ZABBIX

Release 007

ZABBIX Manual v1.4

Review and Approval			
	Name	**Signature**	**Date**
For ZABBIX SIA:			

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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 deep 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.

Contacts

ZABBIX SIA

Location: Neretas 2/1-109, LV-1004, Riga, Latvia

Tel: +371 7743943

Fax: +371 7743944

Email: **sales@zabbix.com**

ZABBIX SIA, Product Manager, Director

Alexei Vladishev

Tel: +371 7743943

Fax: +371 7743944

Email: **alexei.vladishev@zabbix.com**

ZABBIX SIA, Sales Department

Email: **sales@zabbix.com**

ZABBIX SIA, Customer Support Department

Email: **support@zabbix.com**

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, jabber, SMS, scripts).
Auto-registration	Auto-registration 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.
Auto-discovery	ZABBIX auto-discovery module is a module which performs automated discovery of hosts and services and generating events for further processing.
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 a 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	ZABBIX Server process which processes ICMP pings.
Poller	ZABBIX Server process which is responsible for retrieval of data from ZABBIX and SNMP agents and processing remote (simple) checks.
ROI	Return on Investment.

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.
Sender	ZABBIX utility which sends data to ZABBIX Server for further processing. It usually used in user scripts.
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	ZABBIX Server process responsible for processing of date and time related functions of trigger expressions.
Trapper	ZABBIX Server process responsible for processing of ZABBIX Agent (active) checks, log files and data sent by sender.
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 front-end 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
`file name`	Name of file or directory
bold text	Notes, important information, strong emphasis
Shell commands	Shell commands, paths, configuration files
`Constants`	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 of servers and network devices
- distributed monitoring with centralised WEB administration
- 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, Windows Vista)
- 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
- audit log

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 recognized 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 scenarios-based 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 behavior 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 centralized 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. ZABBIX 1.4

ZABBIX 1.4 is the next generation of the open source distributed monitoring system from ZABBIX SIA.

These Release Notes cover what's new, installation and upgrade notes for ZABBIX 1.4.

2.1. What's new in 1.4

2.1.1. Auto-discovery

ZABBIX distributed monitoring module allows to deploy ZABBIX systems easily. The discovery supports IP ranges, service checks, agent and SNMP checks for efficient auto-discovery.

2.1.2. Distributed monitoring

ZABBIX distributed monitoring is made for complex environments consisting of different locations.

ZABBIX supports monitoring of an unlimited number of nodes. Centralized configuration allows easy all the nodes to be configured from a single location easily.

2.1.3. WEB monitoring

WEB monitoring module enables flexible and easy monitoring of availability and performance of WEB sites and WEB-based applications. It supports passing of GET and POST variables.

2.1.4. Installation Wizard

Installation Wizard automatically checks pre-requisites, database connectivity and generates a configuration file for WEB front end.

2.1.5. Support of new database engines

SQLite support has been implemented. It allows to use ZABBIX in embedded environments.

2.1.6. WEB interface improvements

WEB interface speed and usability have been improved greatly.

2.1.7. New notification methods

Native support of Jabber messaging has been introduced.

2.1.8. Many-to-many template linkage

More flexible host-template linkage saves time and makes the configuration of hosts more flexible and straight forward.

2.1.9. Database watchdog

ZABBIX server will automatically warns the group of users if the database is down and continues normal operations when the database is back.

2.1.10. XML data import/export

New XML data import and export functionality is an excellent way of sharing templates, hosts configuration and items/triggers related information.

2.1.11. Windows Vista Support

ZABBIX Windows agent supports Windows Vista, both 32 and 64 bit versions.

2.1.12. More flexible actions

Multiple operations (notifications, script execution) per action are supported. The choice of action calculation algorithm was introduced.

2.1.13. Server-side external checks

The server-side external checks can be used to introduce custom checks executed on ZABBIX server side.

2.1.14. New user permission schema

The old user permission schema is no longer supported. It was replaced by a new more efficient, yet simple, schema working on the level of user groups and host groups.

2.1.15. Hysteresis support

ZABBIX supports the use of different trigger expressions for going to ON and OFF states.

2.1.16. Slide show support

Several screens can be grouped into a slide show for better presentation.

2.1.17. ZABBIX server can spread the workload across several servers

Groups of server side processes (discoverer, poller, HTTP poller, trapper, etc) can be located on different physical servers for better performance and availability.

2.1.18. Other improvements

2.1.18.1. The same code for UNIX and Windows agents

Sharing of agent code means better testing and stability.

2.1.18.2. New communication protocol

New communication protocol, compatible with 1.0 and 1.1.x, was developed.

2.1.18.3. Increased maximum size of background images

Maximum size of background images for maps was increased to 1.5-2MB, depending on configuration settings in php.ini.

2.1.18.4. New default templates

Built-in template got new naming, several new templates were introduced.

2.1.18.5. Flexible refresh intervals

ZABBIX support different refresh intervals for items for different days of week and time.

2.1.18.6. Stacked graphs

Stacked graphs are supported.

2.1.18.7. More flexible log rotation

New parameter, LogFileSize, controls parameters of log rotation for ZABBIX server and agents.

2.1.18.8. Support of static linkage

Static linkage of server and agent binaries was fixed.

2.1.18.9. Colour selection for graphs

Graphs support moredefaul colors and selection of RGB style color.

2.1.18.10. Log filtering on agent side

Log filtering by Posix style regular expression was implemented for more efficient monitoring of log files.

2.1.18.11. Improved configuration script

2.1.18.12. ZABBIX sender to read configuration parameter from agent's configuration file

ZABBIX sender (zabbix_sender) can read server related parameters from agent's configuration file.

2.1.18.13. Support of macros in remote commands

Standard macros can be also used in remote commands.

2.1.18.14. New configuration parameters

Several server-side configuration parameters were introduced.

2.1.18.15. avg() will support integer type

Function avg() can be used for integer items.

2.1.18.16. An icon can be assigned to hosts having 'unknown' status

An icon for hosts in 'unknown' status can be defined for use in maps.

2.2. What's no longer supported

2.2.1.1. Repeated actions and notifications

Repeated actions and notification, poorly working in 1.1.x, are no longer supported. This functionality will be replaced by new escalation module in future releases of ZABBIX.

2.2.1.2. Bulk loader was replaces by XML Data Import/Export

Plain text bulk loader was replaced by more flexible XML Data Import/Export module.

2.2.1.3. User permissions on per-element level

User permissions of per-element level are no longer supported. It has been replaces by new user permission schema.

2.3. Installation and Upgrade Notes

2.3.1. Installation

See the INSTALLATION section for full details.

2.3.2. Version compatibility

Agents from ZABBIX 1.0 and ZABBIX 1.1.x can be used with ZABBIX 1.4. No modification required.

ZABBIX 1.4 agents can be used with earlier versions of ZABBIX. Note that the newest agents do not support old keys of ZBABIX 1.0.

2.3.3. Upgrade procedure

The following steps have to be performed for successful upgrade from ZABBIX 1.3.x to 1.4.

The whole upgrade procedure may take several hours depending on size of ZABBIX database.

2.3.3.1. Stop ZABBIX server

Stop ZABBIX server to make sure that no new data are coming to database.

2.3.3.2. Backup existing ZABBIX database

This is very important step. Make sure that you have backup of your database. It will help if upgrade procedure fails (lack of disk space, power off, any unexpected problem).

2.3.3.3. Backup configuration files, PHP files and ZABBIX binaries

Make a backup copy of ZABBIX binaries, configuration files and PHP files.

2.3.3.4. Install new server binaries

You may use pre-compiled binaries or compile your own.

2.3.3.5. Review Server configuration parameters

Some parameters of zabbix_server.conf were changed in 1.4, new parameters added. You may want to review them.

2.3.3.6. Upgrade database

Database upgrade scripts are located in directory upgrade/dbpatches/1.4/<db engine>:

MySQL: upgrade/dbpatches/1.4/mysql/patch.sql

Oracle: upgrade/dbpatches/1.4/oracle/patch.sql

PostgreSQL: upgrade/dbpatches/1.4/postgresql/patch.sql

Note: Database upgrade may take quite significant time, several hours or more. It is recommended to test the upgrade in test environment.

Make sure that you have enough permissions (create table, drop table, create index, drop index). Also make sure that you have enough free disk space.

Normally you should have at least 2x more disk space than size of existing database.

Note: These scripts are for upgrade from ZABBIX 1.1.x to 1.4 only!

2.3.3.7. Install new ZABBIX GUI

Follow Installation Instructions.

2.3.3.8. Start new ZABBIX binaries

Start new binaries. Check log files to see if the binaries are started successfully.

2.4. Commercial support

ZABBIX SIA offers a full range of support options to meet your specific needs.

ZABBIX Support Services provide direct access to our expert Support Engineers who are ready to assist you in the development, deployment, and management of ZABBIX.

Visit **http://www.zabbix.com/services.php** or contact **sales@zabbix.com** for more details.

3. Installation

3.1. How to Get ZABBIX

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

3.2. Requirements

3.2.1. Hardware Requirements

3.2.1.1. Memory Requirements

ZABBIX requires both physical and disk memory. 128 MB of physical memory and 256 MB of free disk space 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.

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

3.2.1.2. CPU Requirements

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

3.2.1.3. Other hardware

A serial communication port and a serial GSM Modem required for using SMS notifications built-in ZABBIX.

3.2.1.4. 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 Linux 64 bit	AMD Athlon 3200+ 2GB	MySQL InnoDB	500
Large	Ubuntu Linux 64 bit	Intel Dual Core 6400 4GB RAID	MySQL InnoDB or PostgreSQL	>1000
Very large	RedHat Enterprise	Intel Xeon 2 CPU 8GB RAID	MySQL InnoDB or PostgreSQL	>10000

Note: Actual configuration depends on number of active items and refresh rates very much. It is recommended to keep database engine on a separate box for large installations.

3.2.2. 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.

3.2.3. 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:

Software	Version	Comments
Apache	1.3.12 or later	
PHP	4.3 or later	
PHP modules: **php-gd** **php-bcmath**	4.3 or later	PHP GD module must support PNG images.
MySQL **php-mysql**	3.22 or later	Required if MySQL is used as ZABBIX backend database.
Oracle **php-sqlora8**	9.2.0.4 or later	Required if Oracle is used as ZABBIX backend database.
PostgreSQL **php-sqlora8**	7.0.2 or later	Required if PostgreSQL is used as ZABBIX backend database. Consider using PostgreSQL 8.x or later for much better performance.
SQLite **php-sqlite3**	3.3.5 or later	Required if SQLite is used as ZABBIX backend database.

Note: ZABBIX may work on previous versions of Apache, MySQL, Oracle, and 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.

3.2.4. 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

3.2.5. 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.

3.3. Components

3.3.1. ZABBIX Components

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

3.3.2. 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.

3.3.3. 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.

3.3.4. 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.

3.4. Installation from Source

3.4.1. 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.

Iksemel library and header files

Required to enable Jabber messaging. Optional.

Libcurl library and header files

Required for WEB monitoring module. 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.

GNU Make

GNU make is required to process ZABBIX Makefiles.

3.4.2. 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.

3.4.3. 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_mysql.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 –with-jabber –with-libcurl # for MySQL + Jabber + WEB monitoring

or

shell> ./configure --enable-server --with-pgsql --with-net-snmp –with-jabber –with-libcurl # for PostgreSQL + Jabber + WEB monitoring

or

shell> ./configure --enable-server --with-oracle=/home/zabbix/sqlora8 --with-net-snmp –with-jabber –with-libcurl # for Oracle + Jabber + WEB monitoring

Note: Use flag --with-oracle to specify location of sqlora8 library. The libary 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-snmp can be used instead of --with-net-snmp. If no SNMP support required, both --with-net-snmp and --with-ucd-snmp may be skipped.

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

shell> ./configure --enable-server --enable-agent --with-mysql --with-net-snmp –with-jabber –with-libcurl

