

ZABBIX

Release 016

ZABBIX Manual v1.6

Review and Approval

	Name	Signature	Date
For ZABBIX SIA:			

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About this Manual

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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.

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Glossary

TERM	DESCRIPTION
Active	Active refers to a mode that the ZABBIX Agent can run in. When running actively, the agent keeps track of what items to send to the server and at what intervals. The agent can poll the server at set intervals in order to keep track of what items it should be sending.
Active checker	Active checker gather operational information from the system where ZABBIX Agent is running, and report this data to the ZABBIX for further processing.
Action	An action is a response taken when a Trigger has been triggered. Actions can be configured to send messages to specific user groups as defined in ZABBIX, based on their Media Type settings, or execute remote commands.
Agent	Agent refers to the program that is run on hosts that want to be monitored. It is run as a service and can process both active and passive checks simultaneously.
Alerter	Alerter is a server process which is responsible for execution of actions (emails, 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 pattern 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.
IPMI	Intelligent Platform Management Interface.

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, text 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 Childs. Master Node can control configuration of the Childs.
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.
Proxy	ZABBIX Proxy process which collects performance and availability data from servers and network devices and send it to a ZABBIX Server for further processing.

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.
Child or Child Node	Child Node is linked to a Master Node. Child 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

No internal documents at the moment.

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

Release	Date	Reason	Who
13	10/04/2008	Updated Release Notes	Alexei Vladishev
15	18/09/2008	Pre-1.6 updates.	Alexei Vladishev
16	04/11/08	Added: <ul style="list-style-type: none">▪ Maintenance mode▪ Configuration (Hosts, WEB, Triggers, Graphs, Maps, everything)▪ Parameters StartDBSyncers, BufferSend, BufferSize▪ creation of new themes▪ Key zabbix[proxy,...]	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
Important note	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 a primary monitoring platform.

1.5.Goals and Principles

1.5.1.Main Goals 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.What's new in ZABBIX 1.6

1.6.1.Escalations and Repeated notifications

Support of escalations and repeated notifications has been implemented. Escalations can be configured in a very flexible way and may include not only notifications but also execution of remote and IPMI commands.

1.6.2.Much Better Performance

ZABBIX database cache module, when enabled by the parameter StartDBSyncers, increases speed of ZABBIX up-to 4-8x times depending on the configuration.

1.6.3.Support of IPv6

All ZABBIX modules support both IPv4 and IPv6. ZABBIX can be used in mixed or IPv6 only environments.

1.6.4.Support of IPMI

ZABBIX support monitoring of IPMI parameters and manual execution of IMPI commands from ZABBIX front-end as well as remote commands.

1.6.5.Better Distributed Monitoring

ZABBIX distributed monitoring has been improved for a more efficient Node synchronisation protocol.

See also details on ZABBIX Proxy.

1.6.6.ZABBIX Proxy Process

ZABBIX Proxy is a lightweight process, which collects data collection on behalf of ZABBIX Server. The proxies can be used in order to centralise monitoring of remote locations by reporting to the central server or one of ZABBIX nodes in the distributed environment.

ZABBIX Proxy simplifies deployment and maintenances of the centralised distributed monitoring significantly.

1.6.7.Dashboard

ZABBIX Dashboard provides high level personalized details about the monitored environment. Now this is a central part of ZABBIX front-end.

1.6.8.Dynamic Screens

A screen element can be made dynamic. In this case, the information displayed in the element will depend on the particular host selected by ZABBIX user.

1.6.9.Nice Zoom for Graphs

The Zoom period can be selected by mouse for drill-down analysis.

1.6.10.Pie Charts

Pie charts (both 2D and 3D) are supported.

1.6.11.Basic Management Functions

Traceroute and Ping can be executed from a number of screens. More scripts can be added and configured.

The scripts are executed on the single ZABBIX server or any ZABBIX node in the distributed setup.

1.6.12.More Efficient Communication with Agents

ZABBIX Agents support data buffering, which can be tuned by new configuration parameters, BufferSize and BufferSend.

