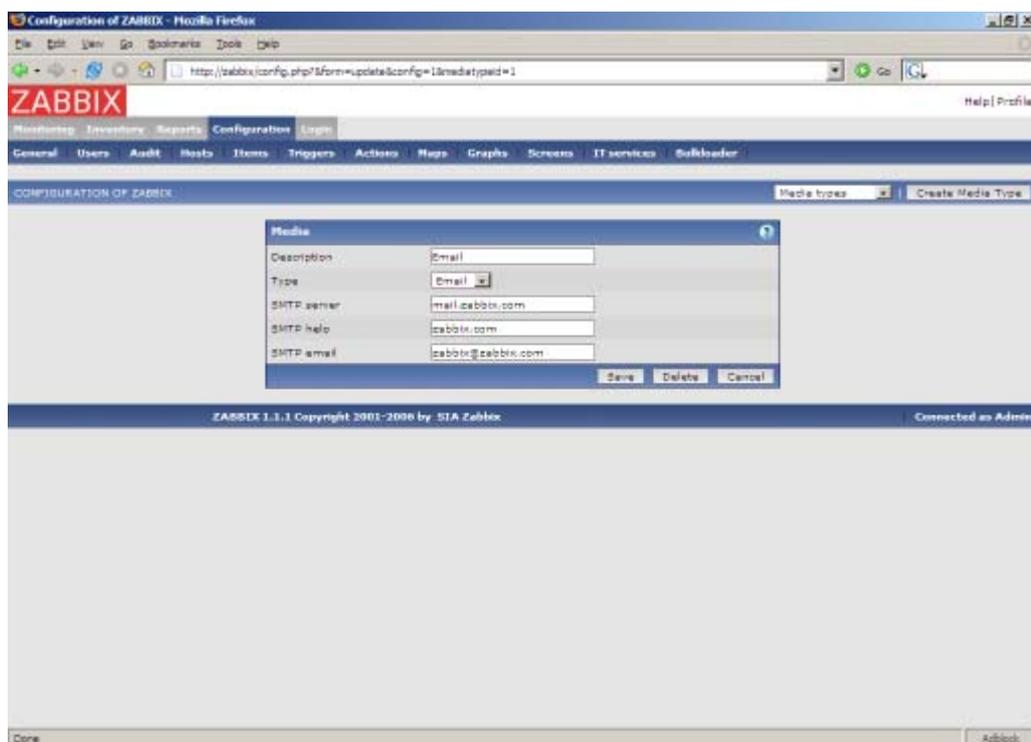
Done! You may try to log in.

5.3. Email settings

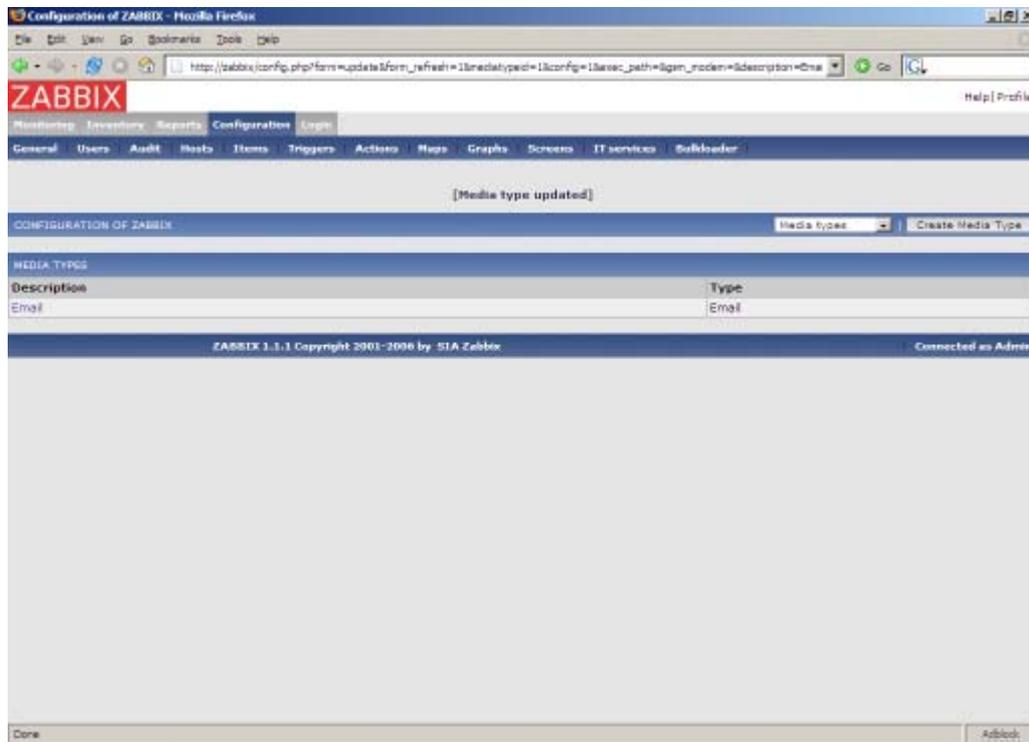
Initially, ZABBIX has only one notification delivery method (media type) defined, Email. Email configuration can be found under Menu->Configuration->Media types.



Select "Email" from the list of all available media types.



Set correct SMTP server, SMTP helo and SMTP email values. Press "Save" when ready.

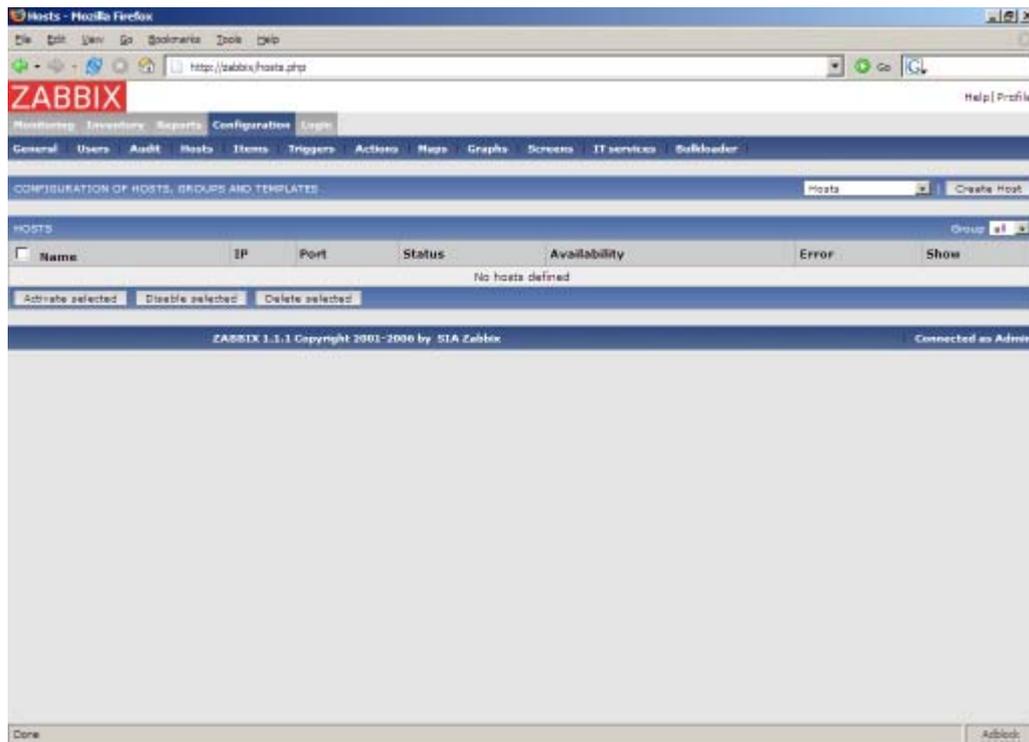


Now you have media type "Email" defined. A media type must be linked with users, otherwise it will not be used.