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. Connectionsfrom 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
```

3.4.4. 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.

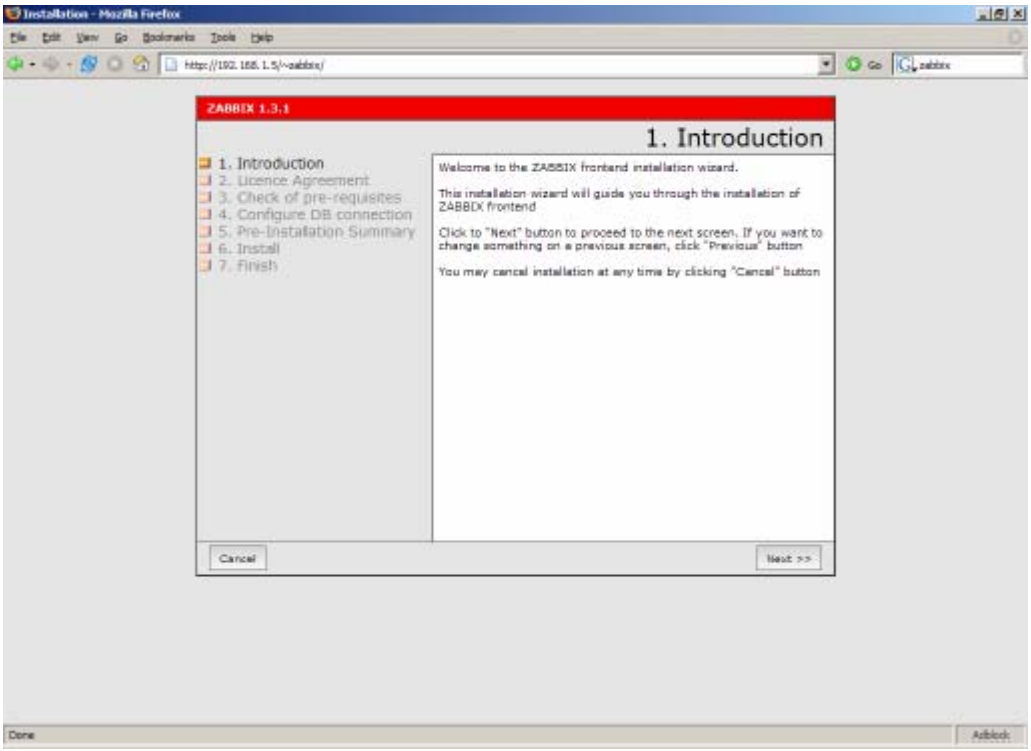
Step 9 Run zabbix_agentd on all monitored machines

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

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

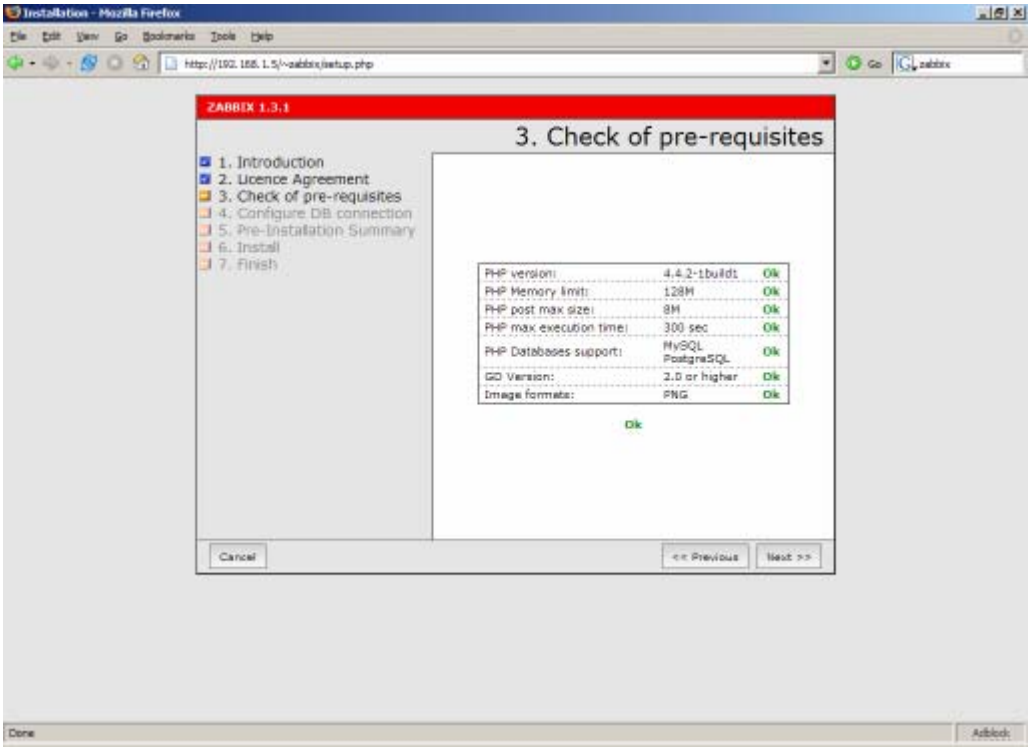
3.4.5. ZABBIX WEB Interface

Step 1 Point your browser to ZABBIX URL.

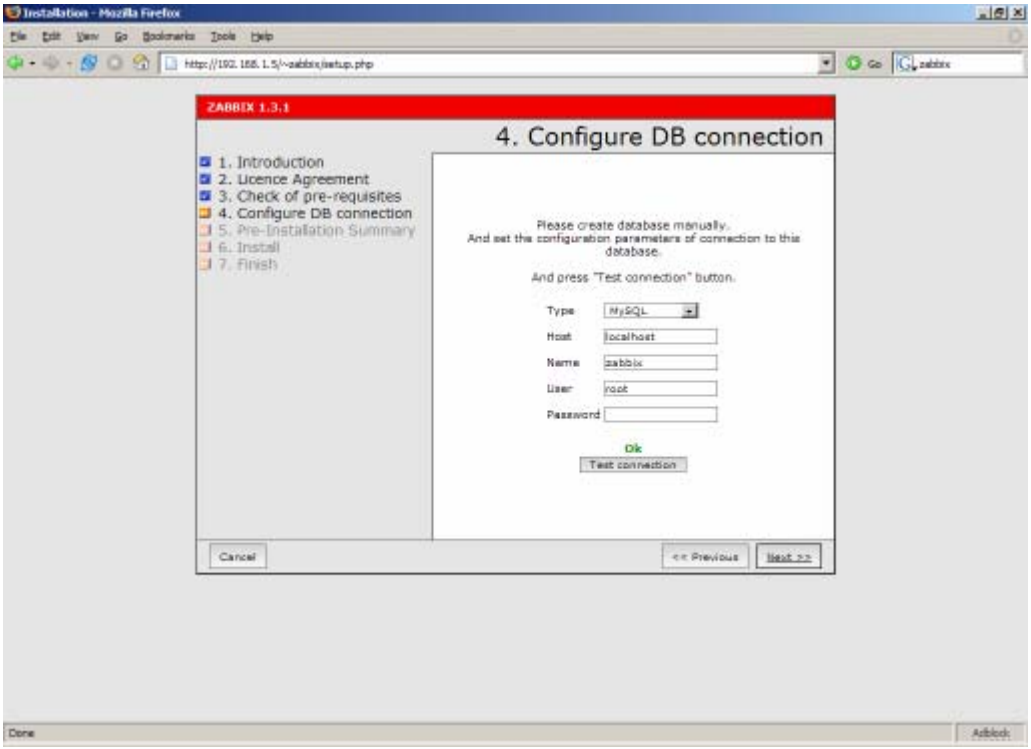


Step 2 Read and accept GPL v2.

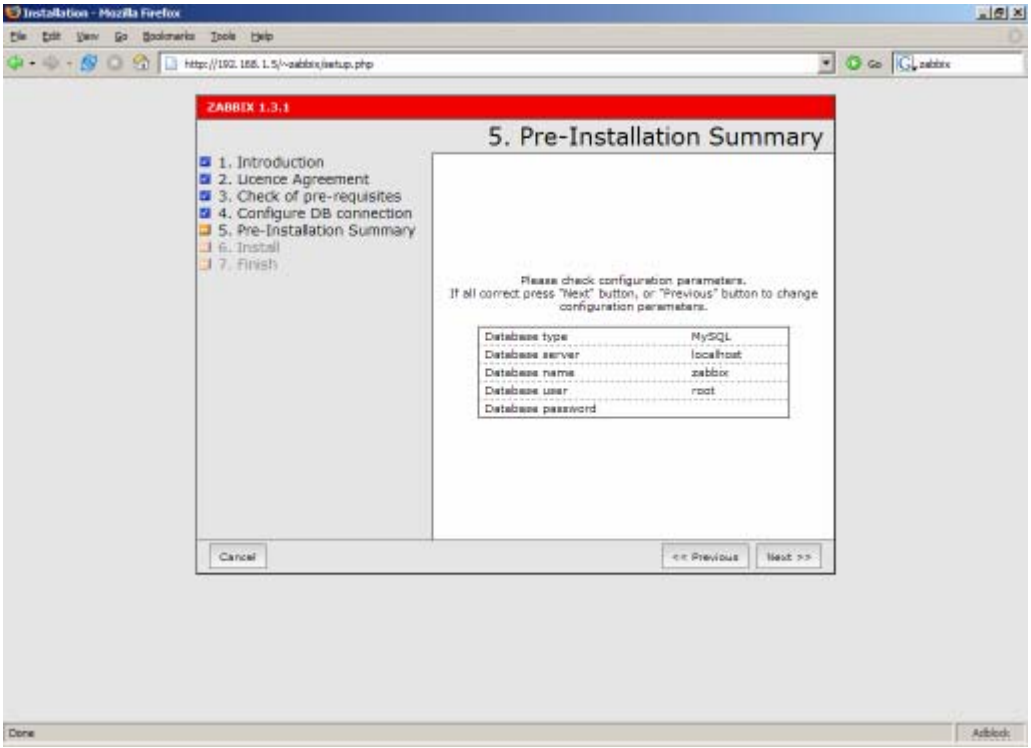
Step 3 Make sure that all software pre-requisites are met.



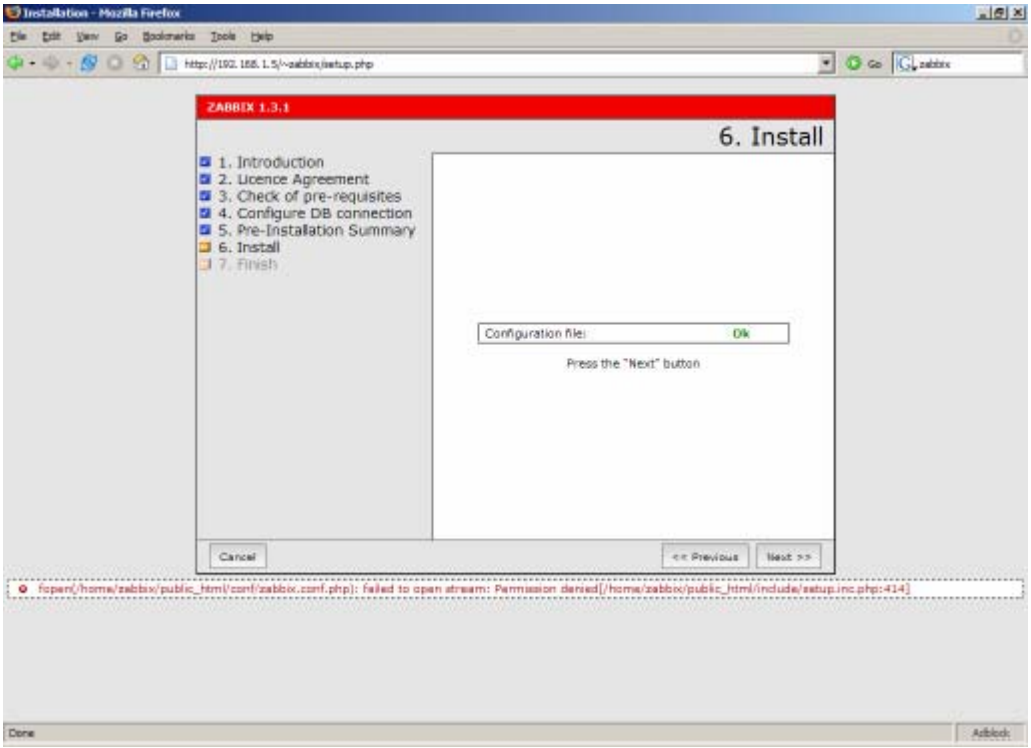
Step 4	Configure database settings. ZABBIX database must already be created.



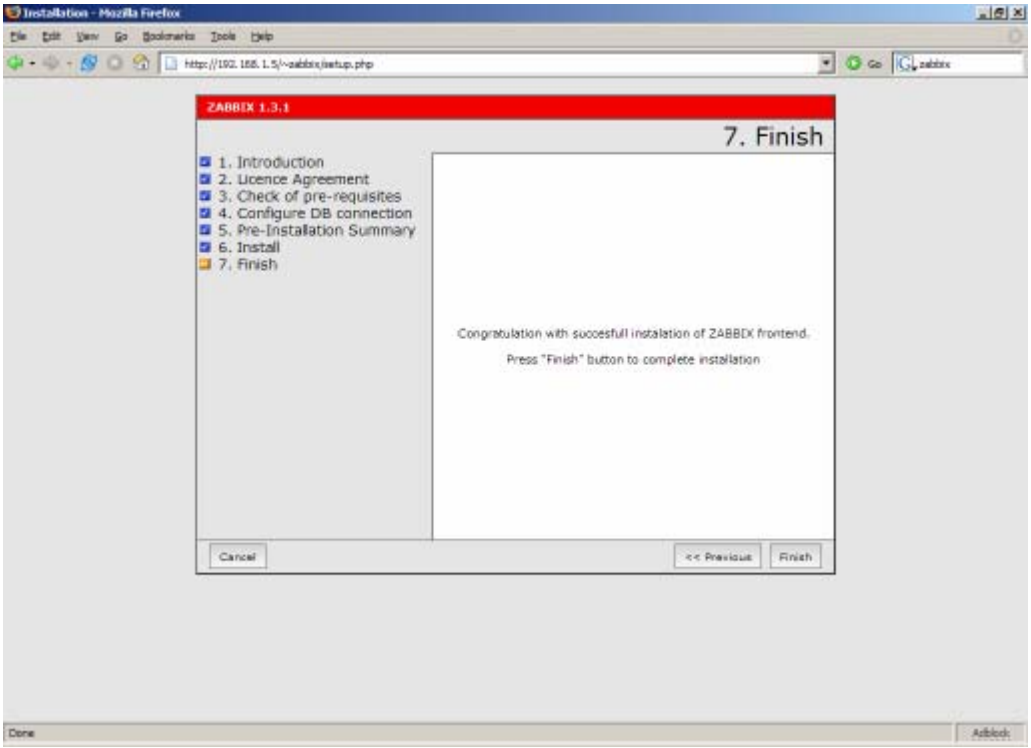
Step 5 See summary of settings.



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:

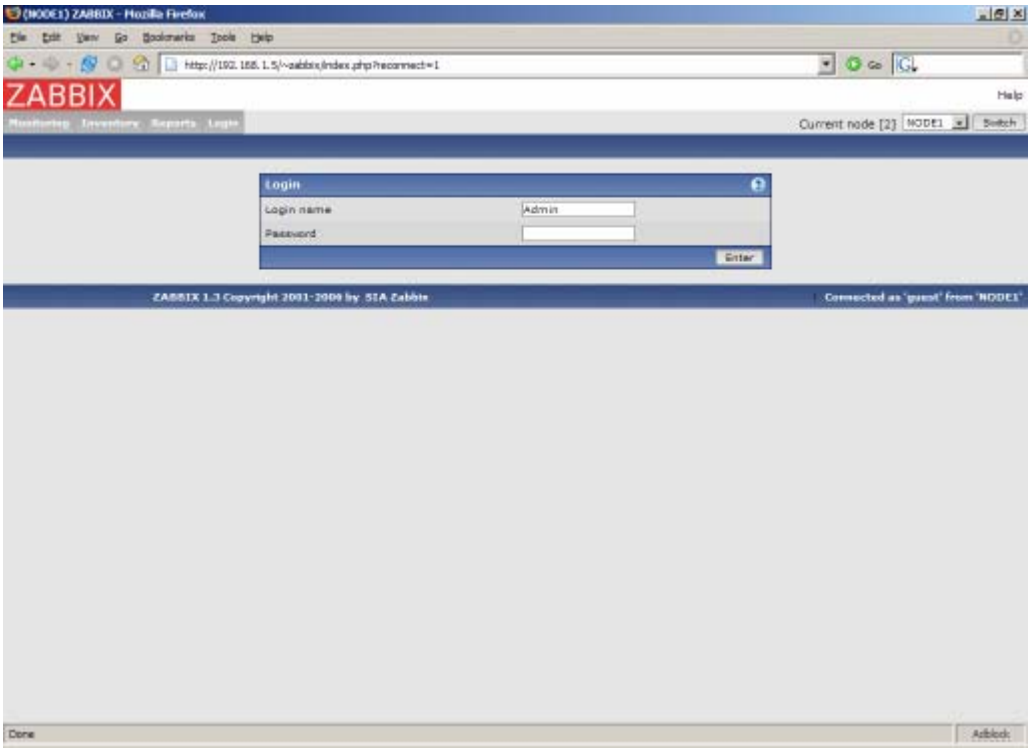
shell> ./zabbix_server –n <nodeid>

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

shell> ./zabbix_server –n 1

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

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



3.5. 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!

3.5.1. 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.

4. ZABBIX Processes

4.1. 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.
ExternalScripts	No	/etc/zabbix/externalscripts	Location of scripts for external checks.
FpingLocation	No	/usr/sbin/fping	Location of ICMP pinger. It must have setuid flag set.
HousekkepingFrequency	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.
Include	No	-	Use this parameter to include a file into the configuration file. Number of parameters **Include** is not limited. For example: Include=/etc/zabbix/db_conn.conf
ListenIP	No	-	Interface to listen by trapper

Parameter	Mandatory	Default value	Description
			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.
LogFileSize	No	1	This parameter controls log rotation setting for **LogFile**. By default, ZABBIX automatically roatates log file when it reaches 1MB. This parameter is in MB. If set to 0, no log rotation will be performed.
NodeID	No	0	Unique NodeID (0-999). Must be '0' or missing for standalone ZABBIX Server.
PidFile	No	/tmp/zabbix_server.pid	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)
StartDiscoverers	No	1	Number of discoverers to start (0-255).
StartHTTPPollers	No	5	Number of HTTP pollers to start (0-255).
StartPollers	No	5	Number of pollers to start (0-255).
StartPollersUnreachable	No	1	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

Parameter	Mandatory	Default value	Description
			found at misc/conf/zabbix_server.conf
TrapperTimeout	No	5	Do not spend more than Timeout seconds on processing of traps (1-255)
UnavailableDelay	No	60	How ofter 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

4.2. 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: 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.
Include	No	-	Use this parameter to include a file into the configuration file. Number of parameters **Include** is not limited. For example:

Parameter	Mandatory	Default value	Description
			Include=/etc/zabbix/user_parameters.conf
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.
LogFileSize	No	1	This parameter controls log rotation setting for **LogFile**. By default, ZABBIX automatically roatates log file when it reaches 1MB. This parameter is in MB. If set to 0, no log rotation will be performed.
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 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. Value has form , Example:UserParameter=users,who|wc -l Note: Example of the configuration file can be found at

Parameter	Mandatory	Default value	Description
			misc/conf/zabbix_agentd.conf.

4.3. 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

4.4. ZABBIX Agent (Windows)

ZabbixW32 is ZABBIX agent for Win32 systems. It will work on Windows NT 4.0, Windows 2000, Windows XP, and Windows Vista.

4.4.1. Installation

Installation is very simple and includes 3 steps:

Step 1 Create configuration file.

Create configuration file c:/zabbix_agentd.conf (it has the same syntax as UNIX agent).

Step 2 Install agent as a Windows service.

ZabbixW32.exe install

If you wish to use configuration file other that 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.

Step 2 Run agent.

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

4.4.2. Usage

Command line syntax:

zabbixw32 [options] [command]

ZABBIX Windows Agent accepts the following command line parameters:

check-config	Check configuration file and exit.
help	Display help information.
install	Install ZABBIX Win32 Agent as a service.
install-events	Install ZABBIX Win32 Agent as event source for Event Log. This is done automatically when service is being installed.
remove	Remove previously installed ZABBIX Win32 Agent service.
remove-events	Remove ZABBIX Win32 Agent event source. This is done automatically when service is being removed.
standalone	Run in standalone mode.
start	Start ZABBIX Agent service.
stop	Stop ZABBIX Agent service.
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

Parameter	Mandatory	Default value	Description
			"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 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.
Include	No	-	Use this parameter to include a file into the configuration file. Number of parameters **Include** is not limited. For example: Include=c:\user_parameters.conf
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	-	<parameter_name>,"<perf_counter_path>",<period> Defines new parameter <parameter_name> which is

Parameter	Mandatory	Default value	Description
			an average value for system performance counter <perf_counter_path> for the specified time period <period> (in seconds). 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: PerfCounter = 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

4.5. ZABBIX Sender (UNIX)

ZABBIX UNIX Sender is a command line utility which may be used to send performance data to ZABBIX Server for processing.

The utility is usually used in long running user scripts for periodical sending of availability and performance data.

ZABBIX Sender can be started by executing:

```
shell> cd bin
shell> ./zabbix_sender –z zabbix –p 10051 –h LinuxDB3 –k db.connections –o 43
```

ZABBIX Sender accepts the following command line parameters:

-z –zabbix-server <zabbix server>	Hostname or IP address of ZABBIX Server.
-p --port <zabbix server port>	Specify port number of server trapper running on the server. Default is 10051.
-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 send.
-o –value <value>	Specify value of the key.
-i –input-file <input file>	Load values from input file.
-h –help	Give this help.
-v –version	Display version number.

In order to get this help run:

```
shell> zabbix_sender -h
```

4.6. 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
```

5. Configuration

5.1. Development Environment

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

Four servers are used for test purposes:

- Debain 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
- Ubuintu 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

5.2. General Configuration

5.2.1. 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, jabber, 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.

5.2.2. 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

Note that you may upload image of any size, however images bigger than 1.5MB may not be displayed in maps. Increase value of **max_memory_size** in **php.ini** if you have this problem.

5.2.3. 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 a 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/jabber/SMS/whatever.

Parameters of a value mapping:

Parameter	Description
Name	Unique name of set of value mappings.
Mapping	Set of mappings.
New mapping	Single mapping for addition.

5.2.4. 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

5.2.5. Refresh unsupported items

Some items may become unsupported due to errors in User Parameters or possible an item is not supported by an agent.

ZABBIX can be configured to periodically make unsupported items active.

Parameter	Description
Refresh unsupported items (in sec)	ZABBIX will activate unsupported item every N seconds. If set to 0, the activation will be disabled.

5.2.6. Database watchdog

Availability of ZABBIX server depends on availability of back-end database very much. It cannot work without a database.

Database watchdog, a special ZABBIX server process, is created in order to alarm ZABBIX administrators in case of disaster.

The watchdog will send notifications to a user group in case if the database is down. ZABBIX server will not stop; it will wait until the database is back again to continue processing.

Parameter	Description
User group for database down message	User group for sending alarm message or 'None'.

5.3. Actions

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

Action attributes:

Parameter	Description
Action type	Type of action: **Send message**, **Execute command**
Event Source	Source of event. Currently two sources are supported: **Triggers** – events generated by trigger status changes **Discovery** – events generated by auto-discovery module
Type of calculation	Rule for calculation of conditions: **AND** – actions are executed if an event matches all conditions **OR** – actions are executed if an event matches at least one condition **AND/OR** - action is executed if an events matches all conditions having different types. If an action contains several conditions of the same type, at least one condition with this type must be true.
Conditions	List of conditions for activation of the action.
Send message to	Send message either to **User group** or **Single user**.

Parameter	Description
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**.

5.3.1. Action conditions

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

The following conditions can be defined for **Trigger** based events:

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. **=** - event generated by this Trigger **<>** - event generated by other Trigger
Trigger name	**like**, **not like**	Compare against Trigger Name which generated event.

Condition type	Supported operators	Description
		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.

The following conditions can be defined for **Discovery** based events:

Condition type	Supported operators	Description
Host IP	**=**, **<>**	Check if IP address of a discovered Host is or is not in the range of IP addresses. **=** - Host IP is in the range **<>** - Host IP is out of the range

Condition type	Supported operators	Description
Service type	**=, <>**	Check of a discovered service. **=** - matches discovered service **<>** - event came from a different service
Service port	**=, <>**	Check if TCP port number of a discovered service is or is not in the range of ports. **=** - service port is in the range **<>** - service port is out of the range
Discovery status	**=**	**Up** – matches Host Up and Service Up events **Down** – matches Host Down and Service Down events
Uptime/Downtime	**>=, <=**	Downtime for Host Down and Service Down events. Uptime for Host Up and Service Up events. **>=** - uptime/downtime is more or equal **<=** - uptime/downtime is less or equal Parameter is given in seconds.
Received value	**=** **<>** **>=** **<=** **like** **not like**	Compare with value received from an agent (ZABBIX, SNMP). String comparison. **=** - equal to the value **<>** - not equal to the value **>=** - more or equal to the value **<=** - less or equal to the value **like** – has a substring **not like** – does not have a substring Parameter is given as a string.

For example this set of conditions (caltulation type: AND/OR):

Host group = Oracle servers

Host group = MySQL servers

Trigger name like ‘Database is down’
Trigger name like ‘Database is anavailable’

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’)

5.3.2. Operations

Operation or a set of operations is executed when event matches conditions.

ZABBIX supports the following operations:

- Send message
- Remote command(s)

Additional operations available for discovery events:

- Add host
- Remove host
- Add to group
- Delete from group
- Link to template
- Unlink from template

5.3.3. Macros for messages and remote commands

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

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.
{TRIGGER.VALUE}	Current trigger value: **0** - trigger is in OFF state **1** – trigger is in ON state **2** – trigger UNKNOWN This macro can also be used in trigger expressions.
{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'

5.4. 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.

5.5. Graphs

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

5.6. Medias

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

5.6.1. EMAIL

Email notification

5.6.2. JABBER

Notifications using Jabber messaging.

5.6.3. SCRIPT

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

5.6.4. GSM Modem

ZABBIX supports sending of SMS messages using Serial GSM Modem connected to ZABBIX Server's serial port.

Make sure that:

- Speed of a serial device (normally /dev/ttyS0 under Linux) matches GSM Modem
- GSM Modem has PIN entered and it preserves it after power reset

PIN can be entered by issuing command AT+CPIN="NNNN" (NNNN is your PIN number, the quotes must present) in a terminal software.

ZABBIX has been tested with the following models:

- Siemens MC35
- Teltonika ModemCOM/G10

5.7. Hosts

Host attributes:

Parameter	Description
Name	Unique host name. The name must be unique within ZABBIX Node.
Groups	List of host groups the host belongs to.
New group	Assign new host group.
DNS	DNS name of the host. The name is used as a DNS name for accessing host ZABBIX or SNMP agent or performing Simple Checks.
IP address	IP address.
Connect to	**DNS name** – use DNS name for connections to the host **IP address** – use IP address for connections to the host (recommended)
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.

5.8. 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.

5.9. 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.

5.10. Host and trigger dependencies

ZABBIX does not support host dependencies. Host dependencies can be defined using more flexible option, i.e. trigger dependencies.

How it works?

A trigger may have list of one or more triggers it depends on. It means that the trigger will still change its status regardless of state of the triggers in the list, yet the trigger won't generate notifications and actions in case if one of the trigger in the list has state TRUE.

Example 1 Host dependency

Suppose you have two hosts: a router and a server. The server is behind the router. So, we want to receive only one notification if the route is down:

"The router is down"

instead of:

"The router is down" and "The host is down"

In order to achieve this, we create a trigger dependency:

"The host is down" depends on "The router is down"

In case if both the server and the server is down, ZABBIX will not execute actions for trigger "The host is down".

5.11. Items

Item is a single performance or availability check.