The communication protocol has been improved to support sending of multiple values by one TCP connection.

1.6.13.More Efficient ZABBIX Sender

ZABBIX Sender has been improved to support sending of multiple values by one network connection.

1.6.14.Improved View of Trigger Statuses

The screen will display information about triggers and associated events.

1.6.15.Support of SNMP Data with Dynamic Index

A new syntax can be used to monitor SNMP data with a dynamic index. See SNMP section for more details.

1.6.16.Special Processing of Well-known SNMP OIDs

Simple SNMP OIDs, like ifDescr, ifInOctets, ifInOctets, and other can be used in ZABBIX and will be translated automatically into correct numeric representation by ZABBIX itself.

1.6.17.Added Printable View for All Screens

Any screen can be printed in a nice way by pressing the “Print” link.

1.6.18.Disabling of Login Rights for a Group of Users

An entire user group can be configured not to have access to ZABBIX front-end.

1.6.19.Added Support of UTF-8

ZABBIX front-end is UTF-8 ready. Note that ZABBIX database and ZABBIX server and agent processes still are not ready for correct processing of UTF-8 data.

1.6.20.Added Screen for Better Management of Translations

The screen can be used to add new translations of ZABBIX front-end.

1.6.21.Added Maintenance Mode

ZABBIX maintenance mode can be activated to disable ZABBIX front-end temporarily.

1.6.22.Unlimited Number of Map Link Styles

Any number of triggers can be linked to the map link. The style of the triggers will define how the link is displayed.

1.6.23.Improved User Permission Schema

In 1.6 user permissions slightly differ from the permissions in 1.4.

1.6.24.Other Improvements

1.6.24.1.Queue moved into Administration

Now the information is available to ZABBIX Super Administrators only.

1.6.24.2.Link to Maps, Screens and Graphs moved to the

Dashboard

The main menu was simplified. Now Maps, Screens and Graphs can be accessed from the Dashboard.

1.6.24.3.Auto-login option

The user profile option makes possible automatic login to ZABBIX front-end within one month.

1.6.24.4.New communication protocol

New more efficient communication protocol makes possible sending of multiple values by one TCP connection.

1.6.24.5.Support of themes for ZABBIX front-end

New front-end includes two themes by default. More themes can be added.

1.6.24.6.User ‘guest’ can be disabled

In this case, user authorization is required for access to the ZABBIX front-end.

1.6.24.7.Disabling of a group of users

A group of users can be disabled.

1.6.24.8.Database down screen

Nice screen will appear in case if ZABBIX front-end is unable to talk to the database.

1.6.24.9.Duplicated Login removed

The Login menu item has been removed to avoid confusion.

1.6.24.10.Added sorting for all screens

Most of tables in ZABBIX front-end can be sorted by selected column.

1.6.24.11.Better informative message

Information message has different colours depending on status. It may also contain more details, which are hidden by default.

1.6.24.12.Support of import/export of the host template linkage information

XML import/export respects host template linkage information.

1.6.24.13. Support of negative values in graphs

Graphs support displaying of negative values.

1.6.24.14. Support of directories in the parameter Include

Parameter Include can be used to include all files in a directory.

1.6.24.15. Support of new macros

Add new macros, which can be useful for notifications: {EVENT.DATE}, {EVENT.TIME}, {EVENT.AGE}, {ESC.HISTORY}

1.6.24.16. New after-login greeting message

Welcome message is not confusing any more.

1.6.24.17. Auto-discovery by ICMP ping

Auto-discovery supports discovery by ICMP ping.

1.6.24.18. Increased number of log entries sent per second

By default ZABBIX will send no more than 100 of lines per second per each log file.

1.6.24.19. Added mass-update functionality for hosts and triggers

Some of host and trigger attributes can be mass-updated.

1.6.24.20. Added full-screen icon

Most of screens support full-screen mode, which is controlled by the full-screen icon.

1.6.24.21. Active only mode for ZABBIX agent

Active-only mode can be enabled for agents. In this case, the agent will not listen for incoming connections, which may be important for security.