5.4. Add agent-enabled host

The section provides details about monitoring a host which has ZABBIX agent running. You must have the agent installed and configured properly.

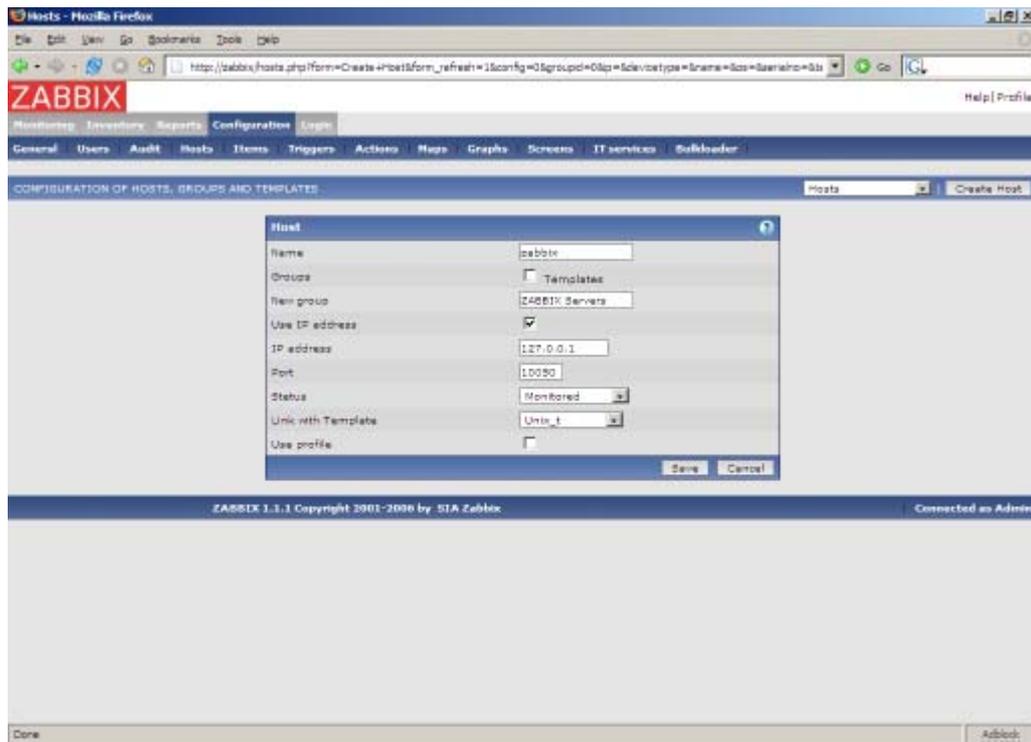
No hosts defined yet.



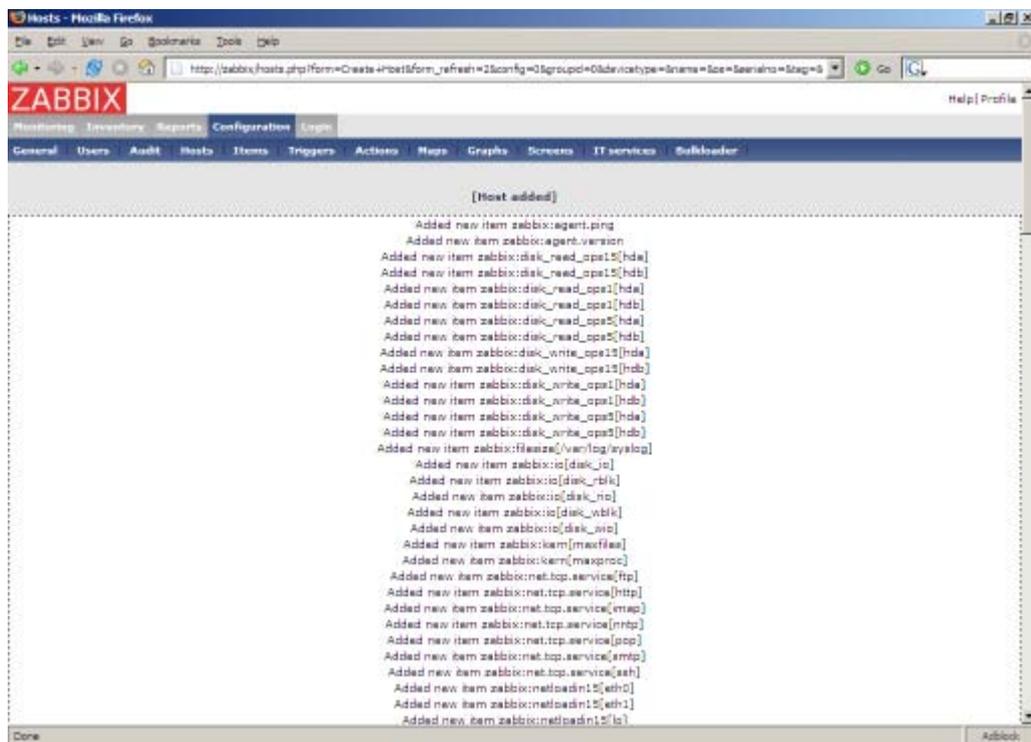
We have ZABBIX agent running on our ZABBIX server and we want to monitor this server.

Click on "Create host". Enter all required details. We will use standard template Unix_t in order to simplify configuration.

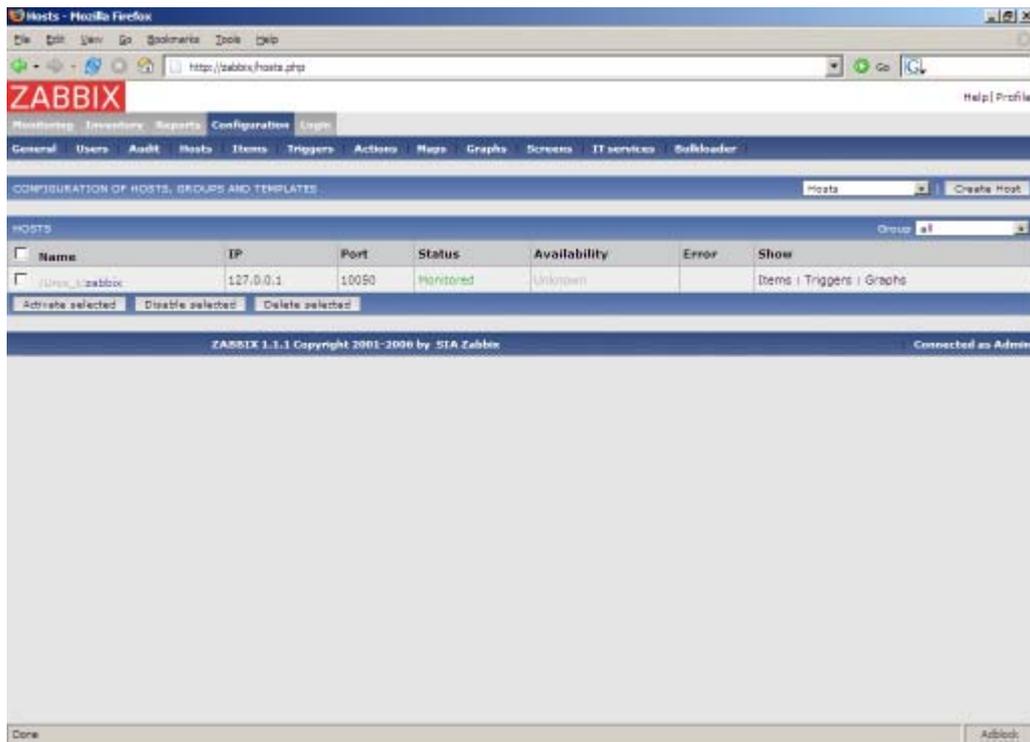
If a template is not used, we should manually add Items and Triggers to the host afterwards.