Item attributes:

Parameter	Description
Description	Item description. It may contain macros: **$1** – first parameter of item key **$2** – second parameter **$N** - Nth parameter For example: Free disk space on $1 If item key is "vfs.fs.size[/,free]", the description will be automatically changed to "Free disk space on /"
Type	Item type. See sections below for detailed description of each type.
Key	Item key. The key must be unique within a single host. For The key value must be supported by an agent or ZABBIX server, if key type is ZABBIX Agent, ZABBIX Agent (active), Simple check, or ZABBIX aggregate.
Type of information	Type of received data. **Numeric (integer 64bit)** – 64bit unsigned integer **Numeric (float)** – floating point number **Character** – character (string) data limited to 255 bytes **Log** – log file. Must be set for keys log[].

Parameter	Description
	Text – text of unlimited size
Units	If set, ZABBIX will add prefix K,M or G if required and the unit postfix to all received values (1024 is 1K). For example, if units set to 'B', ZABBIX will display: 1 as 1B 1024 as 1KB 1536 as 1.5KB Some units have special processing: **b, bps** - 1000 is 1K, special processing for bits. **unixtime** – translated to "yyyy.mm.dd hh:mm:ss" **uptime** – translated to "hh:mm:ss" or "N days, hh:mm:dd", parameter is treated as number of seconds since 01/01/1970. **s** – translated to "yy**y**mm**m**dd**d**hh**h**mm**m**", parameter is treated as number of seconds since 01/01/1970. For example, 2y10m14d3h54m1s
Use multiplier	Pre-process received values. **Do not use** - do not pre-process received values **Custom multiplier** – multiply received values by value defined in **Custom multiplier** Use this option to convert values received in KB, MBps, etc into B, Bps. Otherwise ZABBIX cannot correctly set prefixes (K, M and G).
Custom multiplier	Multiply all received value by this integer or floating pint value.
Update interval (in sec)	Refresh this item every N seconds.
Flexible intervals	List of exceptions for **Update Interval**. For example: 10 sec, 1-5,09:00-18:00 – refresh set to 10 seconds for working hours. Otherwise default update interval will be used. Period format: dd-dd,hh:mm-hh:mm;dd-dd,hh:mm-hh-mm For example, 1-5,09:00-18:00;6-7,10:00-12:00 1- Monday, …,7 - Sunday
Keep history (in days)	Keep detailed history N days in the database. Older data will be removed by Housekeeper.
Keep trends (in days)	Keep aggregated (hourly min,max,avg,count) etailed

Parameter	Description
	history N days in the database. Older data will be removed by Housekeeper.
Status	**Active** - active (normal) status. ZABBIX will process this item. **Disabled** – item is disabled. This item will not be processed. **Not supported** – item is not supported by ZABBIX or SNMP agent. This item will not be processed, however ZABBIX may try to periodically set status of such items to **Active** if configured.
Store value	**As is** – no pre-processing **Delta (speed per second)** – evaluate value as (val-prev_value)/(time-prev_time), where value – current value value_prev – previously received value time – current timestamp prev_time – timestamp of previous value This setting is extremely useful to get speed per second based on constantly growing value. **Delta (simple change)** – evaluate as (value-prev_value), where value – current value value_prev – previously received value
Show value	Apply value mapping to this item. Value mapping does not change received values, it is for displaying data only. It works with integer items only. For example, “Windows service states”.
Applications	Link item to one or more applications.

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.

5.11.1. 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	X
agent.varsion		X	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	-	-	-	-
	errors	-	X	X	-	X	-	-	-	-
	dropped	-	X	X	-	-	-	-	-	-

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Max OS/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.services[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.boottime		-	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	-	-	-
	avg5	-	X	X	-	X	X	-	-	-

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Max OS/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	-	-	-	-
type	count	-	-	-	-	X	-	-	-	-

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Max OS/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	-	-	-	-
	bytes	-	-	-	-	X	-	-	-	-

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Max OS/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	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	-
mode	**total**	-	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
	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	-
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	-	-

5.11.2. 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.		
log[file<,regexp>]	Monitoring of log file.	Log.	**file** – full file name **regexp** – regual expression	Must be Active Check.
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	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

Key	Description	Return value	Parameters	Comments
			dropped number of dropped packets	statistics.
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><,cmdli	Memory used by process name running	Memory used by process.	name - process name user - user name	Example: proc.mem[,root] -

Key	Description	Return value	Parameters	Comments
ne>]	under user user		(default is all users) mode - one of avg, max, min, sum (default) cmdline - filter by command line	memory used by all processes running under user "root". proc.mem[zabbix_server,zabbix] - memory used by all processes zabbix_server running under user zabbix proc.mem[,oracle,max,oracleZABBIX] - memory used by most memory hungry process running under oracle having oracleZABBIX in its command line
proc.num[<name> <,user> <,state><,cmdline>]	Number of processes name having state running under user user	Number of processes.	name - process name user - user name (default is all users) state - one of all (default), run, sleep, zomb cmdline - filter by command line	Example: proc.num[,mysql] - number of processes running under user mysql proc.num[apache2,www-data] - number of apache2 running under user www-data proc.num[,oracle,sleep,oracleZABBIX] - number of processes in sleep state running under oracle having oracleZABBIX in its command line
system.cpu.intr	Device interrupts.	Integer.		
system.boottime	Timestamp of system boot.	Integer.		Time is seconds.
system.cpu.load[<cpu> <,mode>]	CPU(s) load.	Processor load. Float.	cpu - CPU number (default is all CPUs) mode - one of avg1 (default),avg5 (average within 5 minutes), avg15	Example: system.cpu.load[] Note that returned value is not

Key	Description	Return value	Parameters	Comments
				percentage. Old naming: system.cpu.loadX
system.cpu.switches	Context switches.	Switches count.		Old naming: system[switches]
system.cpu.util[<cpu> <,type> <,mode>]	CPU(s) utilisation.	Processor load in percents	cpu - CPU number (default is all CPUs) type - one of idle, nice, user (default), system mode - one of avg1 (default),avg5 (average within 5 minutes), avg15	Old naming: system.cpu.idleX, 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]

Key	Description	Return value	Parameters	Comments
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 swap space, percentage), pused (used swap space, percentage)	Example: system.swap.size[,pfree] - percentage of free swap space Old naming: system.swap.free, system.swap.total
system.uname	Returns detailed host information.	String value		Example of returned value: *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*
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: *1938292000* Example:

Key	Description	Return value	Parameters	Comments
				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: *b5052decb577e0fffd622d6ddc017e82* Example: vfs.file.md5sum[/etc/zabbix/zabbix_agentd.conf]
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]

Key	Description	Return value	Parameters	Comments
				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 HTML document (default is /), port - port number (default is 80)	WEB page source as text	Returns EOF on fail. Example: web.page.get[www.zabbix.com,index.php,80]
web.page.perf[host,<path>,<port>]	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]
web.page.regexp[host, <path>, <port>, <regexp>, <length>,]	Get first occurence of regexp in WEB page	Matched string	host - hostname, path - path to HTML document (default is /), port - port number (default is 80), regexp - 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
agent[avg_collector_time]	Average time spent by collector	Time in milliseconds	

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

Key	Description	Return value	Comments
	where parameter is the counter path.		counters that require just one sample (like \System\Threads). It will not work as expected for counters that require more that 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 – no such service	Parameter must be real service name as it seen in service properties under "Name:", not service display name!
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 currenty 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>

Key	Description	Return value	Comments
			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.

5.11.3. SNMP Agent

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 1 General example

Parameter	Description
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> For example, 'my_param'.

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.

Example 2 Monitoring of Uptime

Parameter	Description
Community	public
Oid	MIB::sysUpTime.0
Key	router.uptime
Value type	Float
Units	uptime
Multiplier	0.01

5.11.4. 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. Dafult 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 server is running and accepting connections	0 – POP server is down 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	0 – SSH server is down

Key	Description	Return value
	server is running and accepting connections	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 server is running and accepting connections	0 – SMTP server is down 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.

5.11.4.1. Timeout processing

ZABBIX will not process a simple check longer than Timeout seconds defined in ZABBIX Server configuration file.

In case if Timeout time succeeded, '2' is returned.

5.11.4.2. ICMP pings

ZABBIX uses external utility **fping** for processing of ICMP pings. The utility is not part of ZABBIX distribution and has to be additionally installed. If the utility is missing, has wrong permissions or its location does not match FpingLocation defined in configuration file, ICPM pings (icmpping and icmppingsec) will not be processed.

Run these commands as user 'root' in order to setup correct permissions:

```
shell> chown root:zabbix /usr/sbin/fping
shell> chmod 710 /usr/sbin/fping
shell> chmod ug+s /usr/sbin/fping
```

5.11.5. 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	Character. Add item with this key to have ZABBIX internal messages stored.

Key	Description	Comments
	generated by ZABBIX server.	
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 triggers in ZABBIX database	

5.11.6. Aggregated checks

Aggregate checks do 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')
```

5.11.7. External checks

External check is a check executed by ZABBIX Server by running a shell script or a binary.

External checks do not require any agent running on a host being monitored.

Syntax of item's key:

`script(parameters)`

script – name of the script.

parameters – list of command line parameters

ZABBIX server tries to find the script in directory defined in configuration parameter **ExternalScripts**.

Note: Do not overuse external checks! It can decrease performance for ZABBIX system very much.

Example 1	Execute script check_oracle.sh with parameters "-h 192.168.1.4"

```
check_oracle.sh(-h 192.168.1.4)
```

5.12. 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 unreachanble ▪ trigger expression cannot be evaluated ▪ trigger expression has been recently changed

5.12.1. 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 ⇔ (A>B-0.000001) & (A<B+0.000001)
#	Not equal. The operator is defined as: A=B ⇔ (A<B-0.000001) | (A>B+0.000001)
|	Logical OR
&	Logical AND

The following functions are supported:

FUNCTION	ARGUMENT	SUPPORTED VALUE TYPES	DEFINITION
abschange	ignored	float, int, str, text	Returns absolute difference between last and previous values. For strings: 0 – values are equal 1 – values differ
avg	sec or #num	float, int	Average value for period of time. Parameter defines length of the period in seconds.
delta	sec or #num	float, int	Same as max()-min()
change	ignored	float, int, str, text	Returns difference between last and previous values. For strings: 0 – values are equal 1 – values differ

FUNCTION	ARGUMENT	SUPPORTED VALUE TYPES	DEFINITION
count	sec	float, int, log, str	Number of successfully retrieved values for period of time in seconds. The function accepts second optional parameter **pattern**. For example, **count(600,12)** will return exact number of values equal to '12' stored in the history. Integer items: exact match Float items: match within 0.00001 String and log items: matches if contains pattern
date	ignored	any	Returns current date in YYYYMMDD format. For example: 20031025
dayofweek	ignored	any	Returns day of week in range of 1 to 7. Mon – 1, Sun – 7.
diff	ignored	float, int, str, text	Returns: ▪ 1 – last and previous values differ ▪ 0 - otherwise
fuzzytime	ignored	float, int	Returns 1 if timestamp (item value) does not differ from ZABBIX server time for more than N seconds. Normally used with system.localtime.
last	ignored	float, int, str, text	Last (most recent) value. Parameter is ignored.
max	sec, #num	float, int	Maximal value for period of time. Parameter defines length of the period in seconds.
min	sec, #num	float, int	Minimal value for period of time. Parameter defines length of the period in seconds.
nodata	sec	any	Returns: ▪ 1 – if no data received during period of time in seconds. The period should not be less than 30 seconds. ▪ 0 - otherwise

FUNCTION	ARGUMENT	SUPPORTED VALUE TYPES	DEFINITION
now	ignored	any	Returns number of seconds since the Epoch (00:00:00 UTC, January 1, 1970).
prev	ignored	float, int, str, text	Returns previous value. Parameter is ignored.
str	ignored	str, log	Find string is last (most recent) value. Parameter defines string to find. Case sensitive! Returns: ▪ 1 – found ▪ 0 – otherwise
sum	sec, #num	float, int	Sum of values for period of time. Parameter defines length of the period in seconds.
time	ignored	any	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!

Most of numeric functions accept number of seconds as an argument. You may also use prefix # to specify that argument has a different meaning:

ARGUMENT	DEFINITION
sum(600)	Sum of all values within 600 seconds
sum(#600)	Sum of last 600 values

The following constants are supported for triggers:

CONSTANT	DEFINITION
<number>	Positive float number. Examples: 0, 1, 0.15, 123.55

CONSTANT	DEFINITION
<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.

5.12.2. Trigger dependencies

Trigger dependencies can be used to limit number of messages sent in case if an event belongs to several resources.

For example, a host 'Host' is behind router 'Router'. If the Router is down, then obviously the Host is unreachable as well. One does not want to receive notifications about both the Host and the Router. This is when Trigger dependencies may be handy.

In this case, we define that trigger 'Host is down' depends on trigger 'Router is down'. Before applying actions for event 'Host is down', ZABBIX will check if there are corresponding dependencies defined. If so, and one of the triggers is in TRUE state, then actions will not be executed and notifications will not be sent.

5.12.3. Trigger severity

Trigger severity defines how important is a trigger. ZABBIX supports following trigger severities:

SEVERITY	DEFINITION	COLOR
Not classified	Unknown severity.	Gray.
Information	For information purposes.	Light greed.
Warning	Be warned.	Light yellow.
Average	Average problem.	Dark red.
High	Something important has happened.	Red.
Disaster	Disaster. Financial losses, etc.	Bright red.

The severities are used to:

- visual representation of triggers. Different colors for different severities.
- audio alarms in Status of Triggers screen. Different audio for different severities.
- user medias. Different media (notification channel) for different severities. For example, SMS – high severity, email – other.

5.12.4. Hysteresis

Sometimes a trigger must have different conditions for different states. For example, we would like to define a trigger which would become TRUE when server room temperature is higher than 20C while it should stay in the state until temperature will not become lower than 15C.

In order to do this, we define the following trigger:

Example 1 Temperature in server room is too high

```
({TRIGGER.VALUE}=0&{server:temp.last(0)}>20)|
({TRIGGER.VALUE}=1&{server:temp.last(0)}>15)
```

Note use of macro {TRIGGER.VALUE}. The macro returns current value of the trigger itself.

5.13. Screens and Slide Shows

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.

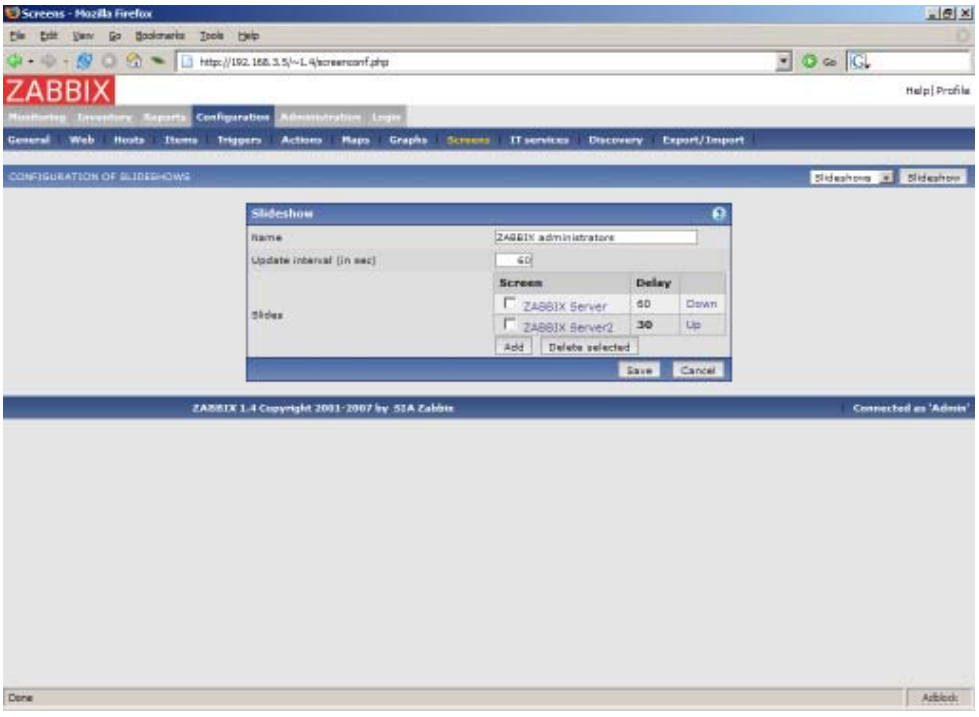
Screen is a table which may contain the following elements in each cell:

- simple graphs
- user-defined graphs
- maps
- other screens
- plain text information
- server information (overview)
- trigger information (overview)
- data overview
- clock
- history of events
- history of actions
- URL (data taken from other location)

Number of elements in each screen is unlimited.

Slide Show is a set of screens which be automatically rotated according to configured update intervals.

PARAMETER	Description
Name	Name of slide show.
Update interval (in sec)	This parameter defines default interval between screen rotations in seconds.
Slides	List of individual slides (screens):
Screen	Screen name
Delay	How long the screen will be displayed, in seconds. If set to 0, **Update Interval** of the slide show will be used.



Example 1 Slide show “ZABBIX administrators”

The slide show consists of two screens which will be displayed in the follwing order:

ZABBIX Server ➔ Pause 60 seconds ➔ ZABBIX Server2 ➔ Pause 30 seconds ➔ ZABBIX Server ➔ Pause 60 seconds ➔ ZABBIX Server2 ➔ ...

5.14. 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...]

5.15. User permissions

[To be finished …]

5.16. Utilities

5.16.1. 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`.

5.16.2. 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`.

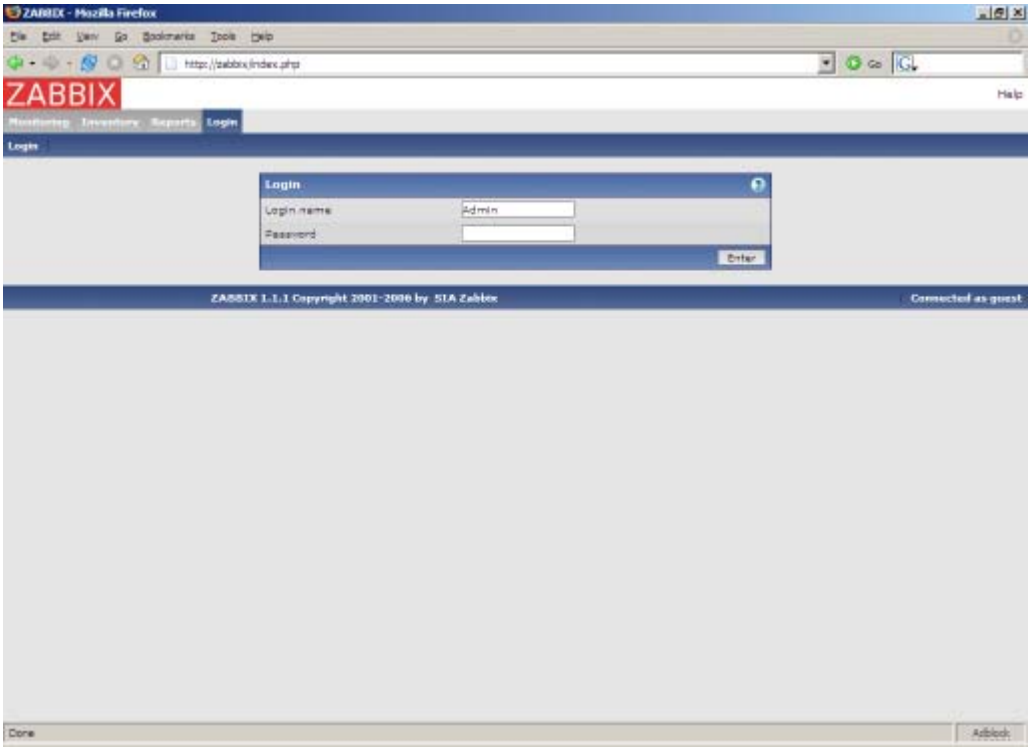
  Add this line:

  ```
  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`

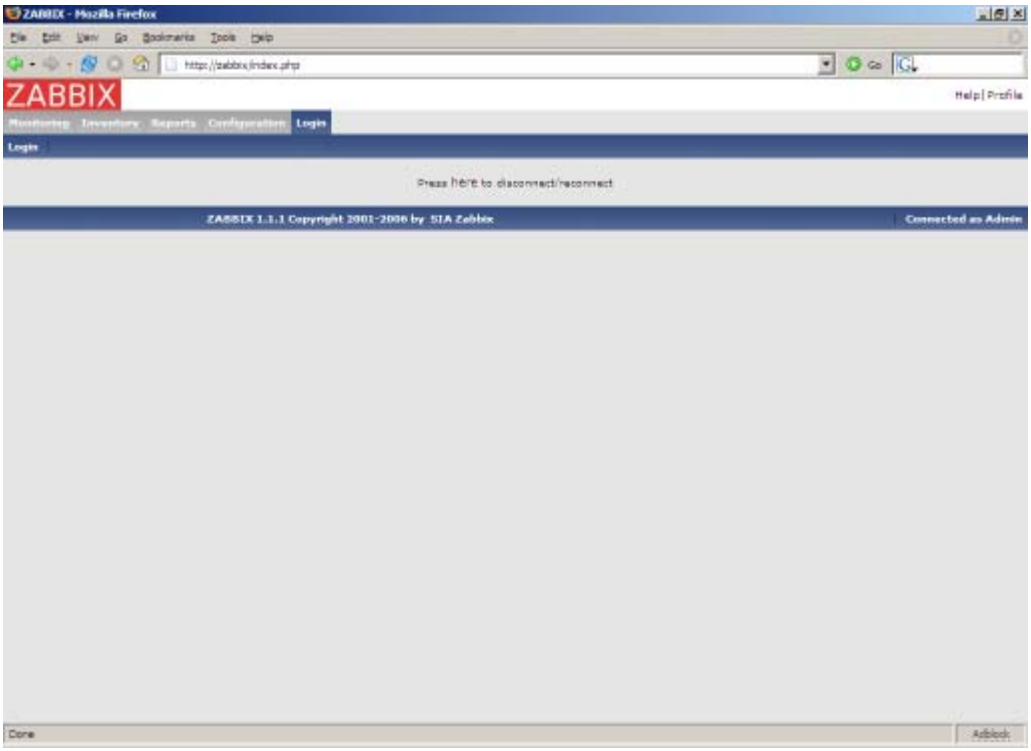
6. Quick Start Guide

6.1. Login

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

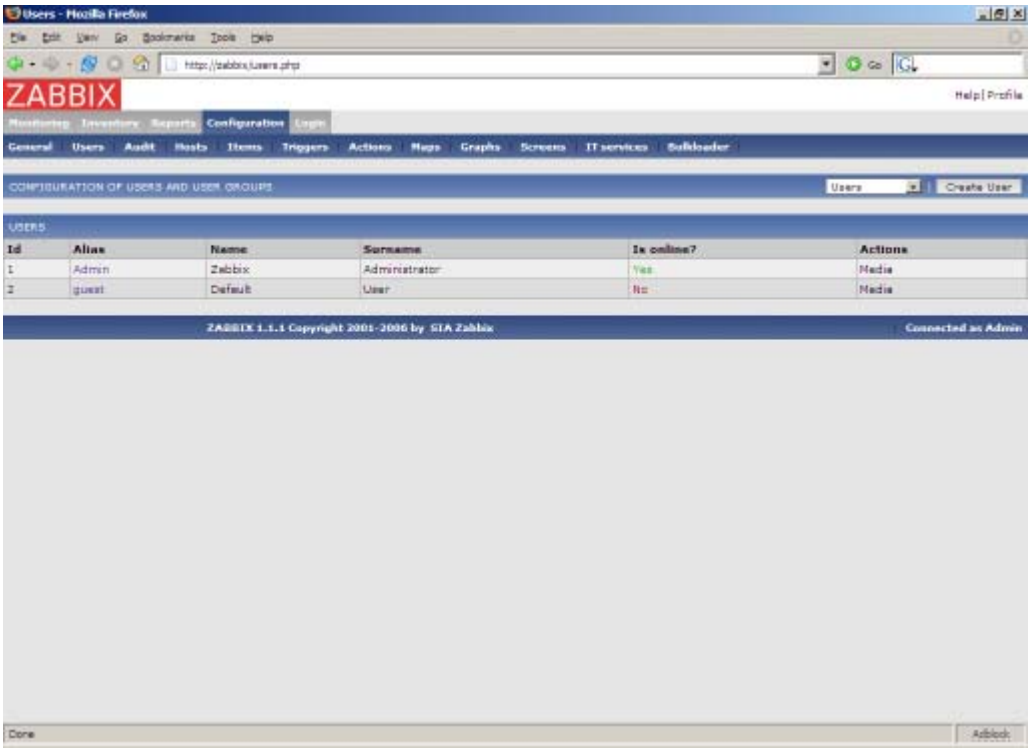


When logged in, you will see "Connected as Admin" and access to "Configuration" area will be granted:

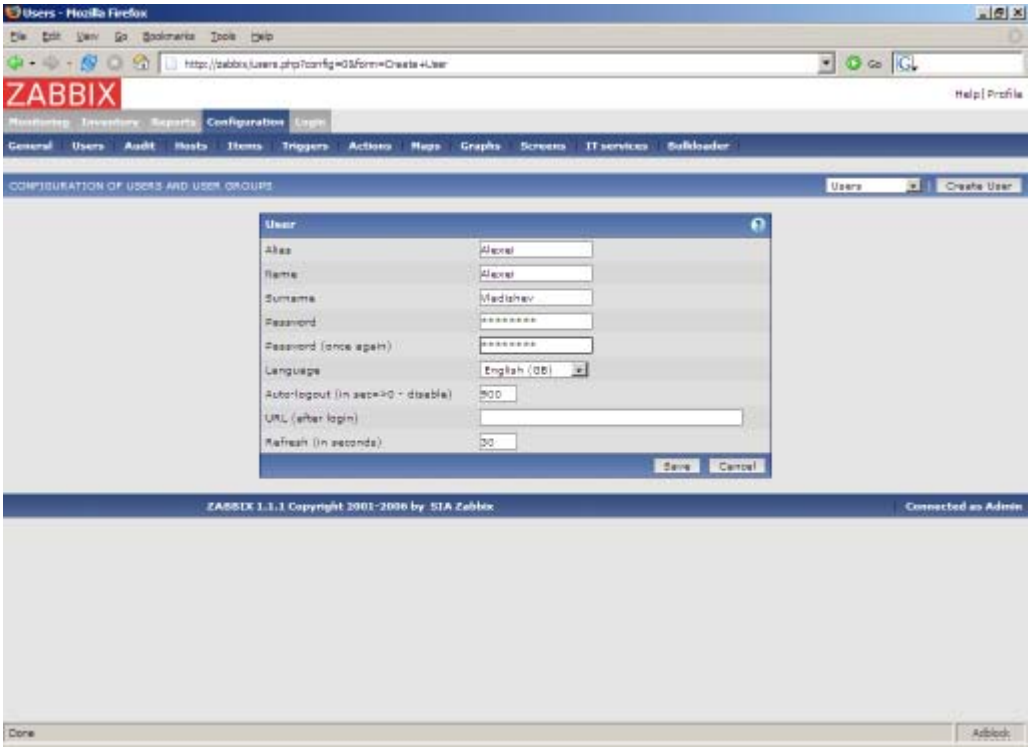


6.2. Add user

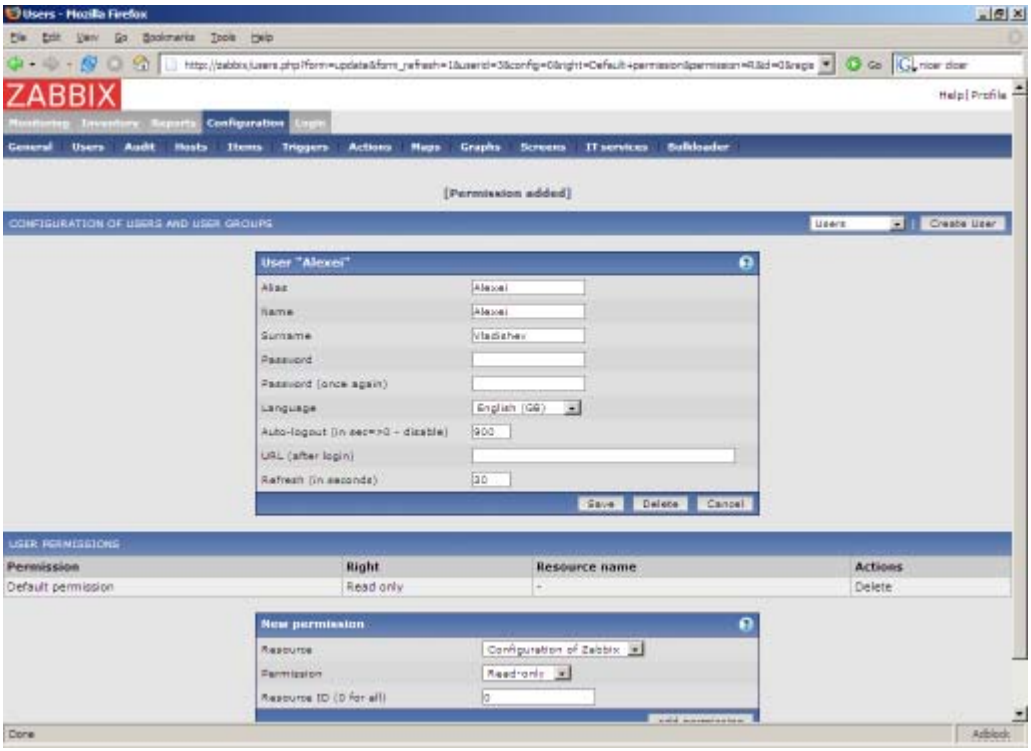
After initital installation, ZABBIX has only two users defined. User "Admin" is ZABBIX superuser. User "Admin" has all permissions. User "guest" is a special default user. If an user does not log in, the user will be granted with "guest" permissions. By default, "guest" has only read-only permissions.



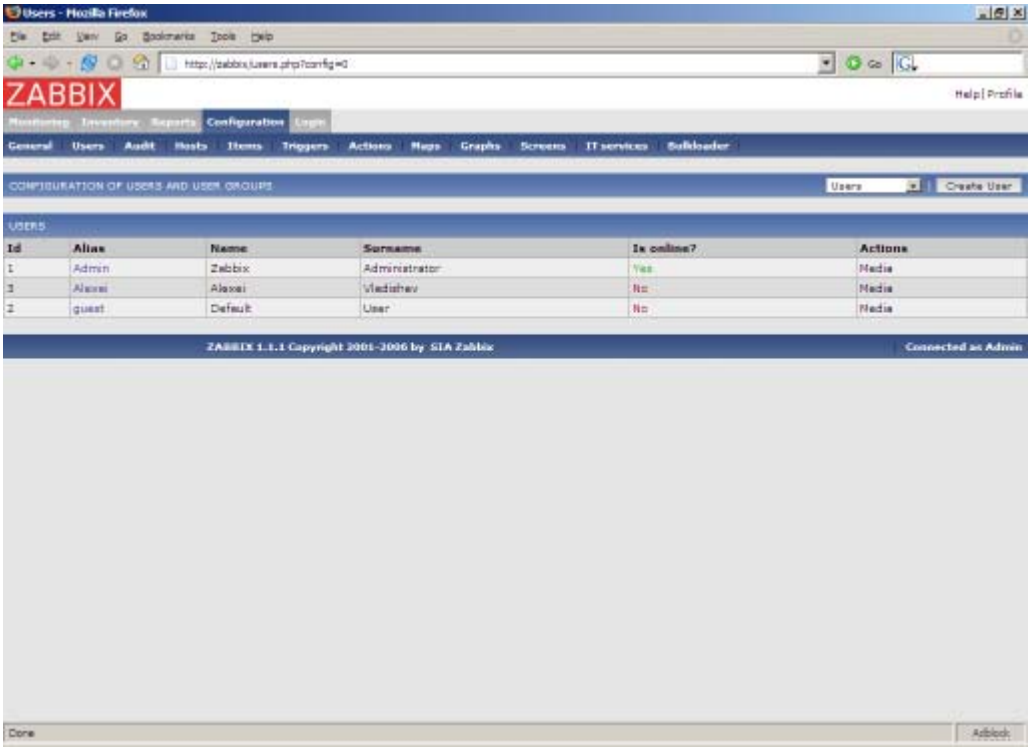
In order to add new user, press "Create user".



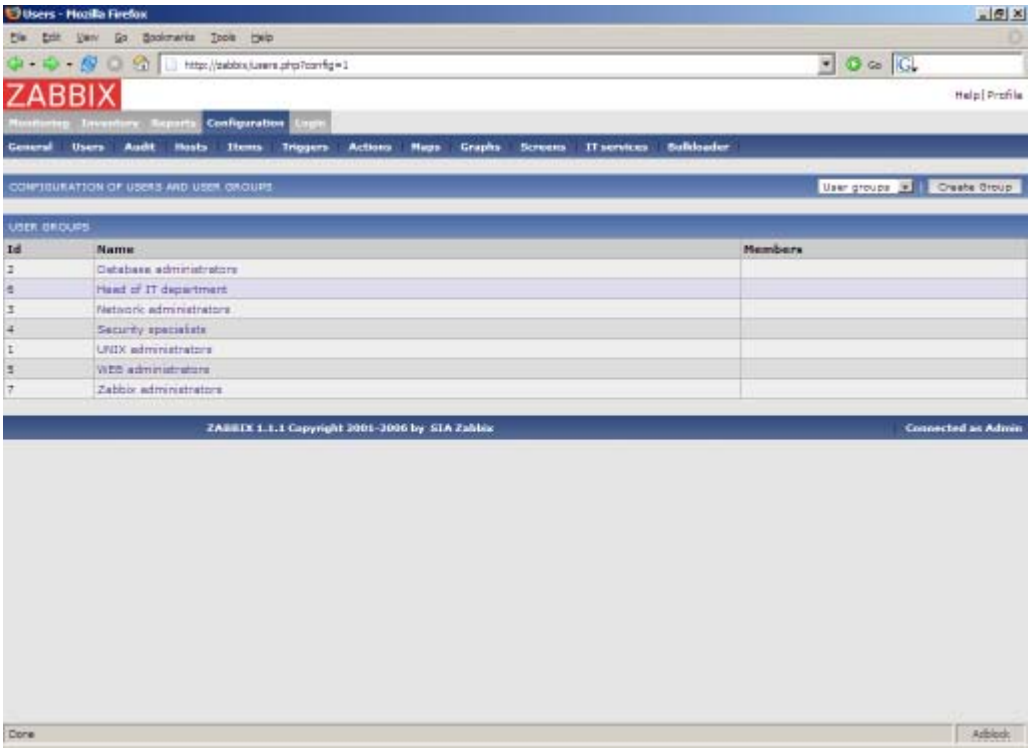
By default, new user has no permissions. Grant user rights.



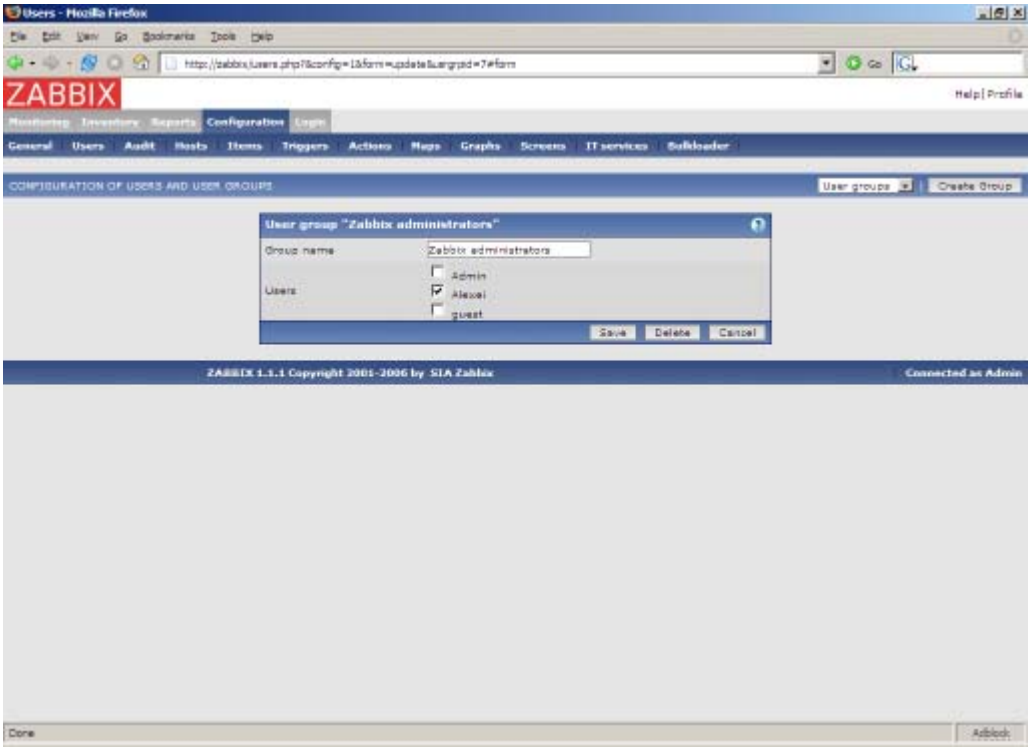
The user is added.



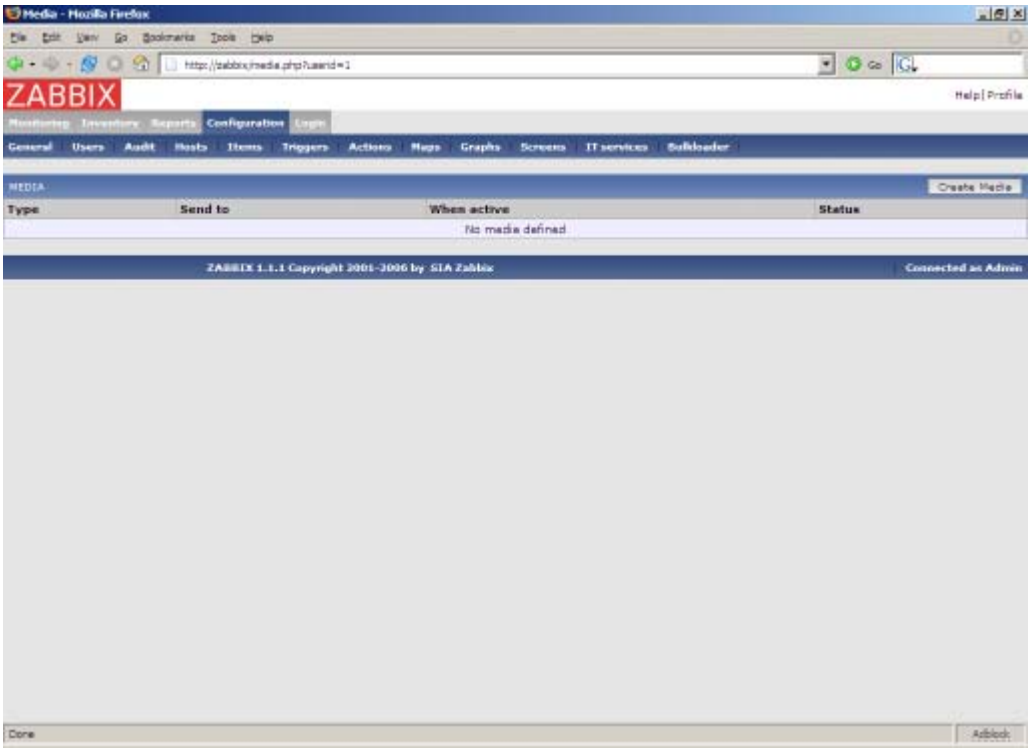
Select "user groups" from drop-down to edit user group membership.