1.6.24.22. Added monitoring of Proxy availability

Availability of proxies can be monitored automatically using new internal checks.

1.6.24.23.Added protection against brute-force attacks

ZABBIX front-end is protected from brute force attacks.

1.6.24.24.Improved event viewing

Every single event provides detailed information about executed commands and notifications.

1.6.24.25.More accurate ICMP pings

Refresh rate for ICMP pings can be controlled individually for each item.

1.6.24.26.Support of bulk acknowledgements

Multiple events can be acknowledged by a single click thanks to bulk-acknowledgement.

1.6.24.27.Added time filter to Availability Report

Availability report support selection of time period.

1.6.24.28.History of Actions moved under Administration

History of actions and remote command moved to Administration->Audit.

1.6.24.29.Required server performance value is available

The value is a good indicator of performance of ZABBIX and can be used for hardware requirements.

1.6.24.30.Added support of auto-login

Optional one month auto-login is supported on user level.

1.6.24.31.Automatic selection of the first element in drop-downs

The first element of all drop-down controls will be selected by default.

1.6.24.32.Last access time is displayed for users

Last access time is available for users.

1.6.24.33.More flexible Status of Trigger screen

Status of Triggers screen provide information about triggers and corresponding events.

1.6.24.34.Extended host profiles

Extended host profiles can be optionally used.

1.7.Installation and Upgrade Notes

1.7.1.Installation

See the INSTALLATION section for full details.

1.7.2.Version compatibility

Older agents from ZABBIX 1.0, ZABBIX 1.1.x and ZABBIX 1.4.x can be used with ZABBIX 1.6. It does not require any configuration changes on agent side.

1.7.3.Important

User permission schema has been changed. Now ZABBIX Administrators do not have write access to all hosts by default.

ZABBIX 1.6 does not allow empty user passwords. **All empty passwords are replaced by 'zabbix' after database upgrade!** User 'guest' is the only exception.

1.7.4.Upgrade procedure

The following steps have to be performed for successful upgrade from ZABBIX 1.4.x to 1.6.

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

1.7.4.1.Stop ZABBIX server

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

1.7.4.2.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).

1.7.4.3.Backup configuration files, PHP files and ZABBIX binaries

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

1.7.4.4. Install new server binaries

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

1.7.4.5. Review Server configuration parameters

Some parameters of `zabbix_server.conf` were changed in 1.6, new parameters added. You may want to review them.

1.7.4.6. Upgrade database

Database upgrade scripts are located in directory `upgrades/dbpatches/1.6/<db engine>`:

MySQL: `upgrades/dbpatches/1.6/mysql/patch.sql`

Oracle: `upgrades/dbpatches/1.6/oracle/patch.sql`

PostgreSQL: `upgrades/dbpatches/1.6/postgresql/patch.sql`

Note: Database upgrade may take quite significant time, several hours or more. It is recommended to test the upgrade procedure in a non-production 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.

Note: These scripts are for upgrade from ZABBIX 1.4.x to 1.6 only!

1.7.4.7. Install new ZABBIX GUI

Follow Installation Instructions.

1.7.4.8. Start new ZABBIX binaries

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

1.8. 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.

2. Installation

2.1. How to Get ZABBIX

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

2.2. Requirements

2.2.1. Hardware Requirements

2.2.1.1. Memory Requirements

ZABBIX requires both physical and disk memory. 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!