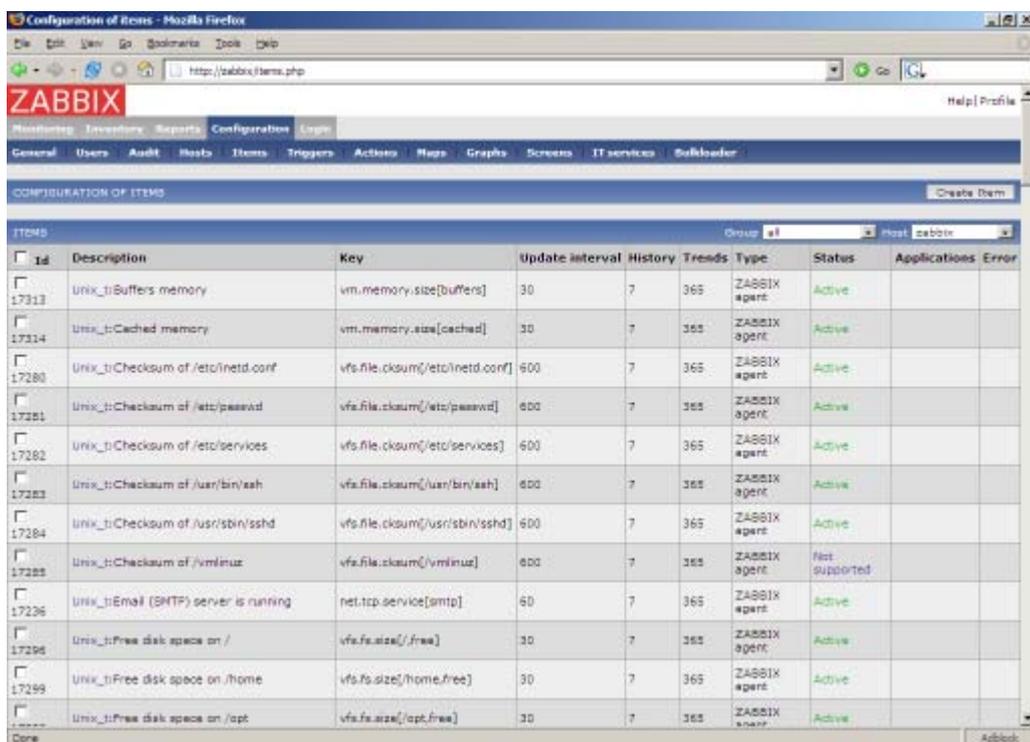
The host is created and it has exactly the same items and triggers as Unix_t has.



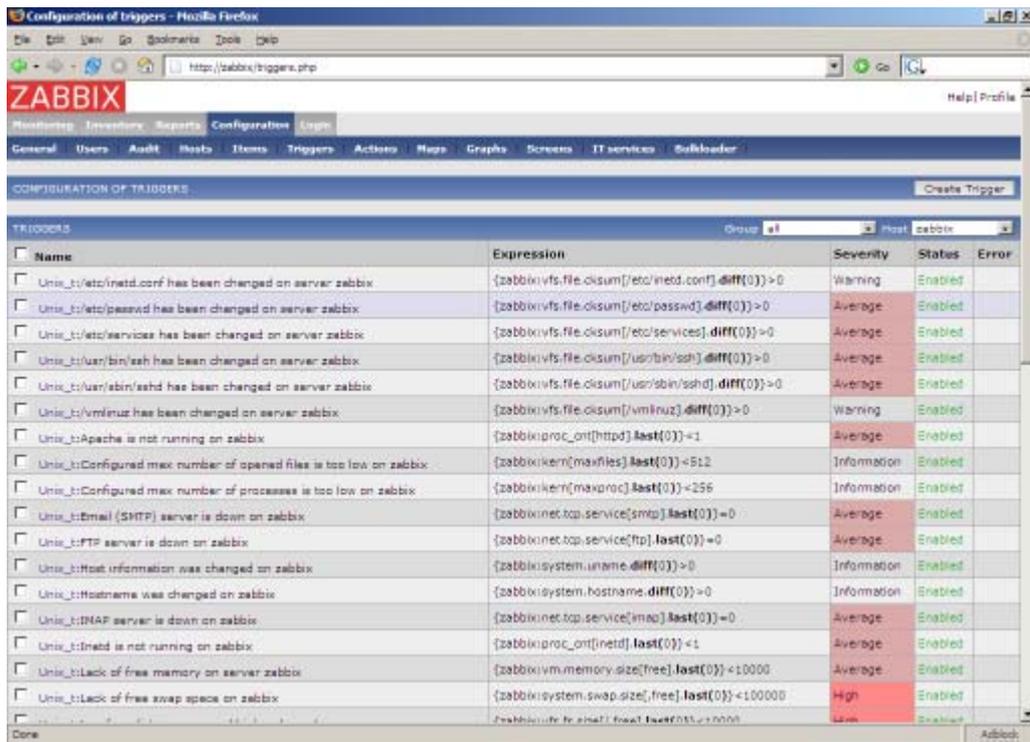
Back to the list of hosts. We see our host in the list.



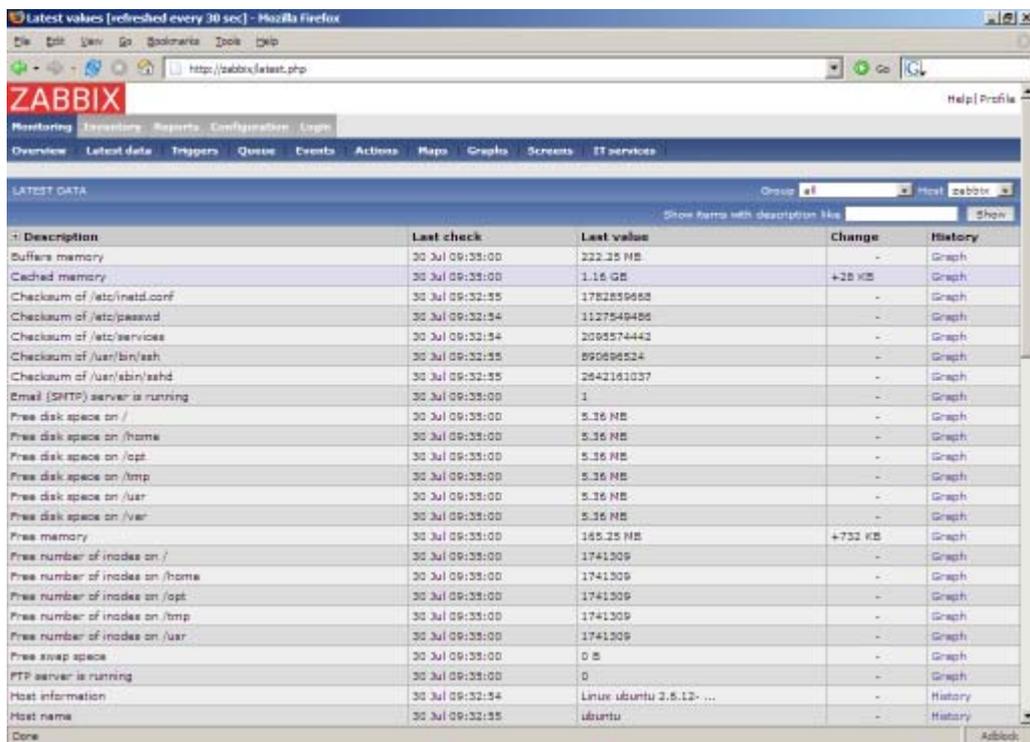
Let check if this host has any items to monitor. Menu->Configuration->Items:



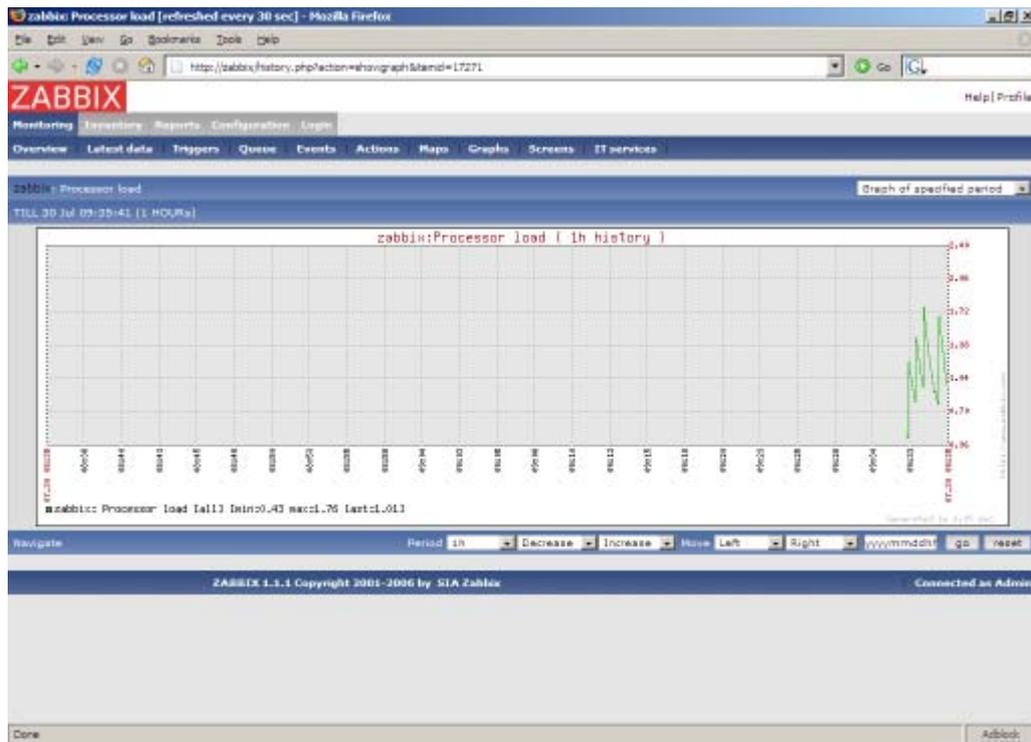
Yes! What about triggers? Menu->Configuration->Triggers:



Good. It is time to see what information is available. Go to Menu->Latest data:



It is time to see some graphs. Click on Graph.



.. and finally triggers. Menu->Status of triggers:

The screenshot shows the "STATUS OF TRIGGERS" page in ZABBIX. It displays a table of triggers with the following data:

Name	Status	SEVERITY	Last change	Acknowledged	Comments
Lack of free swap space on zabbix	TRUE	High	30 Jul 09:32:55	No (Ack)	Add
FTP server is down on zabbix	TRUE	Average	30 Jul 09:32:55	No (Ack)	Add
IMAP server is down on zabbix	TRUE	Average	30 Jul 09:32:54	No (Ack)	Add
News (NNTP) server is down on zabbix	TRUE	Average	30 Jul 09:32:54	No (Ack)	Add
POP3 server is down on zabbix	TRUE	Average	30 Jul 09:32:55	No (Ack)	Add
Too many processes running on zabbix	TRUE	Average	30 Jul 09:37:00	No (Ack)	Add
Total:6					

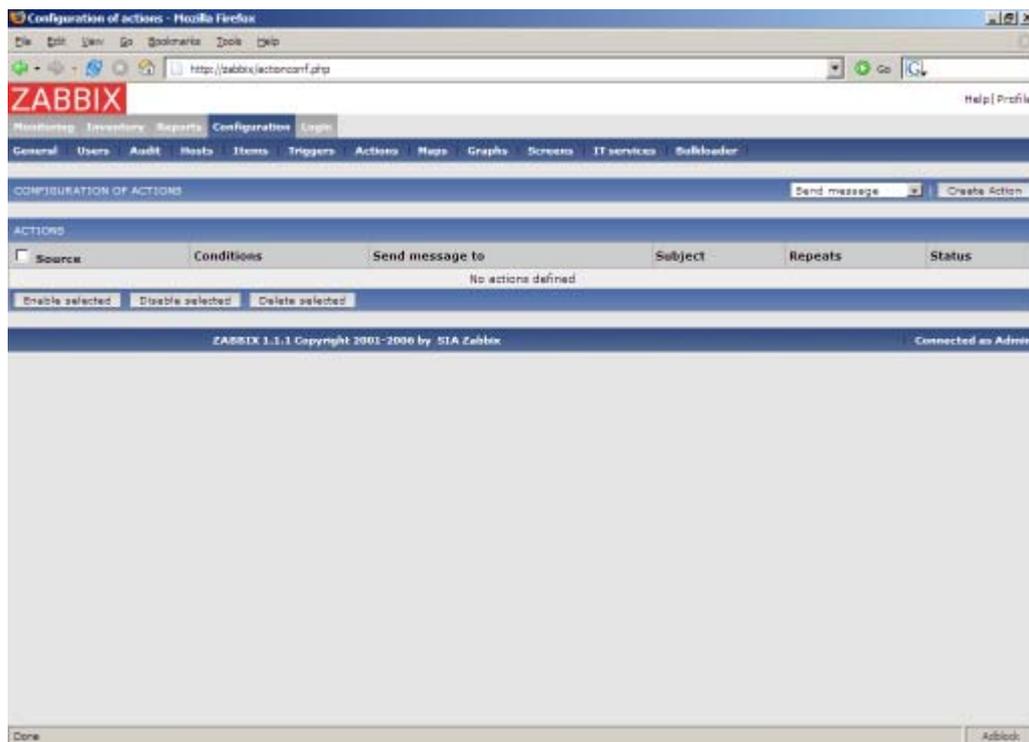
All right, the host is under ZABBIX control. After the host is added, we may be interested in:

- Modifying list of monitored items
- Modifying list of triggers items

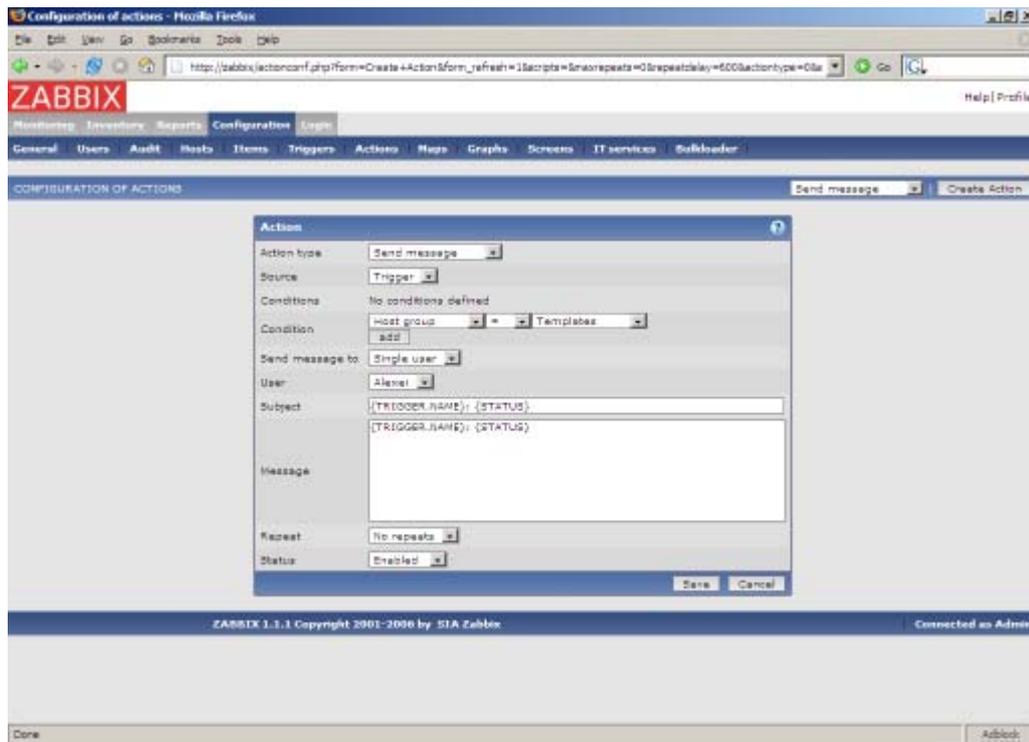
- Adjusting refresh rate for items
- Adding user notification rules

5.5. Setup notifications

We have a host or several hosts monitored. We see graphs and status of the hosts. Now it is time to configure basic email notification. Menu->Configuration->Actions



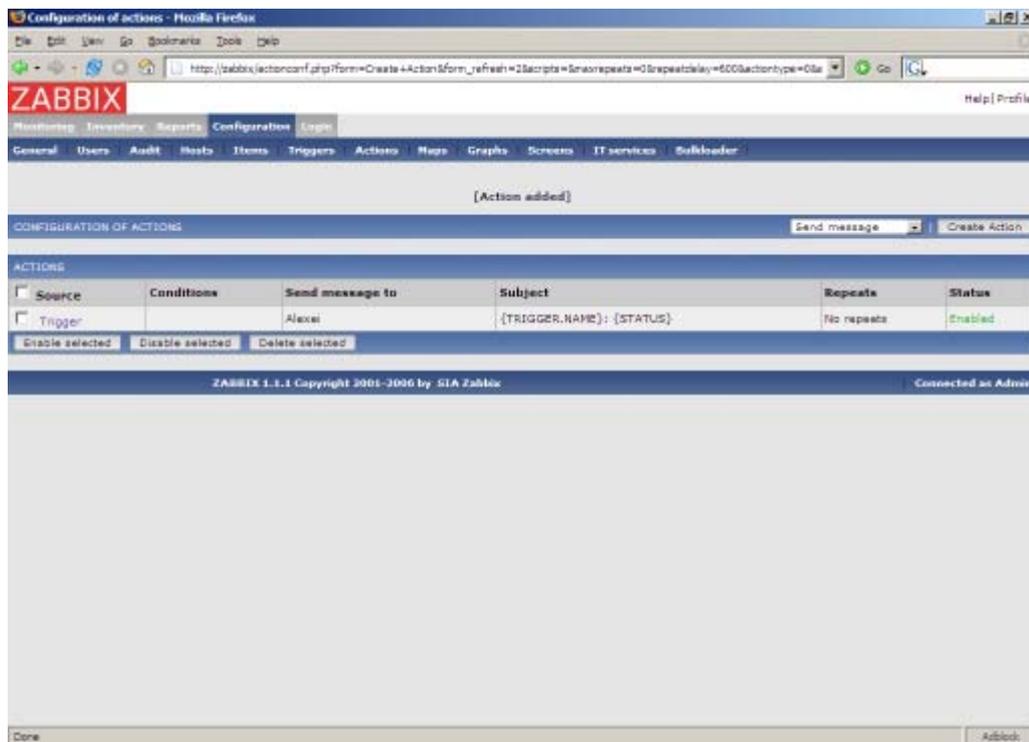
No actions defined yet. Press "Create Action":



If you do not specify any conditions the action will be triggered if any trigger change its status.

Macro {TRIGGER.NAME} will be substituted by a trigger name. Macro {STATUS} is either ON or OFF depending on current status of the trigger.

The action will be applied to all medias linked to the selected user or user group.



This is very basic setup of notifications. We may be interested in:

- Use conditions to define advanced filters for sending notification
- Repeat notifications
- Execution of remote commands

6. Import/Export

[to be finished]

7. Tutorials

The section contains step-by-step instructions for most common tasks.

7.1. Extending ZABBIX Agent

This tutorial provides step-by-step instructions how to extend functionality of ZABBIX agent.

Step 1 Write a script or command line to retrieve required parameter.

For example, we may write the following command in order to get total number of queries executed by a MySQL server:

```
mysqladmin -uroot status|cut -f4 -d":"|cut -f1 -d"S"
```

When executed, the command returns total number of SQL queries.

Step 2 Add this command to agent's configuration file.

Add the command to zabbix_agentd.conf:

```
UserParameter=mysql.questions,mysqladmin -uroot status|cut -f4 -d":"|cut -f1 -d"S"
```

mysql.questions is a unique identifier. It can be any string, for example, queries.

Test this parameter by executing:

```
zabbix_agentd -t mysql.questions
```

Step 3 Restart ZABBIX agent.

Agent will reload configuration file.

Step 4 Add new item for monitoring.

Add new item with Key=mysql.questions to the monitored host. Type of the item must be either ZABBIX Agent or ZABBIX Agent (active).

Be aware that type of returned values must be set correctly on ZABBIX server. Otherwise ZABBIX won't accept them.

7.2. Monitoring of log files

This tutorial provides step-by-step instructions how to setup monitoring of log files. It is assumed that a host is configured already in ZABBIX frontend.

Step 1 Configure ZABBIX agent.

Follow standard instructions in order to install and configure agent on monitored host. Make sure that parameter `Hostname` matches host name of the host configured in ZABBIX frontend.

Also make sure that parameter `DisableActive` is not set in `zabbix_agentd.conf`

Step 2 Add a new item for monitoring of a log file.

Pay attention to the following parameters of the item:

PARAMETER	Description
Type	Must be set to 'ZABBIX Agent (active)'.
Key	Must be set to 'log[]'. For example: log[/var/log/syslog] Make sure that the file has read permissions for user 'zabbix' otherwise the item status will be set to 'unsupported'.
Type of information	Must be set to 'log'.
Update interval (in sec)	The parameter defines how often ZABBIX Agent will check for any changes in the log file. Normally must be set to 1 second in order to get new records as soon as possible.

7.3. Remote actions

This tutorial provides step-by-step instructions how to setup remote execution of pre-defined commands in case on an event. It is assumed that ZABBIX is configured and operational.