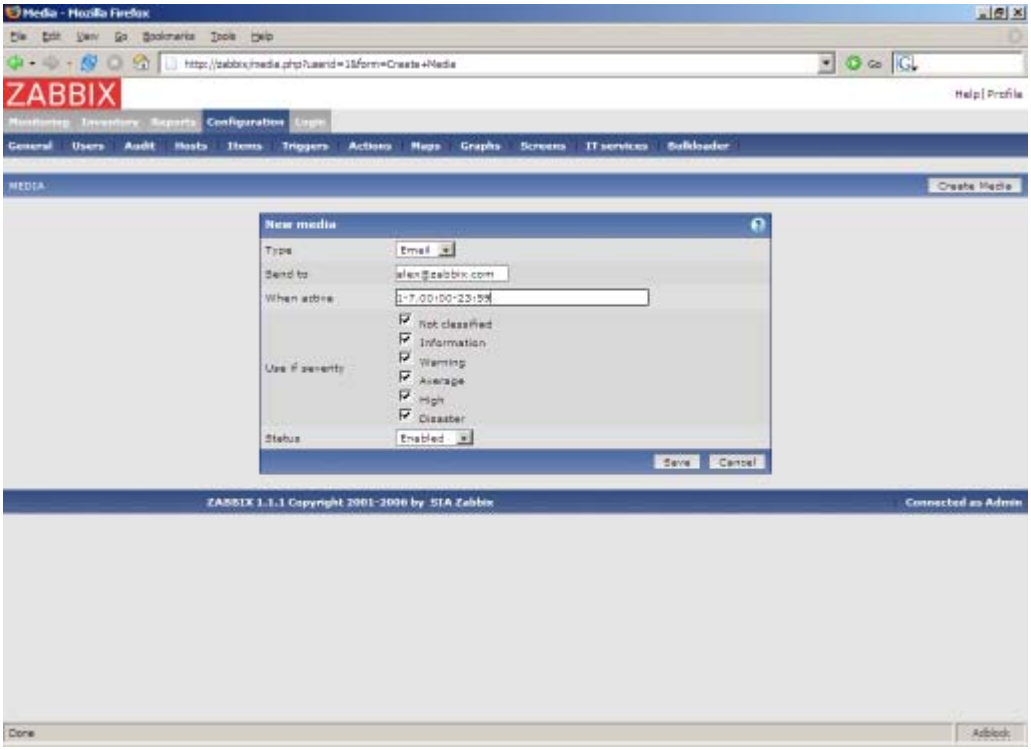
Click on a group to change membership of the group.



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



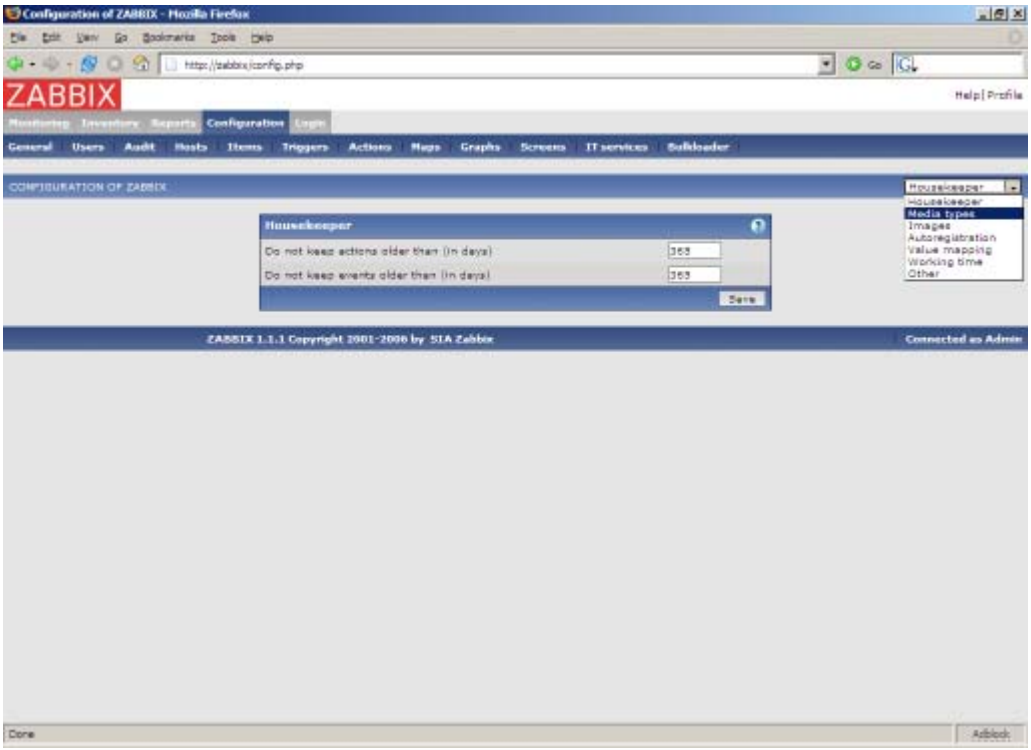
Configure email address, list of severities for which the media will be active.



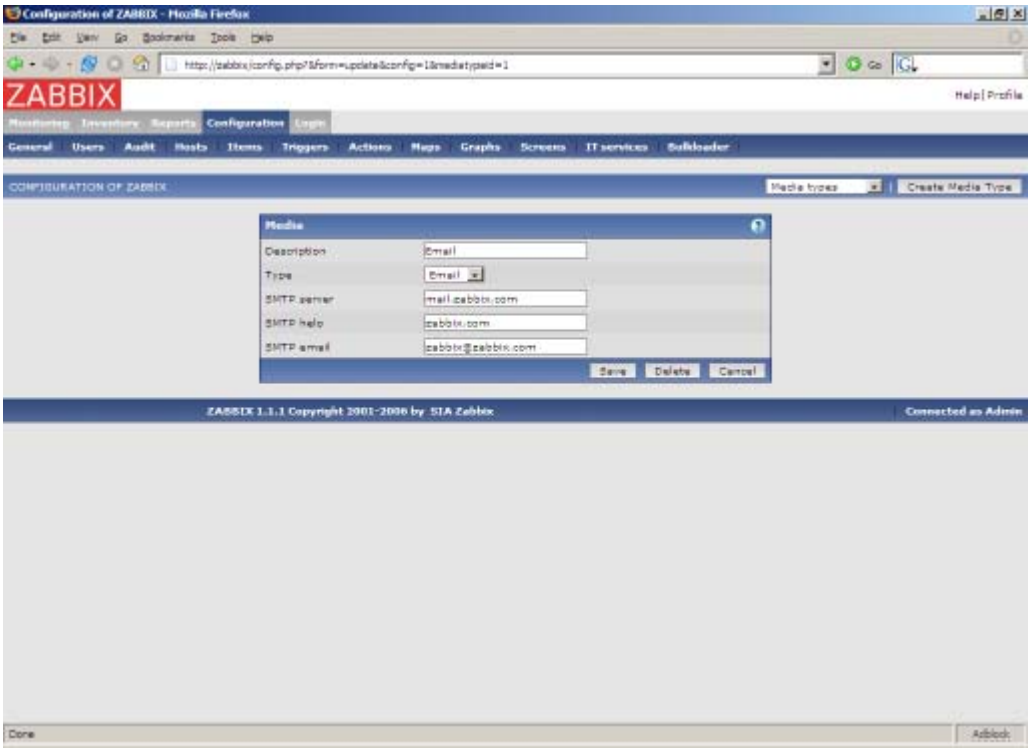
Done! You may try to log in.

6.3. Email settings

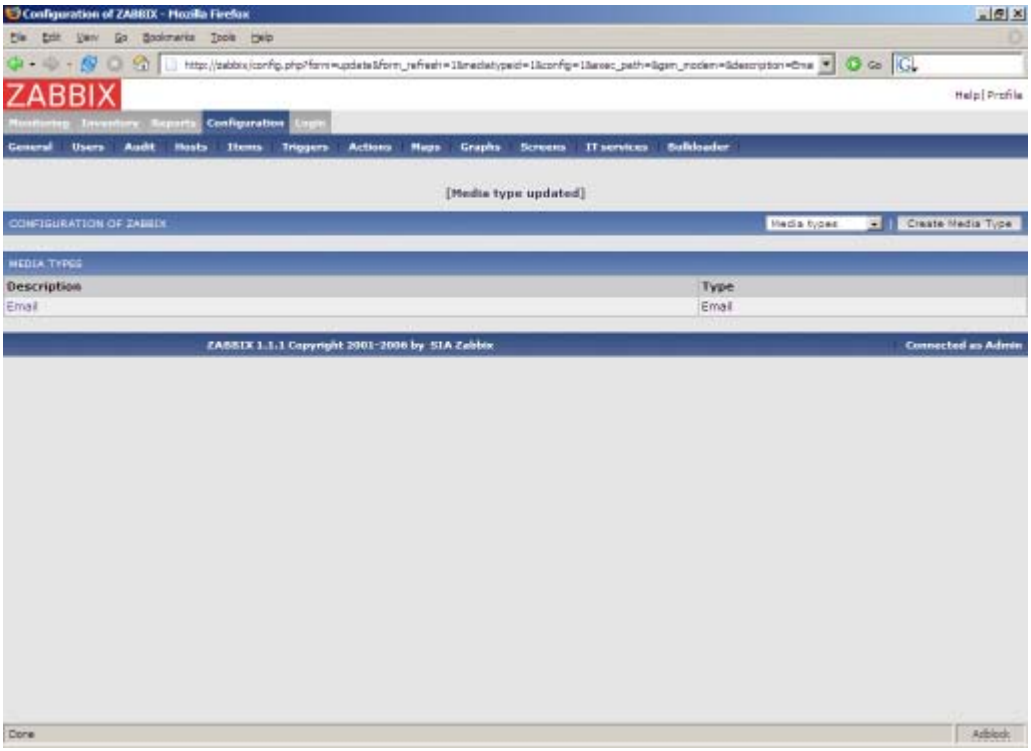
Initially, ZABBIX has only one notification delivery method (media type) defined, Email. Email configuration can be found under Menu->Configuration->Media types.



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



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

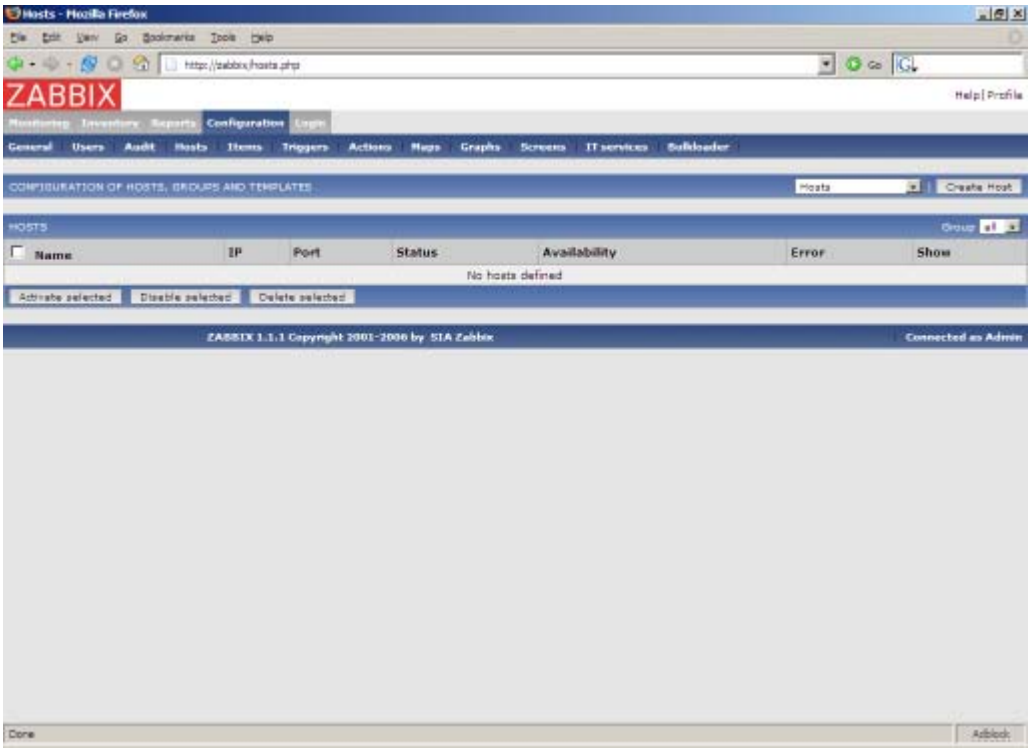


Now you have media type "Email" defined. A media type must be linked with users, otherwise it will not be used.

6.4. 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.

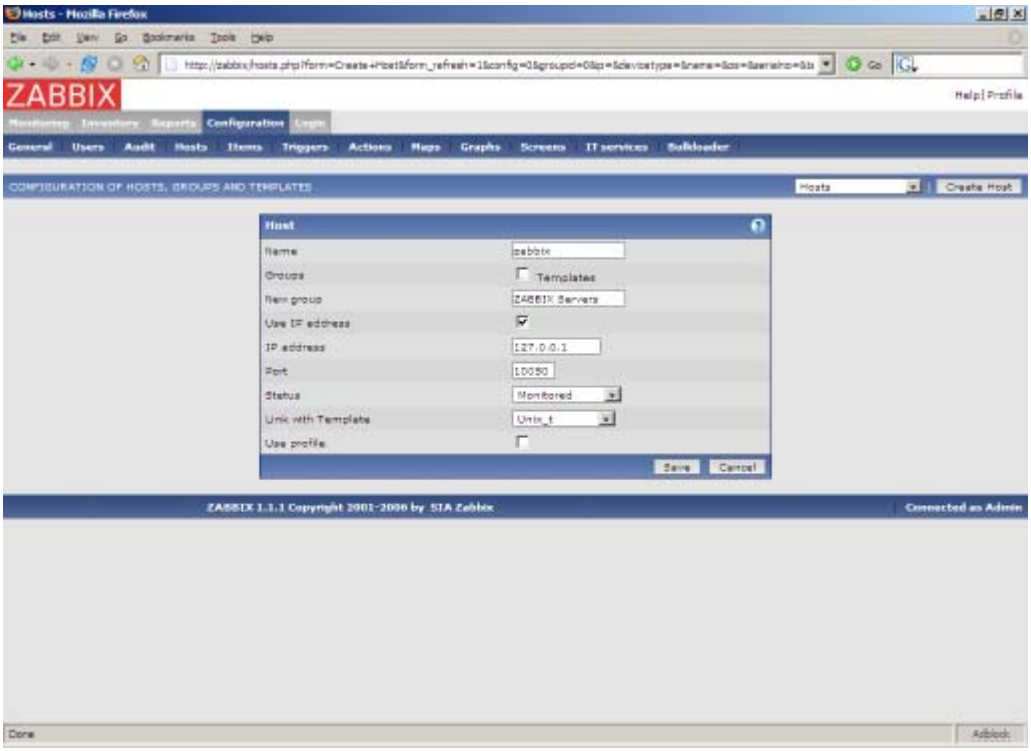
No hosts defined yet.



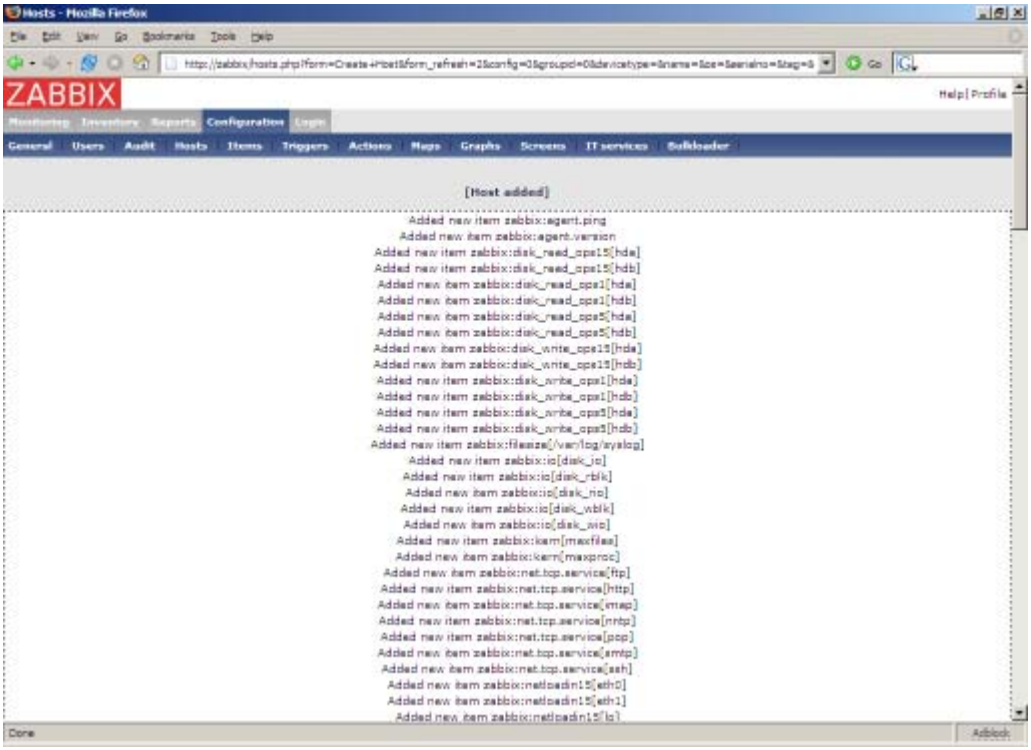
We have ZABBIX agent running on our ZABBIX server and we want to monitor this server.

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

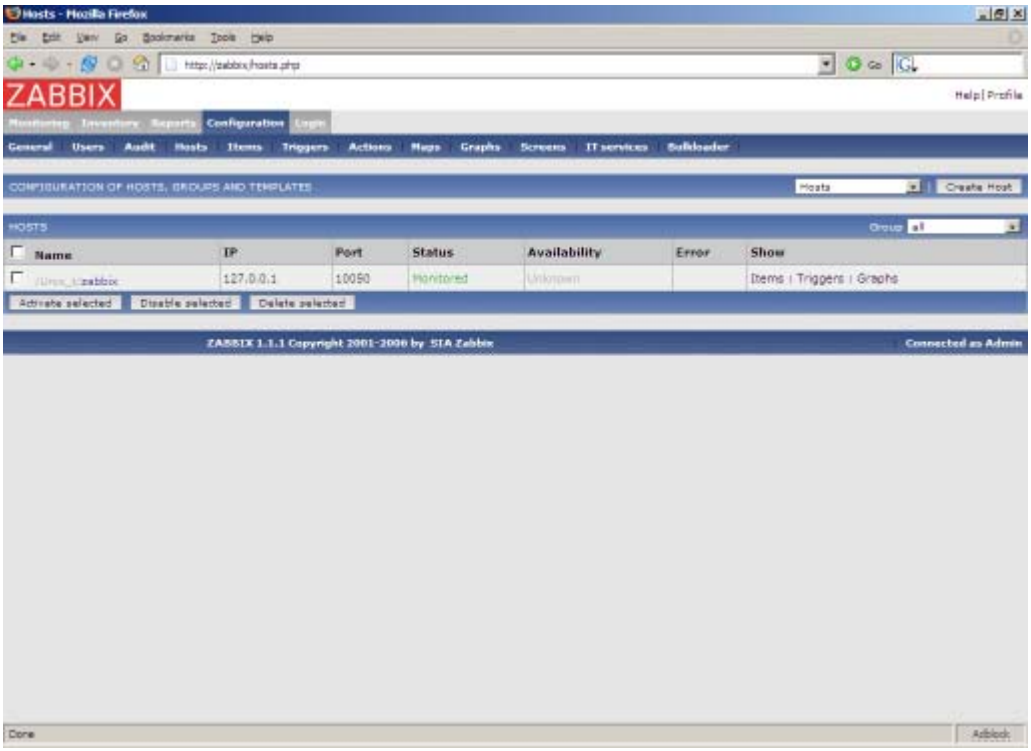
If a template is not used, we should manually add Items and Triggers to the host afterwards.