2.2.1.2. CPU Requirements

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

2.2.1.3. Other hardware

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

2.2.1.4. Examples of hardware configuration

The table provides several hardware configurations:

Name	Platform	CPU/Memory	Database	Monitored
------	----------	------------	----------	-----------

				hosts
Small	Ubuntu Linux	PII 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 RAID10	MySQL InnoDB or PostgreSQL	>1000
Very large	RedHat Enterprise	Intel Xeon 2xCPU 8GB Fast RAID10	MySQL InnoDB or PostgreSQL	>10000

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

2.2.2. Supported Platforms

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

ZABBIX is tested on the following platforms:

- AIX
- FreeBSD
- HP-UX
- Linux
- Mac OS/X
- NetBSD
- OpenBSD
- SCO Open Server
- Solaris
- Windows 2000, 2003, XP, Vista (only ZABBIX agent)

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

2.2.3. Software Requirements

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

The following software is required to run ZABBIX:

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 back end database.
Oracle php-sqlora8	9.2.0.4 or later	Required if Oracle is used as ZABBIX back-end database.
PostgreSQL php-pgsql	7.0.2 or later	Required if PostgreSQL is used as ZABBIX back-end 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 back-end 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 Java Script must be enabled. Other browsers may work with ZABBIX as well.

2.2.4.Choice of database engine

ZABBIX Server and Proxy support 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 or Proxy

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

Database engine of choice	Usage
MySQL InnoDB	Heavy duty Node/Standalone Server Heavy duty Proxy
MySQL MyISAM	Light duty Node/Standalone Light duty Proxy
PostgreSQL	Heavy duty Node/Standalone Server Heavy duty Proxy
Oracle	Heavy duty Node/Standalone Server
SQLite	Light duty Proxy

2.2.5.Database size

ZABBIX configuration data requires fixed amount of disk space and does not grow much.

ZABBIX database size mainly depends on these variables, which define amount of stored historical data:

- Number of processed values per second

This is average number of new values ZABBIX server receives every second. For example, if we have 3000 items for monitoring with refresh rate of 60 seconds, number of values per seconds is calculated as $3000/60 = 50$.

It means that 50 new values are added to ZABBIX database every second.

- Housekeeper settings for history

ZABBIX keeps values for a fixed period of time, normally several weeks or months. Each new value required certain amount of disk space for data and index.

So, if we would like to keep 30 days of history and we receive 50 values per second, total number of values will be around $(30*24*3600)*50 = 129.600.000$, or about 130M of values.

Depending on used database engine, type of received values (floats, integers, strings, log files, etc), disk space for keeping a single value may vary from 40 bytes to hundreds of bytes. Normally it is around 50 bytes per value.

In our case, it means that 130M of values will require $130M * 50 \text{ bytes} = 6.5\text{GB}$ of disk space.

- Housekeeper setting for trends

ZABBIX keeps 1 hour max/min/avg/count statistics for each item in table **trends**. The data is used for trending and long period graphs.

ZABBIX database, depending on database type, requires about 128 bytes per each total.

Suppose we would like to keep trend data for 5 years. 3000 values will require $(3000/1800)*(24*3600*365)*128 = 6.3\text{GB}$ per year, or **31.5GB** for 5 years.

- Housekeeper settings for events

Each ZABBIX event requires approximately 130 bytes of disk space. It is hard number of events generated by ZABBIX daily. In worst case scenario, we may assume that ZABBIX generates one event per second.

It means that if we want to keep 3 years of events, this would require $3*365*24*3600*130 = 11\text{GB}$

The table contains formulas that can be used to calculate disk space required for ZABBIX system:

Parameter	Formula for required disk space (in bytes)
ZABBIX configuration	Fixed size. Normally 10MB or less.
History	$\text{days} * (\text{items}/\text{refresh rate}) * 24 * 3600 * \text{bytes}$ items : number of items days : number of days to keep history refresh rate : average refresh rate of items

	bytes : number of bytes required to keep single value, depends on database engine, normally 50 bytes.
Trends	$\text{days} * (\text{items}/1800) * 24 * 3600 * \text{bytes}$ items : number of items days : number of days to keep history bytes : number of bytes required to keep single trend, depends on database engine, normally 128 bytes.
Events	$\text{days} * \text{events} * 24 * 3600 * \text{bytes}$ events : number of event per second. One (1) event per second in worst case scenario. days : number of days to keep history bytes : number of bytes required to keep single trend, depends on database engine, normally 130 bytes.

So, the total required disk space can be calculated as:

Configuration + History + Trends + Events

The disk space will NOT be used immediately after ZABBIX installation. Database size will grow then it will stop growing at some point, which depends on thosekeeper settings.