Step 1 Configure new action.

Follow standard instructions in order to configure actions. and configure agent on monitored host.

Pay attention to the following parameters of the action:

PARAMETER	Description
Action type	Must be set to 'Remote command'.
Remote command	Each line must contain an command for remote execution. For example: host:/etc/init.d/apache restart Make sure that corresponding agent has EnableRemoteCommands set to 1 in zabbix_agentd.conf.

Syntax of remote commands:

REMOTE COMMAND	Description
<host>:<command>	Command 'command' will be executed on hist 'host'.
<group>#<command>	Command 'command' will be executed on all hosts of host group 'group'.

Important notes

Make sure that user 'zabbix' has execute permissions for configured commands. One may be interested in using `sudo` to give access to priviledged commands.

ZABBIX agent executes commands in background

ZABBIX does not check if a command has been executed successfully

8. Distributed Monitoring

8.1. Goals

There are several goals of the distributed monitoring:

- Monitor large complex environments
This is especially useful when monitoring several geographical locations.
- Offload the overhead from busy ZABBIX server
Monitoring thousands of hosts using single ZABBIX server? This may be for you!
- Get control of whole monitoring from a single location
ZABBIX administrator may control all Nodes from a single ZABBIX WEB frontend.

8.2. Overview

ZABBIX provides effective and reliable way of monitoring distributed IT infrastructure. Configuration of the whole distributed setup can be done from a single location via common WEB interface.

ZABBIX supports up-to 1000 (one thousand) Nodes in a distributed setup. Each Node is responsible for monitoring of its own Location. Node can be configured either locally or by its Master node which has a copy of configuration data of all Slave Nodes. Configuration of Slaves Nodes can be done in offline mode, i.e. when there are no connectivity between Master and Slave Node.

All Nodes may work even in case of communication problems. Historical information and event are stored locally. When communication is back, Slave Nodes will optionally send the data to Master Node.

New Nodes can be attached to and detached from the ZABBIX distributed setup without any loss of functionality of the setup. No restart of any Node required.

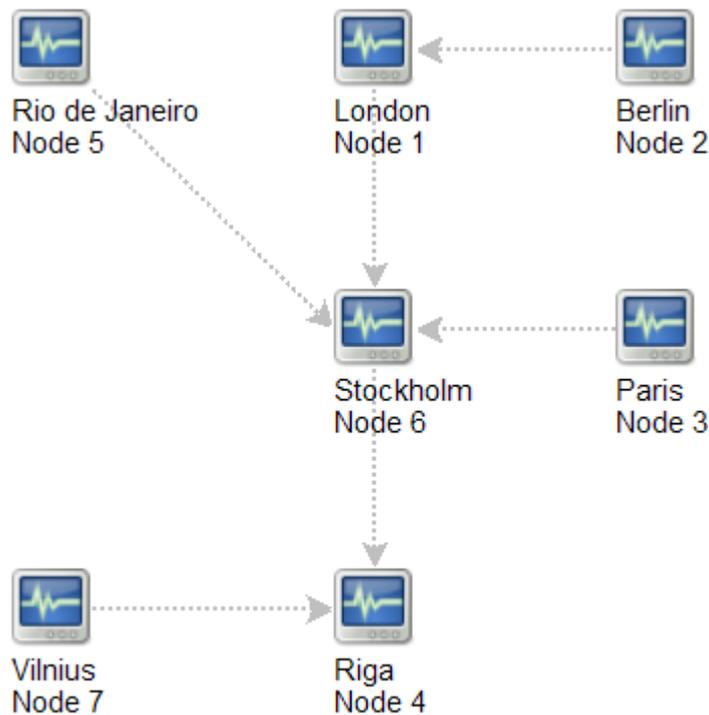
Each Node has its own configuration and works as a normal ZABBIX Server.

8.3. Configuration

Master Node can change configuration of Slave Nodes. Each Node can be configured either locally or by any Master Node of upper level. Configuration changes made by master node have priority over changes made locally.

8.3.1. Sample of Distributed Monitoring setup

The setup consists of seven Nodes. Each Node may be configured either locally (using local WEB interface) or from one of its Master Nodes.



In this example, Riga (node 4) will collect events from all slave nodes. It may also optionally collect historical information as well.

Events, historical data, alerts and SLA statistics

Slaves forward this information to master node. Synchronisation delay does not exceed 10 seconds and it is configurable. In case if there are no communication between slaves and master, slave will send the information when communication is back. Sending of historical data (history, trends) to master is configurable on per item level.

Events and Notifications

Nodes may define their own actions on events from slaves. Events coming from slave may be used to define actions.

Platform Independence

A node may use its own platform (OS, hardware) and database engine independently of other nodes. Also slave nodes can be installed without ZABBIX frontend.

It may be practical to use less powerful hardware with ZABBIX Server running SQLite or MySQL MyISAM while nodes of higher levels may use combination of SMP hardware with MySQL InnoDB, Oracle or PostgreSQL backend.

8.4. Configuration of a single Node

Every Node in distributed environment must be properly configured to have an unique Node ID.

Additional steps

Step 1 Follow standard installation procedure.

Follow standard installation procedure but do not start ZABBIX Server. ZABBIX Frontend must be installed and configured.

Step 2 Configure `zabbix_server.conf`.

Add `NodeID` to ZABBIX Server configuration file. `NodeID` must be an unique Node ID.

Step 3 Configure Master and Slave Nodes.

Use ZABBIX Frontend to configure details of Nodes having direct communication with the Node. Make sure that all IP addresses and port numbers are correct.

Step 4 Start ZABBIX Node.

Start ZABBIX Server:

```
shell> ./zabbix_server
```

If everything was configured properly, ZABBIX node will automatically start configuration and data exchange with all nodes in distributed setup. You may see the following messages in server log file:

```
...
11656:20061129:171614 NODE 2: Sending data of node 2 to node 1
datalen 3522738
11656:20061129:171614 NODE 2: Sending data of node 2 to node 1
datalen 20624
...
```

9. Frontends

10. Performance Tuning

10.1. Real world configuration

Server with ZABBIX 1.0 installed (RedHat Linux 8.0, kernel 2.4.18-14, MySQL/MyISAM 3.23.54a-4, Pentium IV 1.5Ghz, 256Mb, IDE) is able to collect more than 200 parameters per second from servers being monitored (assuming no network delays).

How many servers can be monitored by ZABBIX on the hardware, you may ask? It depends on number of monitored parameters and how often ZABBIX should acquire these parameters. Suppose, each server you monitor has ten parameters to watch for. You want to update these parameters once in 30 seconds. Doing simple calculation, we see that ZABBIX is able to handle 600 servers (or 6000 checks). In case if these parameters need to be updated once in a minute, the hardware configuration will be able to handle $600 \times 2 = 1200$ servers. These calculations made in assumption that all monitored values are retrieved as soon as required (latency is 0). If this is not a requirement, then number of monitored servers can be increased even up to 5x-10x times.

10.2. Performance tuning

10.2.1. Hardware

General advices on hardware:

- Use fastest processor available
- SCSI is better than IDE (performance of IDE disks may be significantly improved by using utility hdparm) and SATA
- 15K RPM is better than 10K RPM which is better than 7200 RPM
- Use fast Ethernet adapter
- Having more memory is always better

10.2.2. Operating System

- Use latest (stable!) version of OS
- Exclude unnecessary functionality from kernel
- Tune kernel parameters

ZABBIX configuration parameters

Many parameters may be tuned to get optimal performance.

zabbix_server

StartPollers

General rule - keep value of this parameter as low as possible. Every additional instance of `zabbix_server` adds known overhead, in the same time, parallelism is increased. Optimal number of instances is achieved when queue, on average, contains minimum number of parameters (ideally, 0 at any given moment). This value can be monitored by using internal check `zabbix[queue]`.