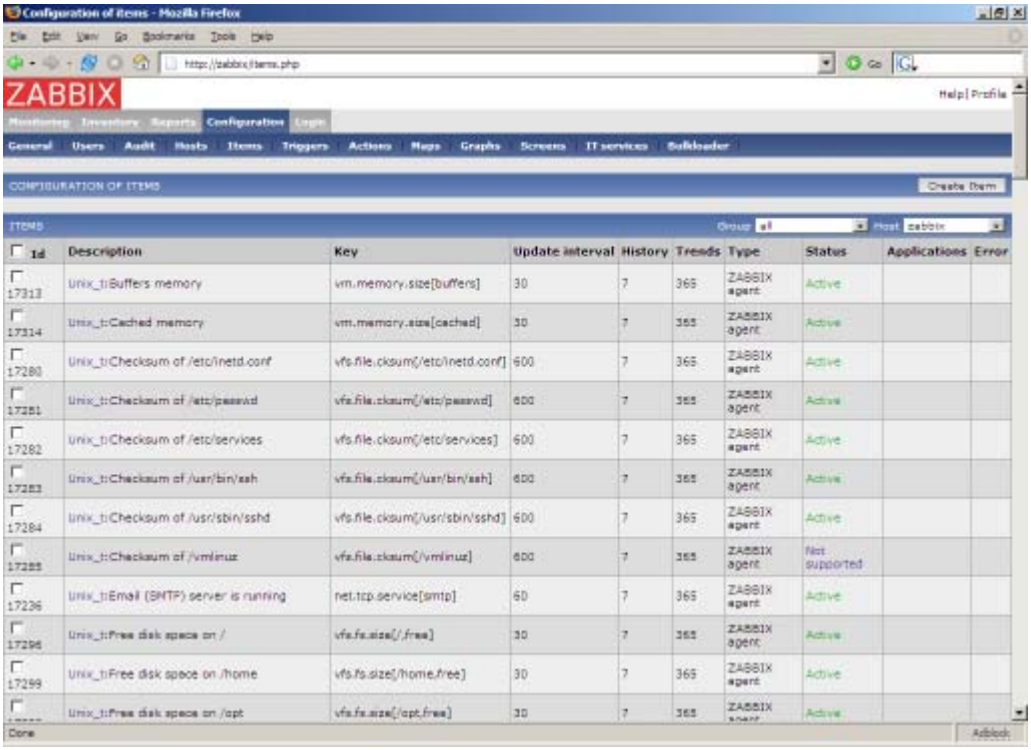
The host is created and it has exactly the same items and triggers as Unix_t has.



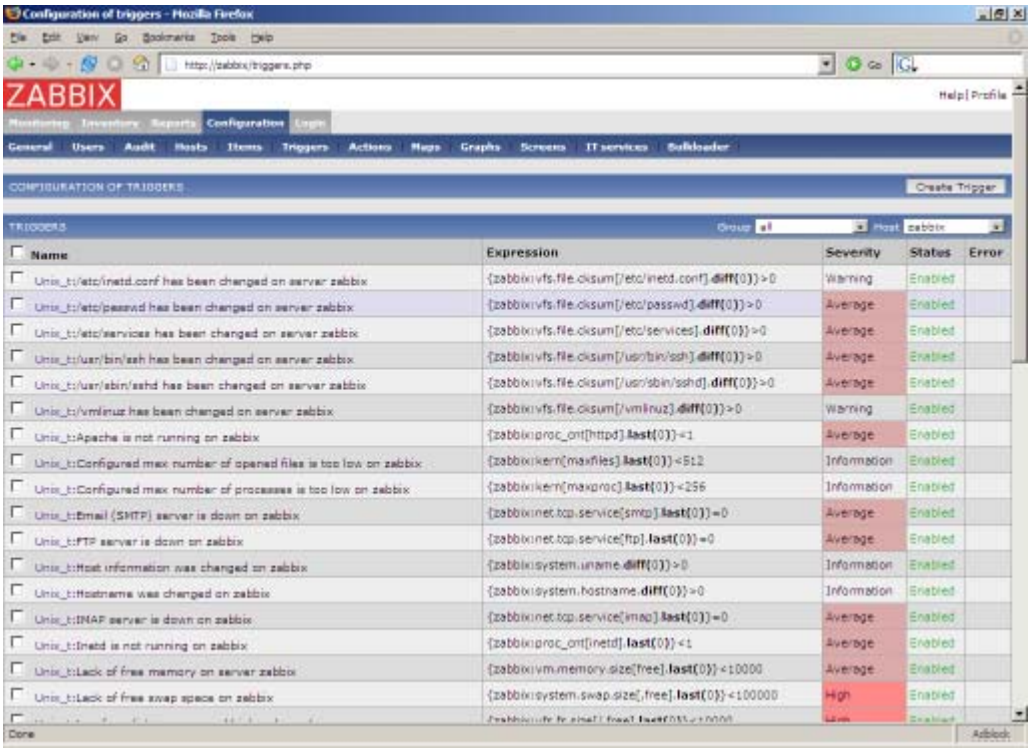
Back to the list of hosts. We see our host in the list.



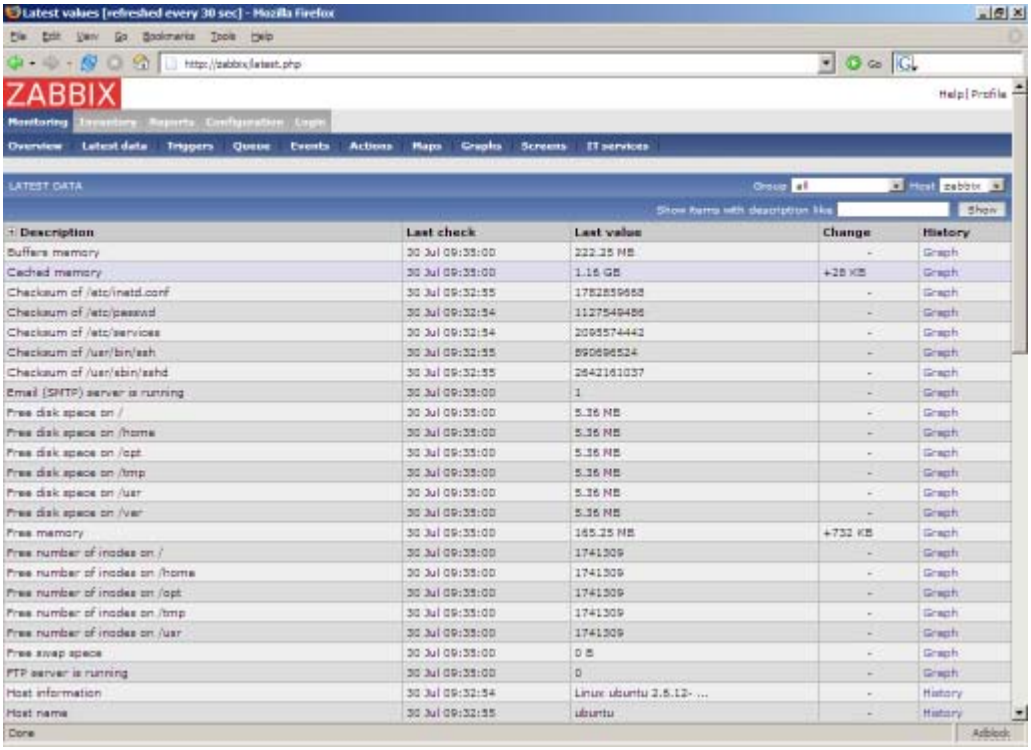
Let check if ithis host has any items to monitor. Menu->Configuration->Items:



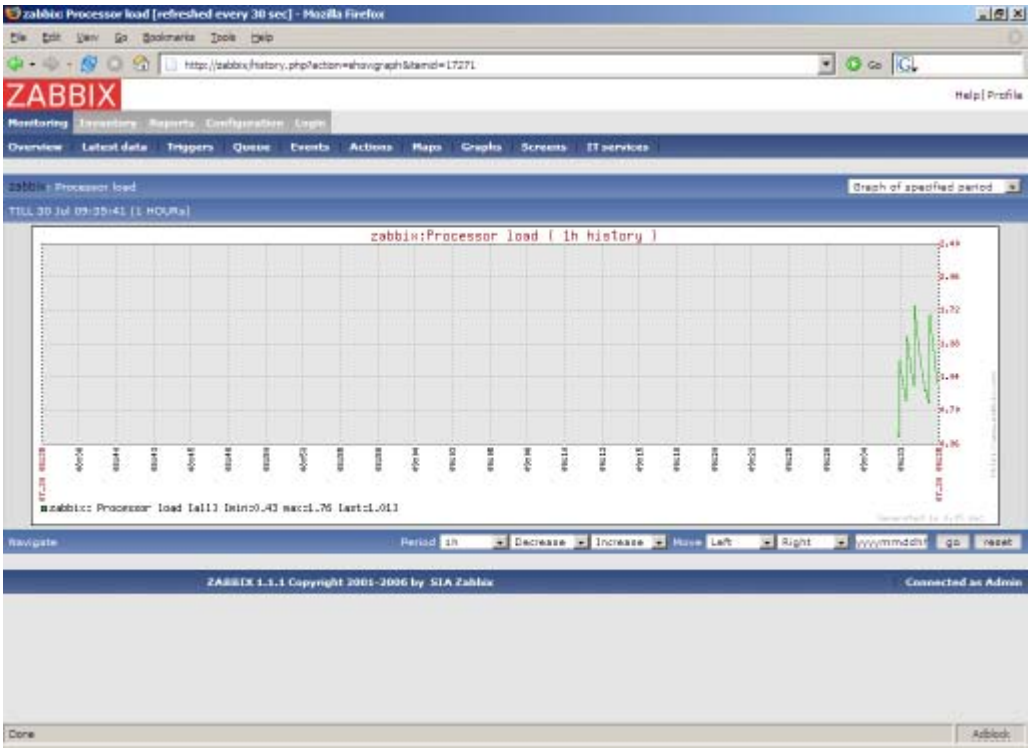
Yes! What about triggers? Menu->Configuration->Triggers:



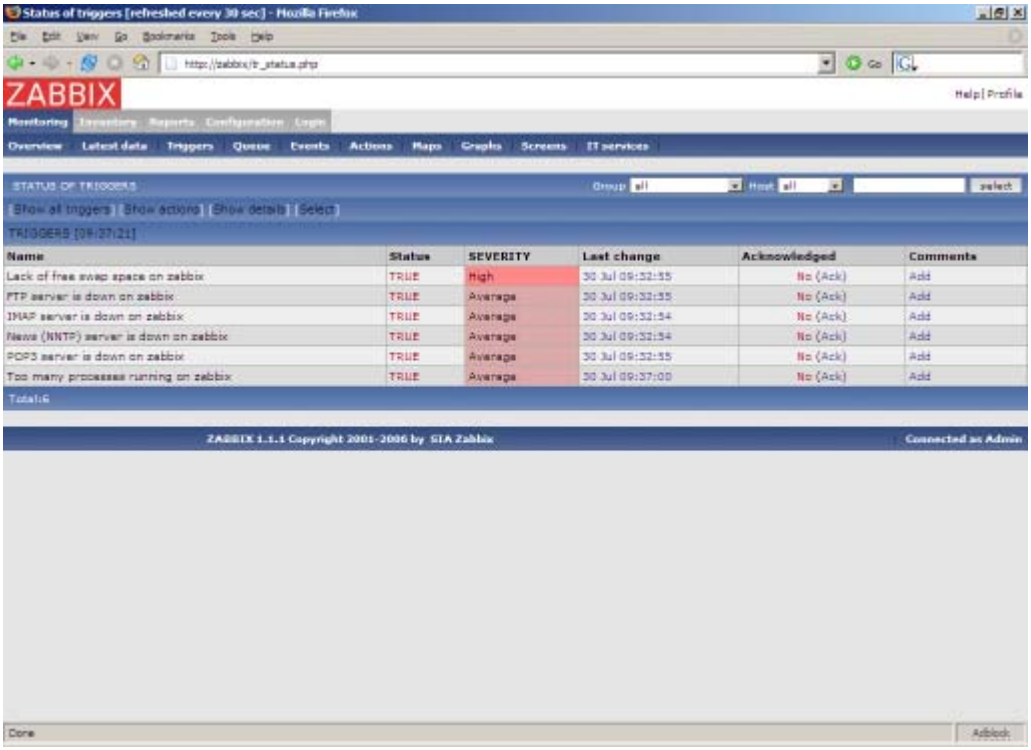
Good. It is time to see what information is available. Go to Menu->Latest data:



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



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



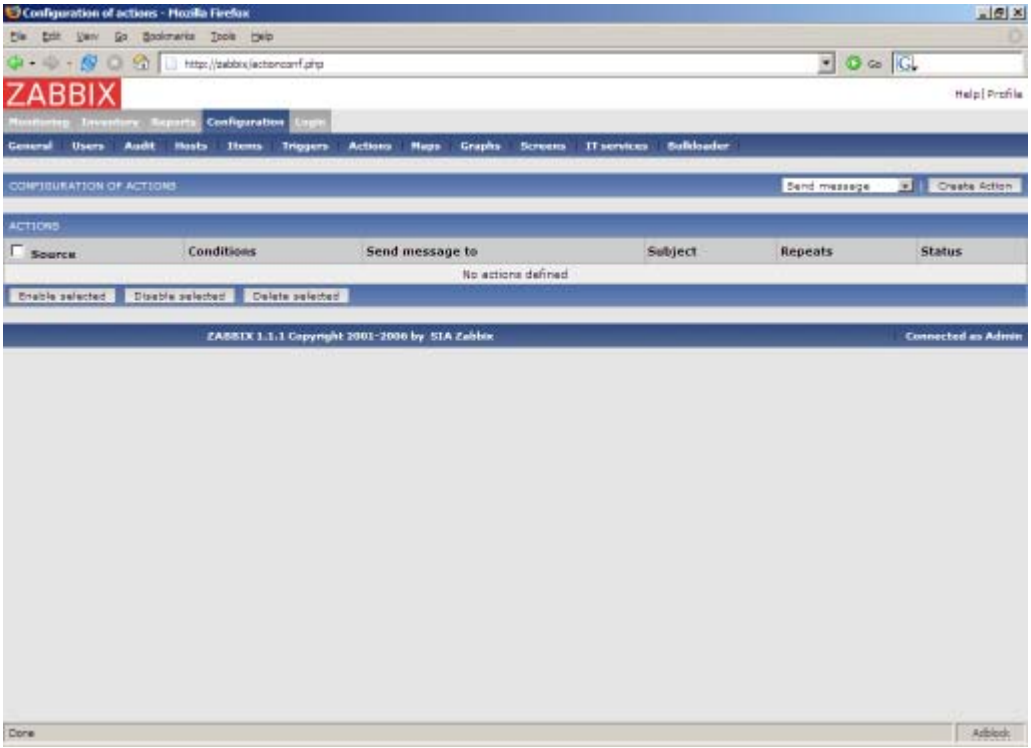
All right, the host is under ZABBIX control. After the host is added, we may be interested in:

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

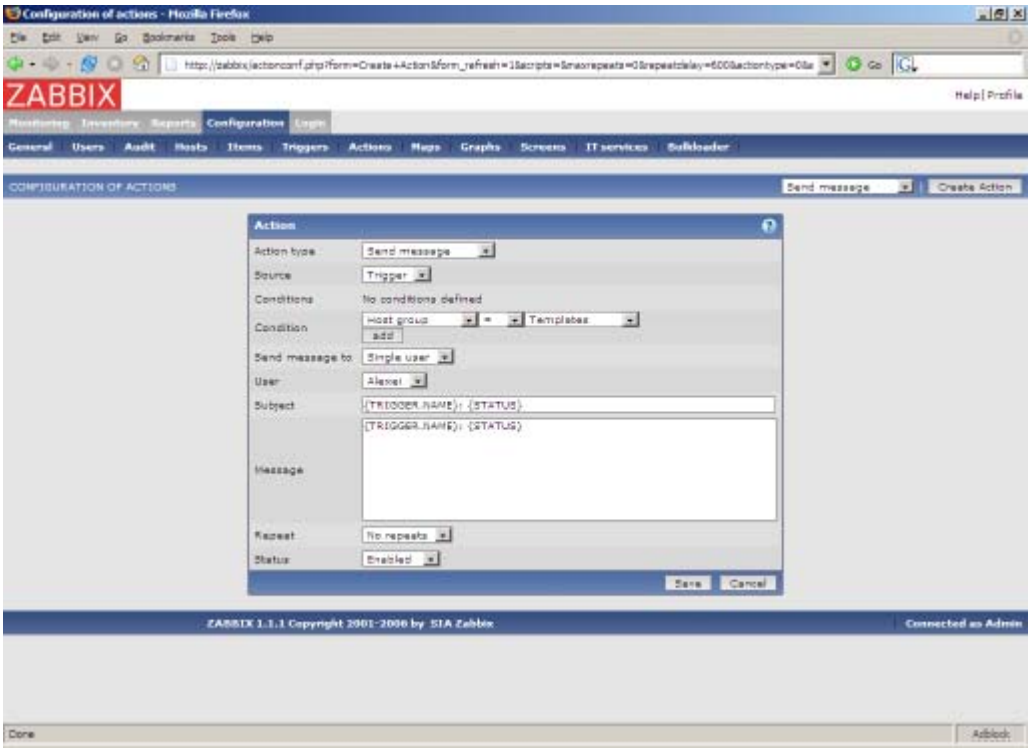
- Adjusting refresh rate for items
- Adding user notificationules

6.5. 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



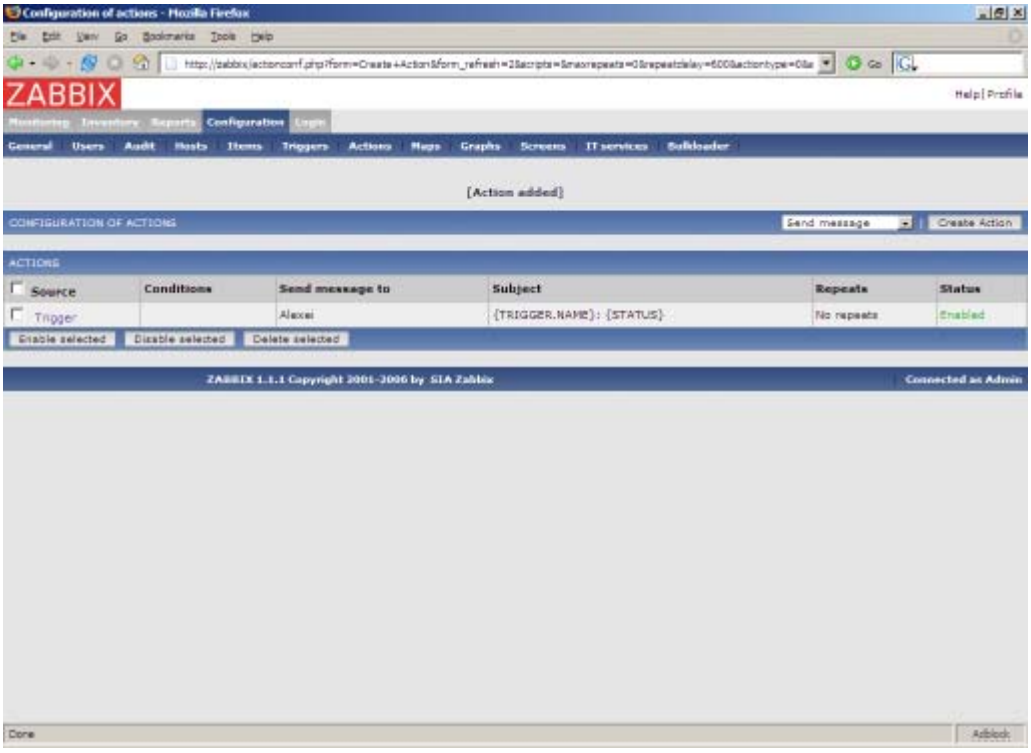
No actions defined yet. Press "Create Action":



If you do not specify any conditions the action will be triggerred 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

7. XML Import and Export

7.1. Goals

ZABBIX Import/Export functionality is created to make possible effective exchange of templates, hosts, items, triggers and graphs configuration parameters.