Note: Disk space requirements for nodes in distributed setup are calculated in a similar way, but this also depends on a total number of child nodes linked to a node.

2.2.6.Time synchronization

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

2.3.Components

2.3.1.ZABBIX Components

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

2.3.2.ZABBIX Server

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

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

2.3.3.ZABBIX Proxy

The Proxy is an optional part of ZABBIX deployment. The Proxy collects performance and availability data on behalf of ZABBIX Server. All collected data is buffered locally and transferred to ZABBIX Server the Proxy belongs to.

ZABBIX Proxy is an ideal solution for a centralized monitoring of remote locations, branches, networks having no local administrators.

ZABBIX Proxies can also be used to distribute load of a single ZABBIX Server. In this case, only Proxies collect data thus making processing on the Server less CPU and disk I/O hungry.

2.3.4.ZABBIX Agent

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

service process), the ZABBIX Server can actively alert the administrators of the particular machine that reported the failure.

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

2.3.5. 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 if SQLite is used.

2.4. Installation from Source

2.4.1. Software requirements

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

The following software is required to compile ZABBIX:

One of the following database engines:

MySQL Headers and Libraries

Version 3.22 or later required.

Oracle Headers and Libraries

Sqlora8 headers and libraries are required.

PostgreSQL Headers and Libraries

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

SQLite Headers and Libraries

Version 3.3.5 or later required.

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

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

Required for SNMP support. Optional.

Iksemel library and header files

Required to enable Jabber messaging. Optional.

Libcurl library and header files

Version 7.13.1 or higher 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.

2.4.2. Structure of ZABBIX distribution

docs

The directory contains this Manual in PDF format

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_get](#)

The directory contains Makefile and sources for zabbix_get.

[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.

[frontends](#)

[frontends/php](#)

The directory contains files of PHP frontend.

[create](#)

The directory contains SQL script for initial database creation.

[create/schema](#)

Database creation schemas.

[create/data](#)

Data for initial database creation.

[upgrades](#)

The directory contains upgrade procedures for different versions of ZABBIX.

2.4.3.ZABBIX Server

Server side

Step 1 Create the ZABBIX superuser account

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

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

Step 2 Untar ZABBIX sources

```
shell> gunzip zabbix-1.6.tar.gz && tar -xvf zabbix-1.6.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, Oracle, PostgreSQL and SQLite.

For MySQL:

```
shell> mysql -u<username> -p<password>
mysql> create database zabbix;
mysql> quit;
shell> cd create/schema
shell> cat mysql.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 Oracle (we assume that user ‘zabbix’ with password ‘password’ exists and has permissions to create database objects):

```
shell> cd create
shell> sqlplus zabbix/password
sqlplus> set def off
sqlplus> @schema/oracle.sql
sqlplus> @data/data.sql
sqlplus> @data/images_oracle.sql
sqlplus> exit
```

For PostgreSQL:

```
shell> psql -U <username>
psql> create database zabbix;
psql> \q
shell> cd create/schema
shell> cat postgresql.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/schema
shell> cat sqlite.sql | sqlite3 /var/lib/sqlite/zabbix.db
shell> cd ../data
shell> cat data.sql | sqlite3 /var/lib/sqlite/zabbix.db
shell> cat images_sqlite3.sql | sqlite3 /var/lib/sqlite/zabbix.db
```

Note: The database will be automatically created if it does not exist.