DebugLevel

Optimal value is 3.

DBSocket

MySQL only. It is recommended to use DBSocket for connection to the database. That is fastest and most secure way.

10.2.3. Database Engine

This is probably most important part of ZABBIX tuning. ZABBIX heavily depends on availability and performance of database engine.

- use fastest database engine, i.e. MySQL
- use stable release of a database engine
- rebuild MySQL or PostgreSQL from sources to get maximum performance
- follow performance tuning instructions taken from MySQL or PostgreSQL documentation
- for MySQL, use InnoDB table structure
- ZABBIX works at least 1.5 times faster (comparing to MyISAM) if InnoDB is used. This is because of increased parallelism. However, InnoDB requires more CPU power.
- keep database tables on different hard disks
- 'history', 'history_str', 'items', 'functions', 'triggers', and 'trends' are most heavily used tables.

10.2.4. General advices

- monitor required parameters only
- tune 'Update interval' for all items. Keeping small update interval may be good for nice graphs, however, this may over load ZABBIX
- tune parameters for default templates
- tune housekeeping parameters
- do not monitor parameters which return same information.

Example: why use `system[proclload]`, `system[proclload5]` and `system[proclload15]` if `system[proclload]` contains all.

- avoid use of triggers with long period given as function argument. For example, `max(3600)` will be calculated significantly slower than `max(60)`.

11. Cookbook

11.1. GENERAL RECIPES

11.1.1. Monitoring of server's availability

Two methods (or combination of both methods) may be used in order to monitor availability of a server.

- ICMP ping (Key "icmpping")
- Key "status"

Use of both email and SMS notification for a single user

ZABBIX can be configured to send notifications using different medias depending of priority of a trigger.

11.1.2. Sending alerts via WinPopUps

WinPopUps maybe very useful if you're running Windows OS and want to get quick notification from ZABBIX. It could be good addition for email-based alert messages. Details about enabling of WinPopUps can be found at https://sourceforge.net/forum/message.php?msg_id=2721722.

11.2. MONITORING OF SPECIFIC APPLICATIONS

11.2.1. AS/400

IBM AS/400 platform can be monitored using SNMP. More information is available at <http://publib-b.boulder.ibm.com/Redbooks.nsf/RedbookAbstracts/sg244504.html?Open>.

11.2.2. MySQL

Configuration file `misc/conf/zabbix_agentd.conf` contains list of parameters that can be used for monitoring of MySQL.

```
### Set of parameter for monitoring MySQL server (v3.23.42 and later)
### Change -u and add -p if required
#UserParameter=mysql[ping],mysqladmin -uroot ping|grep alive|wc -l
#UserParameter=mysql[uptime],mysqladmin -uroot status|cut f2 -d"."|cut -f1 -d"T"
#UserParameter=mysql[threads],mysqladmin -uroot status|cut f3 -d"."|cut -f1 -d"Q"
#UserParameter=mysql[questions],mysqladmin -uroot status|cut f4 -d"."|cut -f1 -d"S"
#UserParameter=mysql[slowqueries],mysqladmin -uroot status|cut f5 -d"."|cut -f1 -d"O"
#UserParameter=mysql[qps],mysqladmin -uroot status|cut -f9 d":"
#UserParameter=version[mysql],mysql -V
```

`mysql[ping]`

Check, if MySQL is alive

Result: 0 - not started 1 - alive

* `mysql[uptime]`

Number of seconds MySQL is running

* `mysql[threads]`

Number of MySQL threads

* `mysql[questions]`

Number of processed queries

* `mysql[slowqueries]`

Number of slow queries

* mysql[qps]

Queries per second

* mysql[version]

Version of MySQL

Example: mysql Ver 11.16 Distrib 3.23.49, for pc-linux-gnu (i686)

11.2.3. Mikrotik routers

Use SNMP agent provided by Mikrotik. See <http://www.mikrotik.com> for more information.

11.2.4. WIN32

Use ZABBIX W32 agent included (pre-compiled) into ZABBIX distribution.

11.2.5. Novell

Use MRTG Extension Program for NetWare Server (MRTGEXT.NLM) agent for Novell. The agent is compatible with protocol used by ZABBIX. It is available from <http://forge.novell.com/modules/xfmod/project/?mrtgext>.

Items have to be configured of type ZABBIX Agent and must have keys according to the MRTGEXT documentation.

For example:

* UTIL1

1 minute average CPU utilization

* CONNMAX

Max licensed connections used

* VFkSys

bytes free on volume Sys:

Full list of parameter supported by the agent can be found in readme.txt, which is part of the software.

11.2.6. Tuxedo

Tuxedo command line utilities tadmin and qadmin can be used in definition of a UserParameter in order to return per server/service/queue performance counters and availability of Tuxedo resources.

11.2.7. Informix

Standard Informix utility onstat can be used for monitoring of virtually every aspect of Informix database. Also, ZABBIX can retrieve information provided by Informix SNMP agent.

11.2.8. JMX

First of all, you need to configure your jvm to allow jmx monitoring. How do you know if you can do this? You can use the sun jconsole utility that comes with the jdk and point it at your machine running the jvm. If you can connect, you are good.

In my tomcat environment, I enable it by setting the following options for the jvm:

```
-Dcom.sun.management.jmxremote \  
-Dcom.sun.management.jmxremote.port=xxxxx \  
-Dcom.sun.management.jmxremote.ssl=false \  
-Dcom.sun.management.jmxremote.authenticate=true \  
-  
Dcom.sun.management.jmxremote.password.file=/path/java/jre/lib/management/j  
mxremote.password"
```

This tells the jmx server to run on port XXXXX, to use password authentication, and to refer to the passwords stored in the jmxremote.password file. See the sun docs on jconsole for details. (You might consider enabling ssl to make the connection more secure.)

Once that is done, I can then run jconsole and see everything that is currently exposed (and to verify that I can connect properly). jconsole will also provide you the information you need to query specific jmx attributes from the information tab.

Now, since I use Tomcat, there are two ways that I can grab the jmx attribute values (or effect a jmx operation). The first way is I can use the servlet provided by Tomcat. (Don't know what jboss has). The second way is I can send well formatted requests via a jmx command line tool.

Let's say I am interested in peak threads used by the system. I browse down through the jmx objects via jconsole, find it under java.lang, Threading. After selecting Threading, I click on the info tab, and I can see the name of the mbean is "java.lang:type=Threading"

With tomcat, I can do the following:

```
curl -s -u<jmxusername>:<jmxpassword> 'http://<tomcat_hostname>/manager/jmxproxy/?qry=java.lang:type=Threading'
```

where the jmx username and password are the ones defined in the file defined in the jvm options above, the qry string is the one obtained from jconsole.

The output from this will be all the metrics from this jmx key. Parse the output and grab the number of your choice.

If you don't have a servlet that will allow you to make a http request to the jmx interface, you can use the command line tool like this

```
<pathTo>/java -jar <pathTo>/cmdline-jmxclient.jar  
<jmxusername>:<jmxpassword> <jvmhostname>:<jmxport>  
java.lang:type=Threading PeakThreadCount
```

The difference with the command line client is you need to specify the attribute you are interested in specifically. Leaving it out will give you a list of all the attributes available under Threading.