Exported data has XML format which is easy to read and modify.

- Sharing of templates

  ZABBIX users may share configuration parameters.

- Integration with third-party tools

  Universal XML format make possible integration and data import/export with third party tools and applications.

7.2. Overview

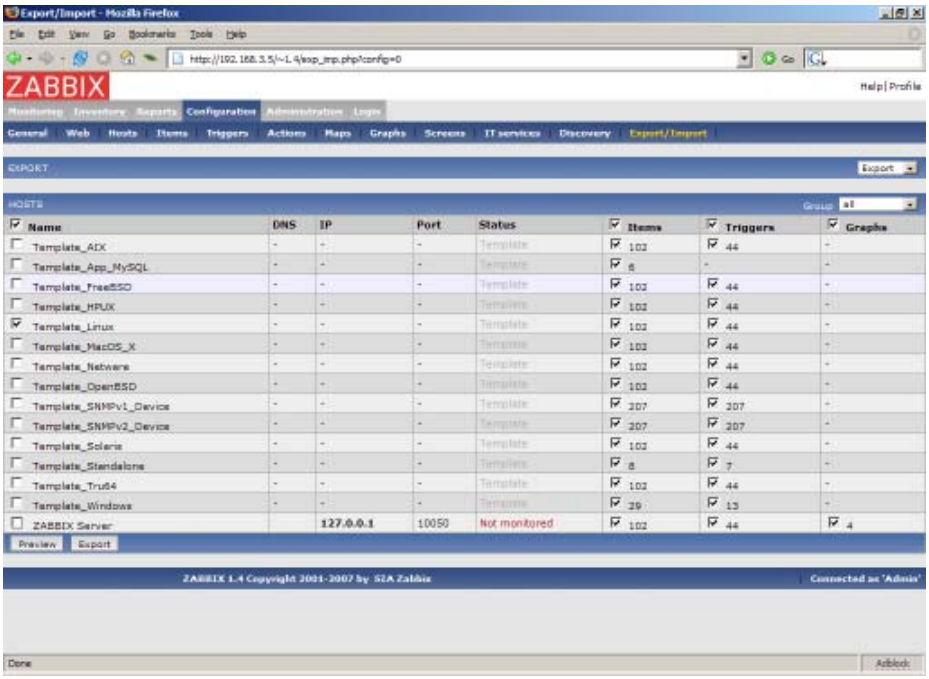
ZABBIX Import/Export processes the following data:

- Hosts
- Applications
- Items
- Triggers
- Custom graphs
- Value mappings

7.3. Data export

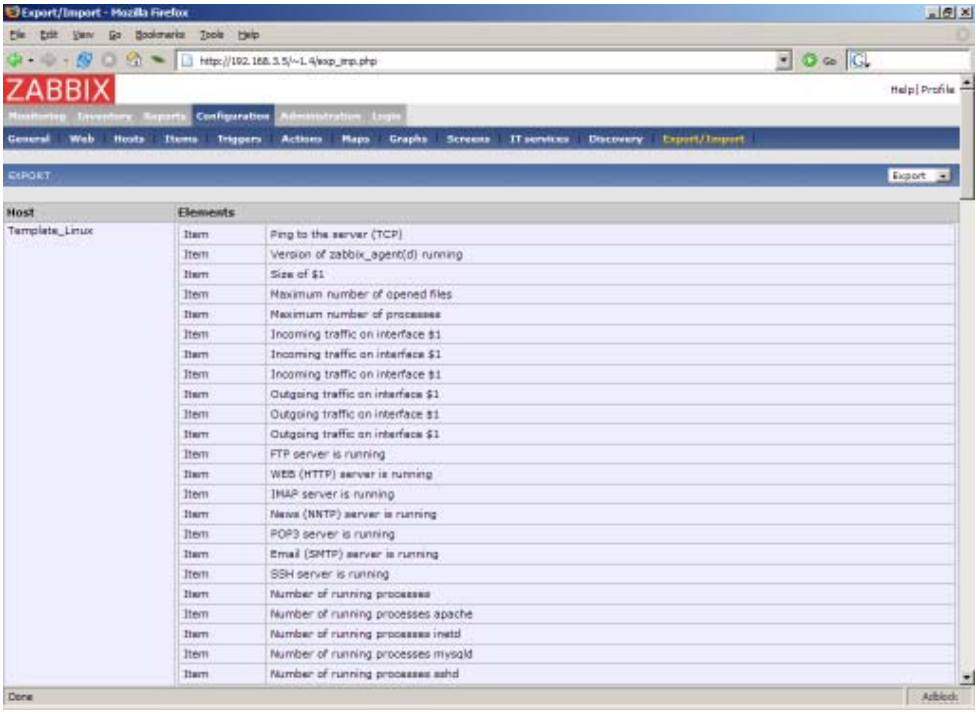
Menu->Configuration->Export/Import

Step 1	Select elements for export



We selected host “Template_Linux” all its items and triggers.

Press button “Preview” to see list of elements to be exported:



Step 2 Export data

Press button “Export” to export selected elements to a local XML file with default name **zabbix_export.xml**.

The file has the following format (one element of each type is shown):

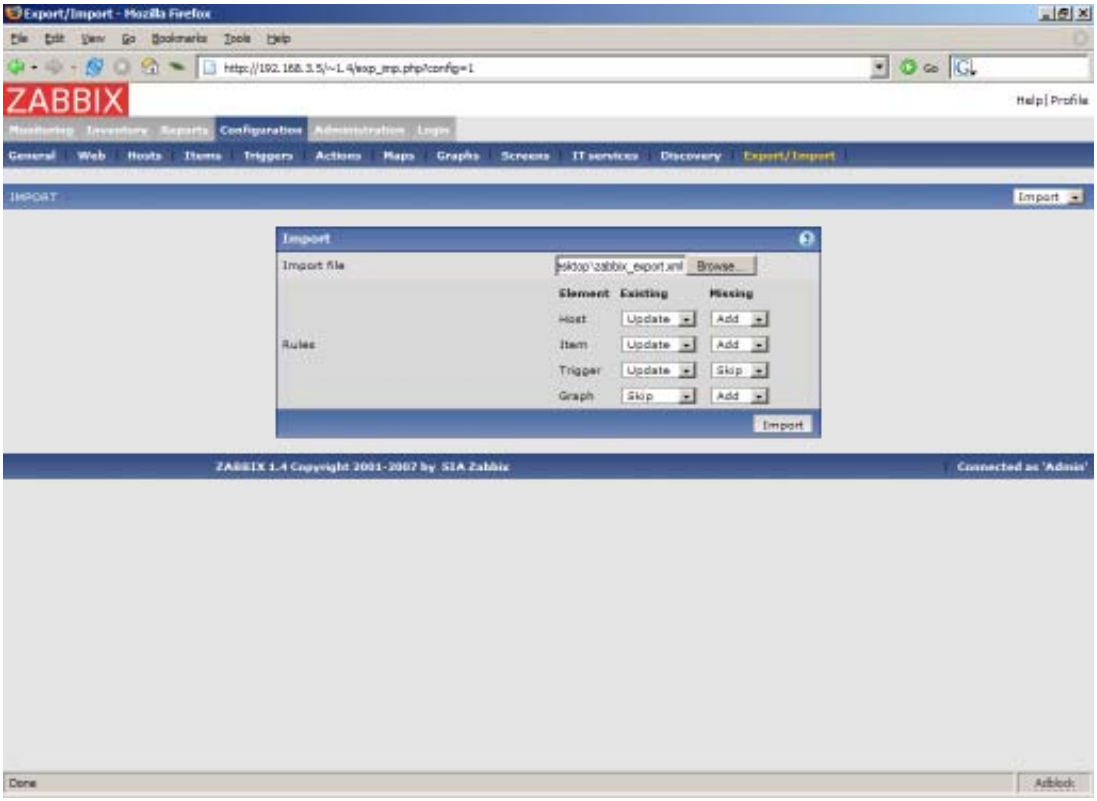
```
<?xml version="1.0"?>
<zabbix_export version="1.0" date="11.05.07" time="11.11">
  <hosts>
     <host name="ZABBIX Server">
        <useip>1</useip>
        <ip>127.0.0.1</ip>
        <port>10050</port>
        <status>1</status>
        <groups>
        </groups>
        <items>
           <item type="0" key="agent.ping" value_type="3">
              <description>Ping to the server (TCP)</description>
              <delay>30</delay>
              <history>7</history>
              <trends>365</trends>
              <snmp_port>161</snmp_port>
              <valuemap>Service state</valuemap>
              <applications>
                 <application>General</application>
              </applications>
           </item>
                     ....
        </items>
        <triggers>
           <trigger>
              <description>Version of zabbix_agent(d) was changed on
{HOSTNAME}</description>
              <expression>{{HOSTNAME}:agent.version.diff(0)}&gt;0</expression>
              <priority>3</priority>
           </trigger>
                     ....
        <graphs>
           <graph name="CPU Loads" width="900" height="200">
              <show_work_period>1</show_work_period>
              <show_triggers>1</show_triggers>
              <yaxismin>0.0000</yaxismin>
              <yaxismax>100.0000</yaxismax>
              <graph_elements>
                 <graph_element item="{HOSTNAME}:system.cpu.load[,avg15]">
                    <color>990000</color>
                    <yaxisside>1</yaxisside>
                    <calc_fnc>2</calc_fnc>
                    <periods_cnt>5</periods_cnt>
                 </graph_element>
                 <graph_element item="{HOSTNAME}:system.cpu.load[,avg1]">
                    <color>009900</color>
                    <yaxisside>1</yaxisside>
                    <calc_fnc>2</calc_fnc>
                    <periods_cnt>5</periods_cnt>
                 </graph_element>
                 <graph_element item="{HOSTNAME}:system.cpu.load[,avg5]">
                    <color>999900</color>
                    <yaxisside>1</yaxisside>
                    <calc_fnc>2</calc_fnc>
                    <periods_cnt>5</periods_cnt>
                 </graph_element>
              </graph_elements>
           </graph>
                     ....
        </graphs>
     </host>
                     ....

  </hosts>
</zabbix_export>
```

7.4. Data import

Menu->Configuration->Export/Import

Step 1	Configure settings for data import and press “Import”.



Pay attention to the following parameters of the item:

PARAMETER	Description
Import file	File name of XML file.
Rules	**Element** defines element of XML file. If parameter **Update** is set for **Existing** element, then the import will update it with data taken from the file. Otherwise it will not update it. If parameter **Add** is set for **Missing** element, then the import will add new element with data taken from the file. Otherwise it will not add it.

8. Tutorials

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

8.1. 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 an 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.

8.2. 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[file<,regexp>]'. For example: log[/var/log/syslog], log[/var/log/syslog,error] Make sure that the file has read permissions for user 'zabbix' otherwise the item status will be set to 'unsupported'. ZABBIX agent will filter entries of log file by the regexp if present.
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.

8.3. 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. Remote command can contain macros!

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

Example 1 Restart of Windows on certain condition.

In order to automatically restart Windows in case of a problem detected by ZABBIX, define the following actions:

PARAMETER	Description
Action type	'Remote command'
Remote command	host:c:\windows\system32\shutdown.exe –r –f Replace 'host' with ZABBIX hostname of Windows server.

9. WEB Monitoring

9.1. Overview

ZABBIX offers advanced functionality for monitoring of WEB sites.

9.2. Scenario

Scenario is set of HTTP requests which will be executed by ZABBIX server. Normally a scenario is defined for one particular part of functionality of our WEB site. Scenarios are very convenient way of monitoring user experience.

All session variables (cookies) are preserved within single execution of one scenario.

Every scenario automatically creates the following items linked to scenarion application:

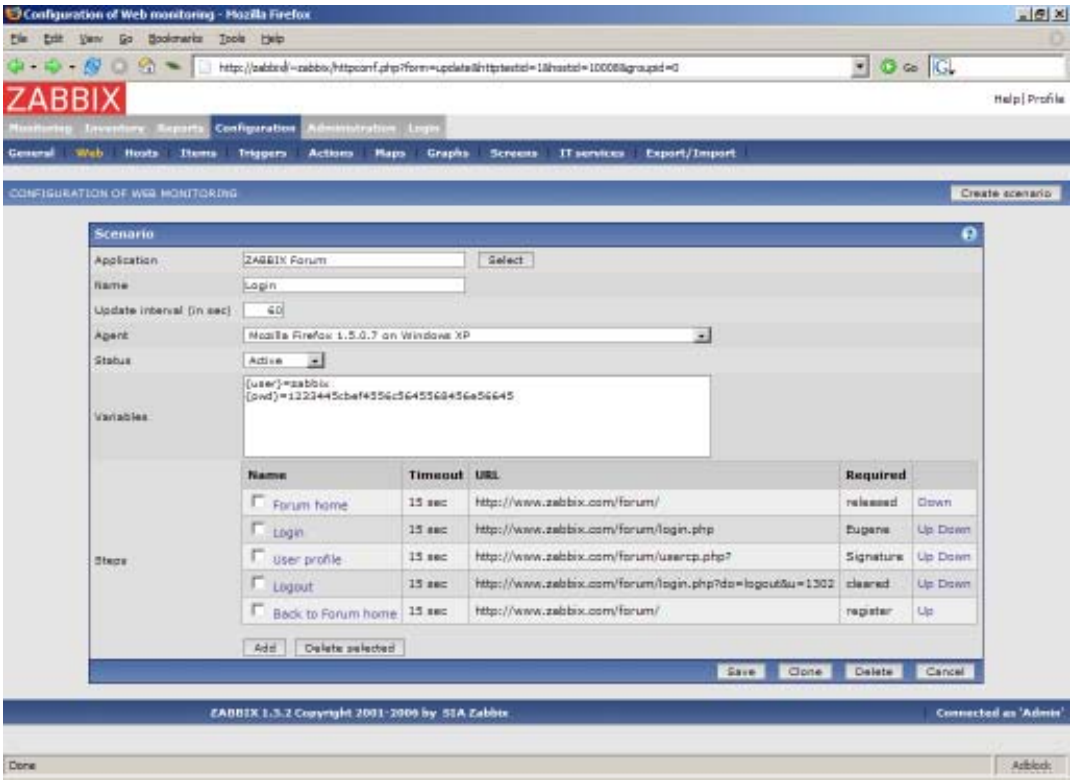
Item	Description
web.test.in[Scenario,,bps]	Total download speed of scenario 'Scenario'
web.test.fail[Scenario]	Failed step of scenario 'Scenario'. 0 – if all steps are executed without problems.

Scenario attributes:

Parameter	Description
Application	Host application the scenario is linked to. Items automatically created by WEB monitoring module will be linked to the application.
Name	Name of the scenario. For example, "Login".
Update interval (in sec)	This parameter defines how ofter ZABBIX should execute this scenario.
Agent	Name of ser agent ZABBIX server pretends to be. For example, "Mozilla Firefox 1.5.0.7 on Windows XP". Useful for testing agent dependent parts of WEB applications.
Status	**Active** – scenario is active **Disabled** - ZABBIX won't execute this scenario

Parameter	Description
Variables	List of macros which can be used in URL and Post variables in steps of the scenario. For example: {user}=zabbix {md5pwd}=1233445cbef4556c5645568456e56645
Steps	List of steps. ZABBIX automatically creates required items for monitoring of WEB applications.

Example 1 Monitoring of ZABBIX Forums.



9.3. Steps

Each scenario consists of one or more steps. Step is basically a HTTP or HTTPS request performed by ZABBIX.

Every step automatically creates the following items linked to scenarion application:

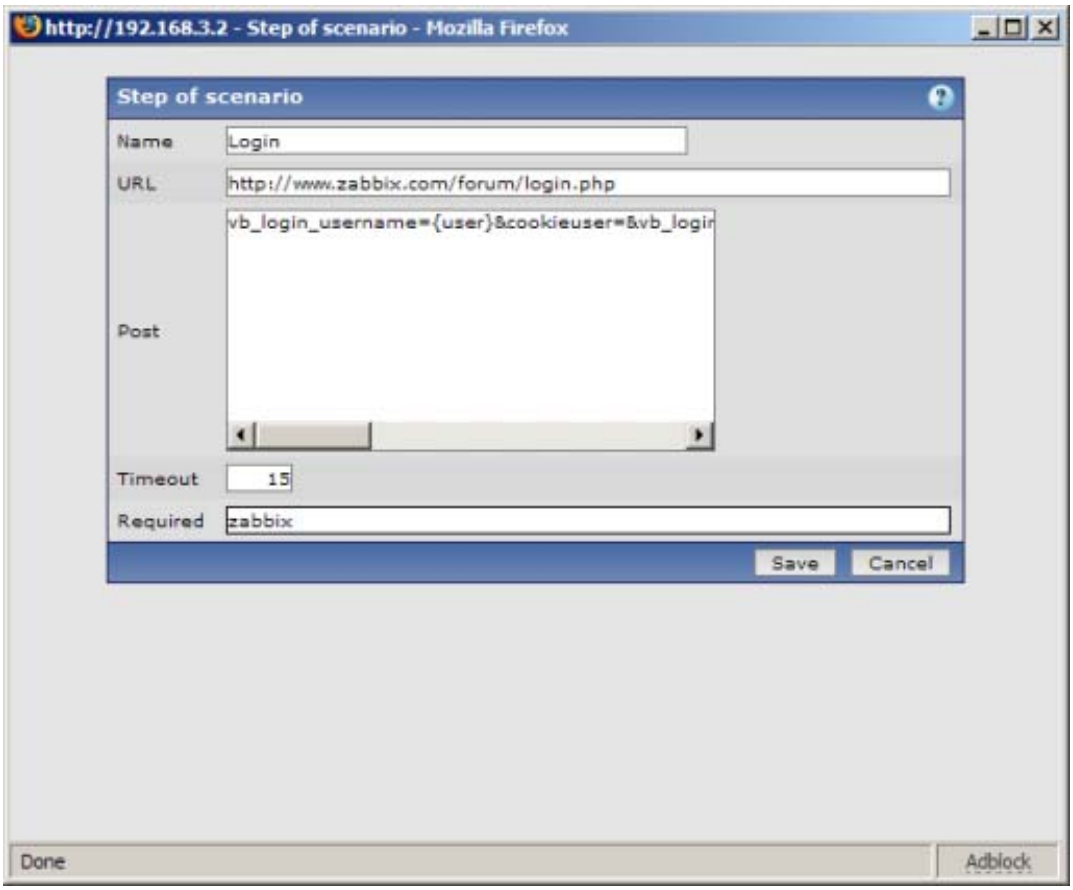
Item	Description
web.test.in[Scenario,Step,bps]	Download speed for step 'Step' of scenario 'Scenario'
web.test.rspcode[Scenario,Step]	Response code for step 'Step' of scenario 'Scenario'
web.test.time[Scenario,Step,resp]	Response time for step 'Step' of scenario 'Scenario'

All these items can be used for graphing, triggers and everything supported by "normal" items.

Step attributes:

Parameter	Description
Name	Unique step name. For example, "Login".
URL	URL. For example, http://www.zabbix.com/forum/login.php
Post	List of post variables. For example: vb_login_username={user}&cookieuser=&vb_login_password=&s=&do=login&forceredirect=1&vb_login_md5password={pwd}&vb_login_md5password_utf={md5pwd} Note that {user} and {md5pwd} are macros defined for scenario.
Timeout	Timeour in seconds. ZABBIX will not spend more than Timeout seconds on execution of this step. In case of timeout, execution of scenario is terminated.
Required	Required string in HTTP response defined as regual expression. Ignored if empty. If HTTP document does not contait this string, execution of scenario is terminated.

Example 1	Login.


http://192.168.3.2 - Step of scenario - Mozilla Firefox
Step of scenario
Name
Login
URL
http://www.zabbix.com/forum/login.php
Post
vb_login_username={user}&cookieuser=&vb_logir
Timeout
15
Required
zabbix
Save
Cancel
Done
Adblock

10. Auto-discovery

10.1. Goals

There are several goals of ZABBIX auto-discovery module:

- Simplify deployment

  Auto-discovery can be used to significantly simplify and speed up ZABBIX deployment. It also makes possible creation of user friendly appliances.