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 library is required for Oracle support. The library can be found at [libssqlora8 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 Agent  
zabbix-agent 10050/udp Zabbix Agent  
zabbix-trapper 10051/tcp Zabbix Trapper  
zabbix-trapper 10051/udp Zabbix Trapper
```

Step 7 Configure /etc/inetd.conf

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

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

Restart inetd

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

Modify default settings in configuration files

Step 8 Configure /etc/zabbix/zabbix_agent.conf

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

Step 9 Configure /etc/zabbix/zabbix_agentd.conf

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

Step 10 Configure /etc/zabbix/zabbix_server.conf

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

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

**Step
11**

Run server processes

Run zabbix_server on server side.

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

**Step
12**

Run agents

Run zabbix_agentd where necessary.

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

2.4.4.ZABBIX Proxy

ZABBIX Proxy is a special process. It is not required to run the process.

Step 1

Create the ZABBIX superuser account

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

Note: ZABBIX Proxy process (zabbix_proxy) is protected from being run under root account.

Step 2

Untar ZABBIX sources

```
shell> gunzip zabbix-1.6.tar.gz && tar -xvf zabbix-1.6.tar
```

Step 3

Create the ZABBIX database. Optional.

Note: ZABBIX Proxy process will create database automatically on the first run if it does not exist. It will use existing database otherwise.

ZABBIX comes with SQL scripts used to create the required database schema. There are separate scripts for MySQL, Oracle, PostgreSQL and SQLite.

For MySQL:

```
shell> mysql -u<username> -p<password>
mysql> create database zabbix;
mysql> quit;
shell> cd create/schema
shell> cat mysql.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 Oracle (we assume that user ‘zabbix’ with password ‘password’ exists and has permissions to create database objects):

```
shell> cd create/schema
shell> cat oracle.sql | sqlplus zabbix/password >out.log
```

Note: Check file out.log for any error messages.

```
shell> cd ../data
shell> cat data.sql | sqlplus zabbix/password >out.log
shell> cat images_oracle.sql | sqlplus zabbix/password >>out.log
```

For PostgreSQL:

```
shell> psql -U <username>
psql> create database zabbix;
psql> \q
shell> cd create/schema
shell> cat postgresql.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/schema  
shell> cat sqlite.sql | sqlite3 /var/lib/sqlite/zabbix.db  
shell> cd ../data  
shell> cat data.sql | sqlite3 /var/lib/sqlite/zabbix.db  
shell> cat images_sqlite3.sql | sqlite3 /var/lib/sqlite/zabbix.db
```

Note: The database will be automatically created if it does not exist.

Step 4 Configure and compile the source code for your system

The sources must be compiled to enable compilation of ZABBIX Proxy process. To configure the source for the Proxy, you must specify which database will be used.

```
shell> ./configure --enable-proxy --with-mysql --with-net-snmp --with-libcurl # for MySQL + WEB monitoring
```

or

```
shell> ./configure --enable-proxy --with-pgsql --with-net-snmp --with-libcurl # for PostgreSQL + WEB monitoring
```

or

```
shell> ./configure --enable-proxy --with-oracle=/home/zabbix/sqlora8 --with-net-snmp --with-libcurl # for Oracle + WEB monitoring
```

Note: Use flag --with-oracle to specify location of sqlora8 library. The library is required for Oracle support. The library can be found at [libssqlora8 homepage](#)

Note: Use flag --enable-static to statically link libraries. If you plan to distribute compiled binaries among different hosts, 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 proxy binaries, run:

```
shell> ./configure --enable-proxy --enable-agent --with-mysql --with-net-snmp --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_proxy.conf

For small installations (up to ten monitored hosts), default parameters are sufficient. However, you should change default parameters to maximize performance of ZABBIX Proxy.

Make sure you have correct Hostname and Server parameters set.

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

Step 9 Run Proxy processes

Run zabbix_proxy:

```
shell> cd sbin  
shell> ./zabbix_proxy
```

2.4.5.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-1.6.tar.gz && tar xvf zabbix-1.6.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 hosts, 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 inetc
```