Again, parse the output for the data of your choice.

Once you can reliably grab the data you are interested in, you can then turn that command into a zabbix userparm.

e.g.

```
UserParameter=jvm.maxthreads, /usr/bin/curl -s -  
u<jmxusername>:<jmxpassword>  
'http://<tomcat_hostname>/manager/jmxproxy/?qry=java.lang:type=Threading' |  
<bin>/awk '/^PeakThreadCount\t:/{ gsub( /[^\0123456789]/, "" ); print $1 }'
```

or

```
UserParameter=jvm.maxthreads, <pathTo>/java -jar <pathTo>/cmdline-  
jmxclient.jar <jmxusername>:<jmxhostname> <jvmhostname>:<jmxport>  
java.lang:type=Threading PeakThreadCount | <some filter to grab just the  
number you need - left as an exercise to the reader>
```

That's it.

I prefer getting my stats from the servlet via http rather than using the java command line client as it is much "lighter" to start up and grab the information.

Need a command line jmx client? I use the one from here:

<http://crawler.archive.org/cmdline-jmxclient/>

Information on setting up jmx monitoring for your jvms
<http://java.sun.com/j2se/1.5.0/docs...ment/agent.html>

General Information on JMX
<http://java.sun.com/j2se/1.5.0/docs...verviewTOC.html>

PS: apparently the 1.5 jvm also supports snmp which provides another option.

11.3. INTEGRATION

11.3.1. HP OpenView

ZABBIX can be configured to send messages to OpenView server. The following steps must be performed:

Step 1 Define new media.

The media will execute a script which will send required information to OpenView.

Step 2 Define new user.

The user has to be linked with the media.

Step 3 Configure actions.

Configure actions to send all (or selected) trigger status changes to the user.

Step 4 Write media script.

The script will have the following logic. If trigger is ON, then execute OpenView command `opcmsg -id application=<application> msg_grp=<msg_grp> object=<object> msg_text=<text>`. The command will return unique message ID which has to be stored somewhere, preferably in a new table of ZABBIX database. If trigger is OFF then `opcmsg <message id>` has to be executed with message ID retrieved from the database.

Refer to OpenView official documentation for more details about `opcmsg` and `opcmsgack`. The media script is not given here.

12. Internals

12.1. Processing of timeouts

This document describes how ZABBIX server handles timeout situations and network errors.

Note that ZABBIX equally treats timeouts and network errors.

ZABBIX poller processes periodically (according to configuration of items) queries ZABBIX and SNMP agents for up-to-date performance and availability information. Normally, if no timeout happens, it connects to the agent, asks for needed information, receives the data, disconnects and processes the received data.

But what happens in case of timeout?

First timeout

ZABBIX writes Host [<hostname>]: first network error, wait for 15 seconds to server's log file and will try to connect to the host only after UnreachableDelay seconds, where UnreachableDelay = 15 by default.

So, normally the host will be checked after 15 seconds.

Next timeouts

After 15 seconds, ZABBIX server will try to connect to the monitored device once again.

In case of timeout and if a host was unavailable for more than UnreachablePeriod, 45 seconds by default, the host will be checked after UnavailableDelay seconds. Host status will be changed to Unreachable.

UnavailableDelay is 60 seconds by default.

ZABBIX writes Host [<hostname>]: another network error, wait for 15 seconds to the log file.

If more than UnreachablePeriod seconds passed since first timeout, the host status will be changed to UNAVAILABLE and it will be checked again each UnavailablePeriod seconds, 60 seconds by default.

Important

One of ZABBIX pollers is dedicated to processing of unreachable and unavailable hosts. The poller does not process normal hosts.

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- Share your experience

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- Write review

ZABBIX is relatively new software and many people are not aware of its existence. It would be very beneficial for the project to be mentioned in popular tech media. Comparison to existing Open Source and commercial competitive products is especially welcome. My assistance is guaranteed!

- Report bugs

Please, report any bugs or inefficiencies of the software. It is not necessary to send patches or workarounds.

- Write code

Before sending a patch or a piece of code, please, make sure that:

- * new code is in sync with ZABBIX coding conventions
- * new code is tested and works under all supported platforms. Report any compatibility issues.
- * new functionality is clearly described
- * no copyright issues associated with your work

Please, consider discussing your ideas with ZABBIX developers before writing actual code.

I believe this policy guarantees high quality of the software and makes support more efficient.

My wish list at Amazon.com

If ZABBIX just saved you from a disaster or if you want to be nice to me, you can purchase something from my wish list at Amazon.com.

Thanks to all who sent me something from Amazon!

- Charlie Collins, USA
- Henrik Huhtinen, Finland
- Jaroslaw Pioro, Poland
- Julian Pawlowski, Virtual-Planet Group GmbH, Germany
- Ken Smith, USA
- Plushosting B.V., Netherlands

Contributors

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15. Credits

ZABBIX team wants to thank the guys from <http://sourceforge.net> for providing hosting for the project. Our team also wants to thank all the ZABBIX users who have sent corrections and suggestions. This sort of feedback helps us make the software better.

15.1. Developers of ZABBIX

- ALEXEI VLADISHEV

Has written most of ZABBIX code including PHP front-end.

- EUGENY GRIGORJEV

Many significant improvements mostly related to PHP front-end.

15.2. Contributors to ZABBIX

In alphabetical order:

- ALEXANDER KALIMULIN

Help with various issues related to C, C functions, etc

- ALEXANDER KIRHENSTEIN

Suggested fixes to make ZABBIX work under SCO.

- ARTURS ABOLTINS

Patch to allow connection to MySQL using UNIX socket. Support for graceful shutdown in case MySQL server goes down (not implemented yet). Idea and initial code for ZABBIX screens.

- CHARLIE COLLINS

Start-up scripts. Significant improvements of the Manual. Thanks Charlie!

- DENIS USTIMENKO

Support for querying SNMP parameters by IP address.

- DANIEL ESTER

Support for SNMP values of type timetick.

- DANIEL HIGGINS

Improvements for email sending routines. Other changes.

- ERIK CARLSEEN

Many excellent ideas.

- EUGENY BACULA

Many suggestions for improvements.

- FRANKY VAN LIEDEKERKE

Support of system[uptime] under Solaris. Fixes and suggestions.

- HARALD HOLZER

RPMs and zabbix.spec.

- IGOR MICKO

Plenty of interesting ideas based on real use of ZABBIX in large monitoring environment.

- JAEN-BAPTISTE MARIOTTE

Help with testing

- JEFF REDDING

Support for non-GCC compilers

- JOHN CRUNK

Start-up scripts for RedHat 8.0

- JOSH KONKOL

Help with testing

- JÜRGEN SCHMITZ

Idea and implementation of `check_service_perf[*]`

- KASPARS CIKMACS

Lots of new ideas based on real experience of using ZABBIX.

- LAURIS STIGLICS

Select criteria in for “Status of Triggers”

- LUKAS MACURA

Many ideas.

- MARC LEDENT

Original implementation of `proc_cnt[*]` for Solaris.

- MARIUSZ ...

Support for `system[proclod]` on Solaris 2.6. Improvements for graphs. Improvements for system maps.

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Fixes in SQL statements of WEB frontend.

- RICKARD PLARS

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- SEBASTIEN "SLIX" LIENARD

Fixed selection of hosts and icons in `sysmap.php`. Other fixes.

- SHAWN MARRIOTT

Proofreading of the Manual.

- VICTOR KIRHENSTEIN

Native ZABBIX agent for WIN32 platforms.

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