- Simplify administration

  Properly configured auto-discovery can simplify administration of ZABBIX system very much.

- Support of changing environments

  Auto-discovery makes possible use of ZABBIX in rapidly changing environments with no excessive administration.

10.2. Overview

ZABBIX provides effective and very flexible auto-discovery functionality. ZABBIX auto-discovery is based on the following information:

- IP ranges
- Availability of external services (FTP, SSH, WEB, PO3, IMAP, TCP, etc)
- Information received from ZABBIX agent
- Information received from SNMP agent

It does NOT provide:

- Discovery of network topology

Every service and host (IP) checked by ZABBIX auto-discovery module generates events which may be used to create rules for the following actions:

- Generating user notifications
- Adding and removing hosts
- Adding hosts to a template
- Removing hosts from a template
- Linking hosts to a template
- Unlinking hosts from a template
- Executing remote scripts

The actions can be configured to respect host or service uptime and downtime.

10.3. How it works

Auto-discovery basically consists of two phases: Discovery and Actions.

First, we discover a host or a service, and generate discovery events.

Then we process the events and apply certain actions depending of type of discovered device, IP, its status, up/down time, etc.

10.3.1. Discovery

ZABBIX periodically scans IP ranges defined in auto-discovery rules. Frequency of the check is configurable for each rule individually.

Each rule defines set of service checks to be performed for IP range.

ZABBIX tries to perform a service check:

- if OK, it generated Service UP and Host UP events
- if FAIL, it generates Service Down event

If all service checks failed for a single IP, ZABBIX generates Host Down event.

Events generated by auto-discovery module have Event Source “Discovery”.

10.3.2. Actions

For a description of all conditions available for auto-discovery based events see Action conditions.

For a description of all operations available for auto-discovery based events see Operations.

10.4. Auto-discovery rule

Auto-discovery rule is a rule used by ZABBIX to discover hosts and services.

Parameters of auto-discovery rule:

Parameter	Description
Name	Name of the rule. For example, “Local network”.
IP range	Range of IP addresses for discovery. It may have the following formats: Single IP: 192.168.1.33

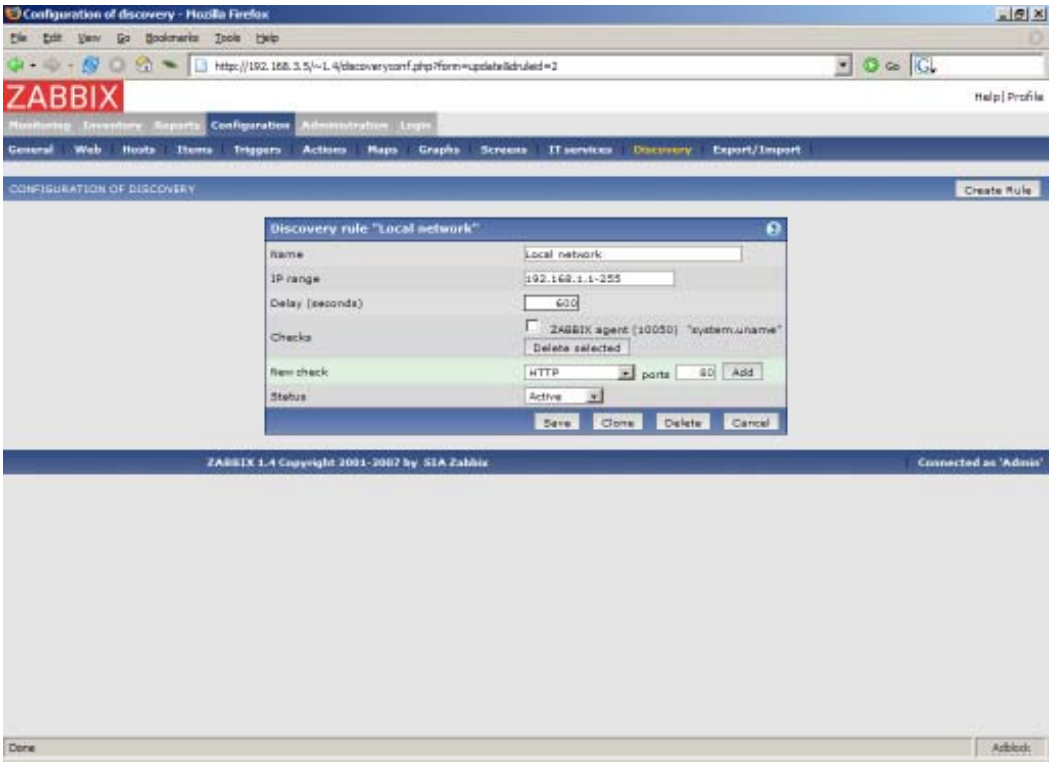
Parameter	Description
	Range of IP addresses: 192.168.1.1-255 List: 192.168.1.1-255,192.168.2.1-100,192.168.2.200
Delay (in sec)	This parameter defines how often ZABBIX should execute this rule.
Checks	ZABBIX will use this list of check for discovery of hosts and services. List of supported checks: SSH, LDAP, SMTP, FTP, HTTP, POP, NNTP, IMAP, TCP, ZABBIX Agent, SNMPv1 Agent, SNMPv2 Agent Parameter Ports may be one of following: Single port: 22 Range of ports: 22-45 List: 22-45,55,60-70
Status	Active – the rule is active and will be execute by ZABBIX server Disable – the rule is not active. It won't be executed.

10.5. Real life scenario

Suppose we would like to setup auto-discovery for local network having IP range of 192.168.1.1-192.168.1.255. In our scenario we want to:

- discover only hosts having ZABBIX Agent running
- run discovery every 10 minutes
- add host for monitoring if host uptime is more than 1 hour
- remove hosts if host downtime is more than 24 hours
- use Template_Windows for Windows hosts
- use Template_Linux for Linux hosts
- add Linux hosts to group "Linux servers"
- add Windows hosts to group "Windows servers"

Step 1	Define auto-discovery rule for our IP range.

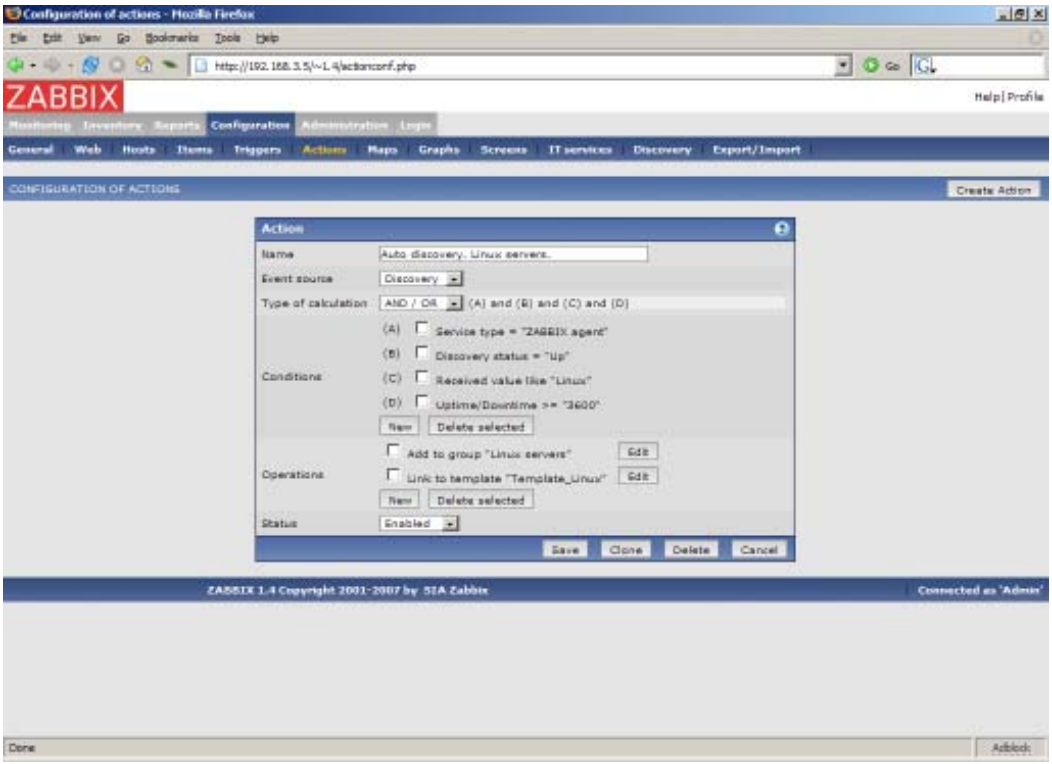


ZABBIX will try to discover hosts in IP range of 192.168.1.1-192.168.1.255 by connecting to ZABBIX Agents and getting system.uname. A value received from an agent can be used to apply different actions for different operating systems. For example, link Windows boxes to Windows_Template, Linux boxes to Linux_Template.

The rule will be executed every 10 minutes (600 seconds).

When the rule is added, ZABBIX will automatically start discovery and generation of Discovery based events for further processing.

Step 2	Define an action for adding newly discovered Linux servers.



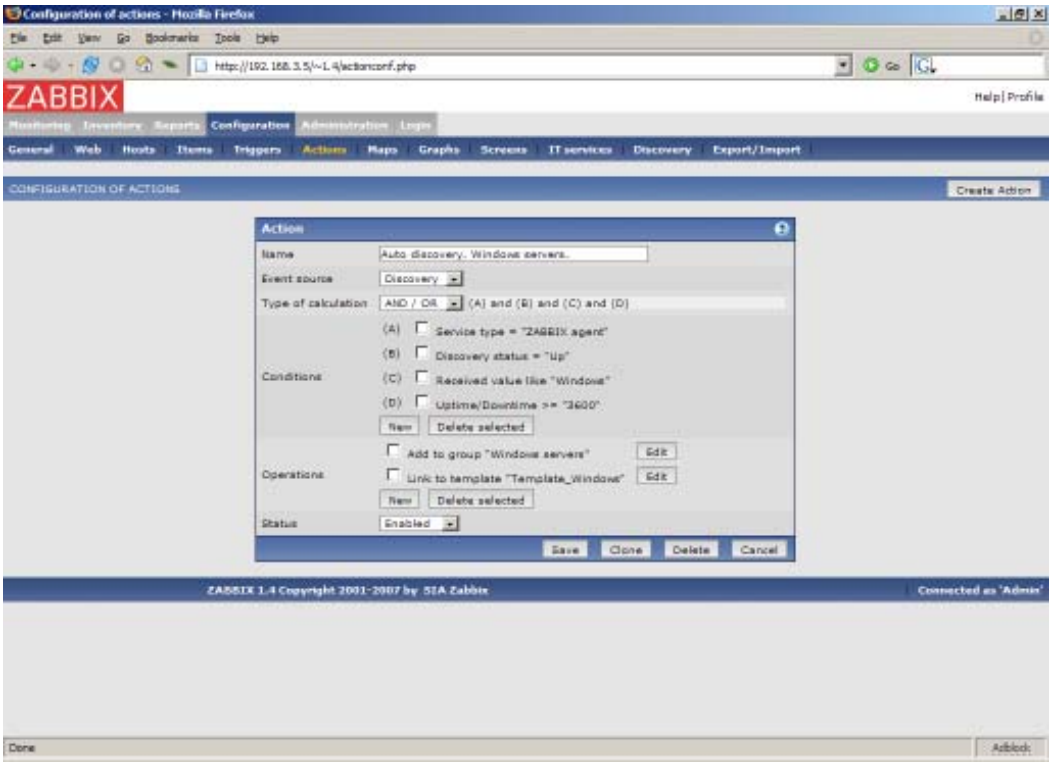
The action will be activated if:

- service “ZABBIX Agent” is Up
- value of system.uname (ZABBIX Agent’s key we used in rule definition) contains “Linux”
- Uptime is more than 1 hour (3600 seconds)

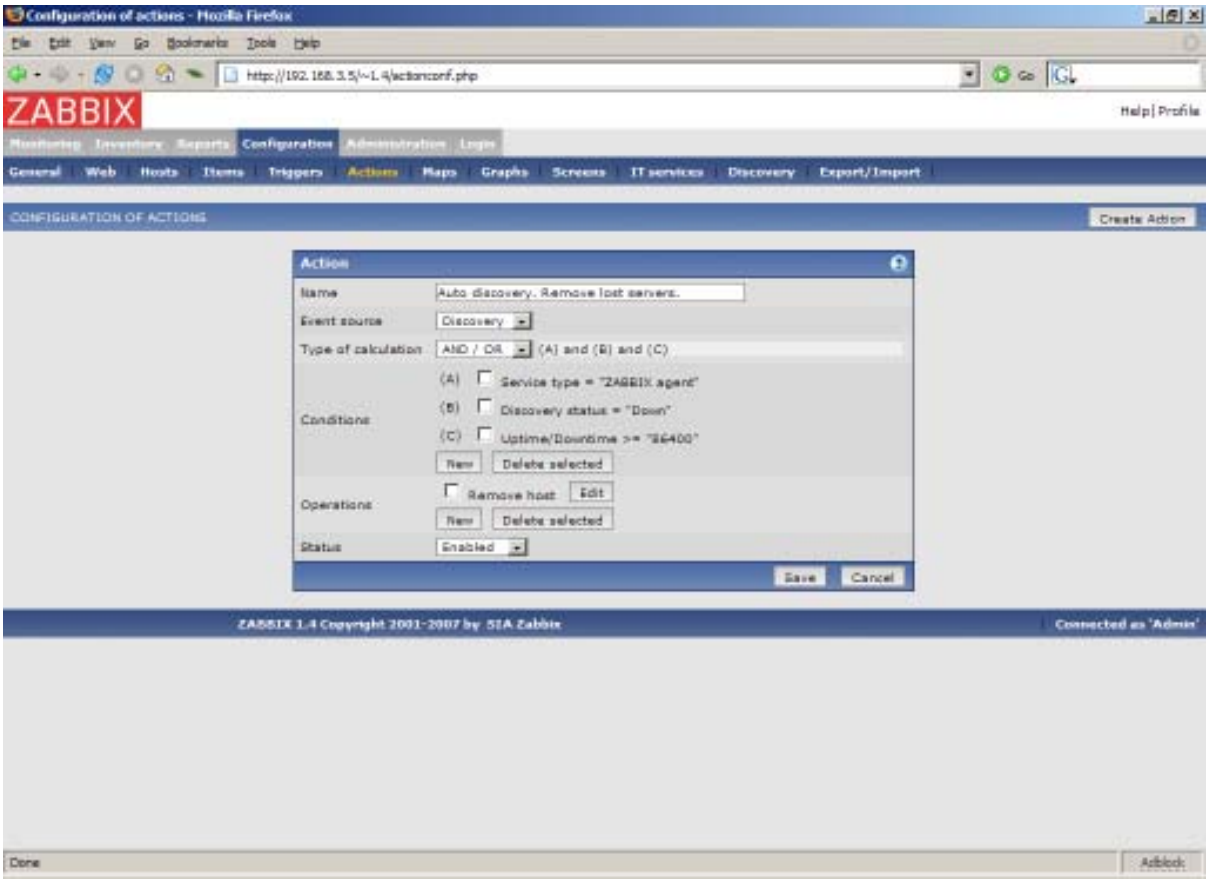
The action will execute the following operations:

- adds newly discovered host to group “Linux servers” (also adds host if wasn’t added previously)
- links host to template “Template_Linux”. ZABBIX will automatically start monitoring of the host using items and triggers from “Template_Linux”.

Step 3	Define an action for adding newly discovered Windows servers.



Step 4	Define an action for removing lost servers.



A server will be removed if service “ZABBIX Agent” is Down for more than 24 hours (86400 seconds).

11. Distributed Monitoring

11.1. 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 front-end.

11.2. 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.

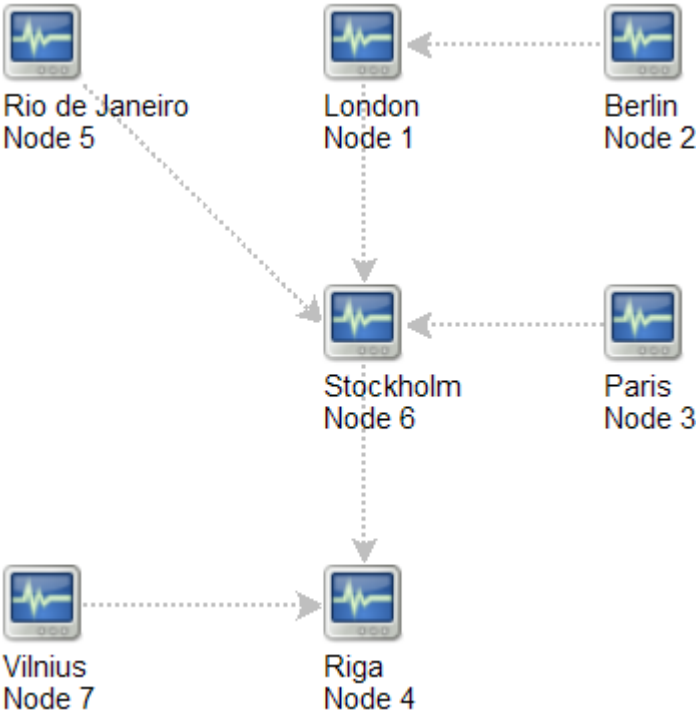
Each Node has its own configuration and works as a normal ZABBIX Server.

11.3. 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.

11.3.1. 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.

11.4. 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 comminucation 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
...
```

12. WEB Interface

13. Performance Tuning

13.1. 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, one 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 600x2=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.

13.2. Performance tuning

13.2.1. Hardware

General advices on hardware:

- Use fastest processor available
- SCSI or SAT 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
- User fast RAID storage
- Use fast Ethernet adapter
- Having more memory is always better

13.2.2. 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 the fastest and the most secure way.

13.2.3. 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 differend hard disks
- 'history', 'history_str, 'items' 'functions', triggers', and 'trends' are most heavily used tables.

13.2.4. 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 wich return same information.

Example: why use system[procload],system[procload5] andsystem[procload15] if system[procload] 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).

14. Troubleshooting

14.1. General advices

15. Cookbook

15.1. GENERAL RECIPES

15.1.1. 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.

15.1.2. 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.

15.2. MONITORING OF SPECIFIC APPLICATIONS

15.2.1. 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.

15.2.2. 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)

15.2.3. Mikrotik routers

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

15.2.4. WIN32

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

15.2.5. 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.

15.2.6. Tuxedo

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

15.2.7. 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.

15.2.8. 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/jmxremote. 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\:/ { 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.

15.3. INTEGRATION

15.3.1. 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, preferrably in a new table of ZABBIX database. If trigger is OFF then opcmack <message id> has to be executed with message ID retrieved from the database.

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

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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.

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

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- new code is tested and works under all supported platforms. Report any compatibility issues.
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Please, consider discussing your ideas with ZABBIX developers before writing actual code.

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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
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- Abdourahmane SECK, Senegal

Contributors

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18. 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.

18.1. Developers of ZABBIX

- ALEXEI VLADISHEV

Author of ZABBIX, has written most of ZABBIX code including PHP front-end.

- EUGENY GRIGORJEV

Many significant improvements mostly related to PHP front-end and ZABBIX agents.

18.2. Contributors to ZABBIX

I am sorry for not mentioning all who contributed to ZABBIX/

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- DANIEL ESTER

Support for SNMP values of type timetick.

- DANIEL HIGGINS

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- EUGENY BACULA

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RPMs and zabbix.spec.

- IGOR MICKO

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Help with testing

- JEFF REDDING

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Start-up scripts for RedHat 8.0

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Help with testing

- JÜRGEN SCHMITZ

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Select criteria in for “Status of Triggers”

- LUKAS MACURA

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- MARC LEDENT

Original implementation of proc_cnt[*] for Solaris.

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- VICTOR KIRHENSTEIN

Native ZABBIX agent for WIN32 platforms.

ZABBIX SIA
Neretas 2/1-109,
LV-1004,
Riga, Latvia

Tel +371 7473943
Fax +371 7473944

Email sales@zabbix.com
Web www.zabbix.com