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

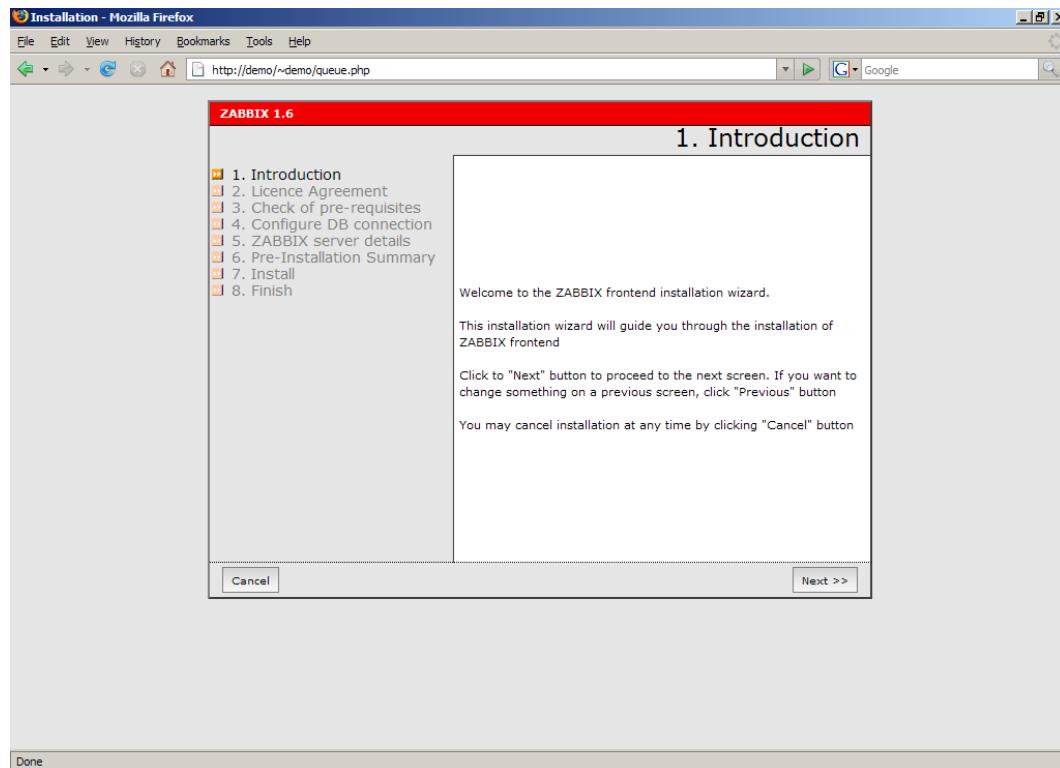
```
shell> /opt/zabbix/bin/zabbix_agentd
```

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

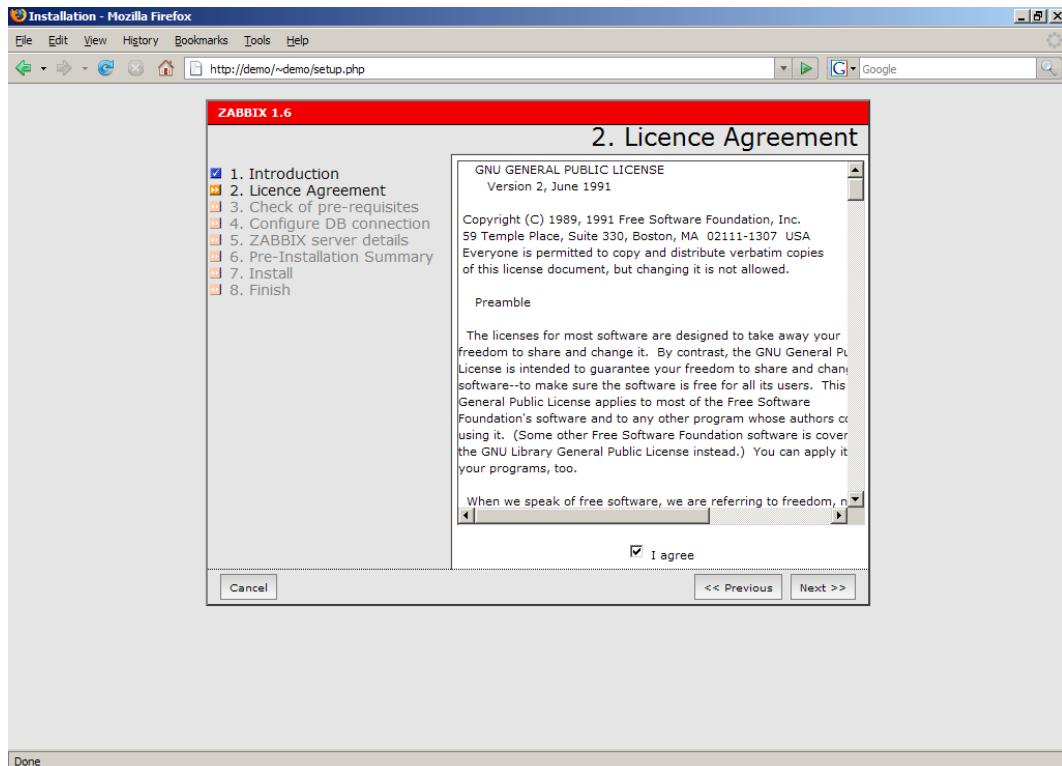
Note: Make sure that your system allows allocation of 2MB of shared memory, otherwise the agent may not start and you will see "Can't allocate shared memory for collector." in agent's log file. This may happen on Solaris 8.

2.4.6.ZABBIX WEB Interface

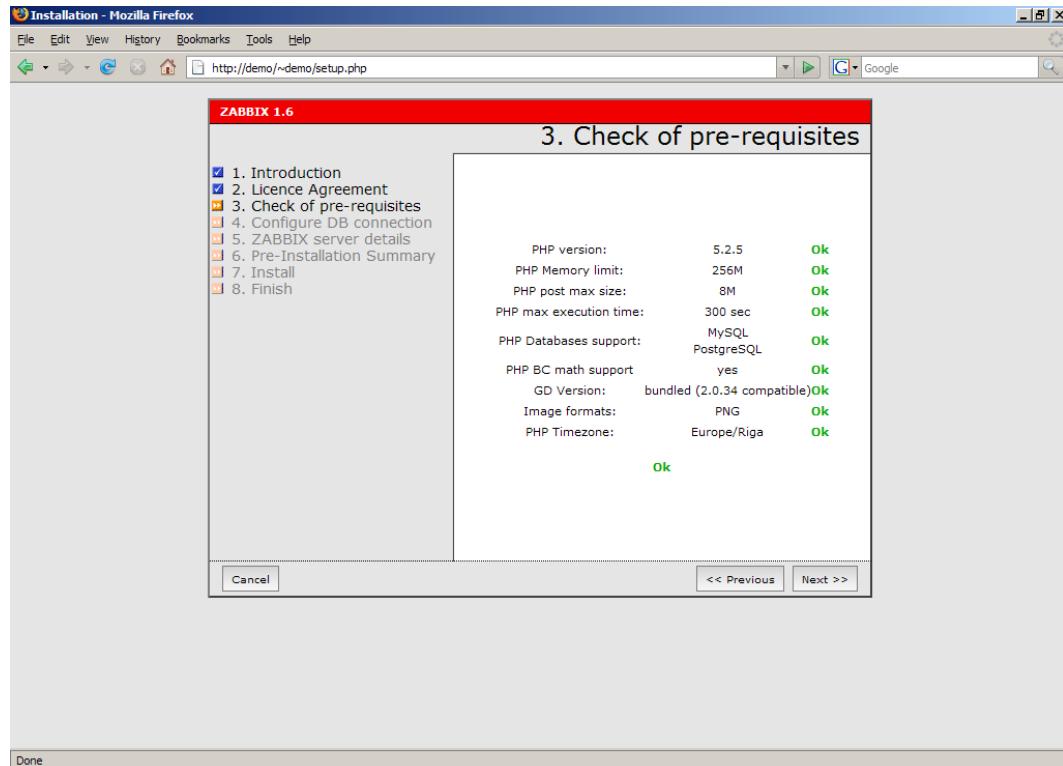
Step 1 Point your browser to ZABBIX URL.



Step 2 Read and accept GPL v2.

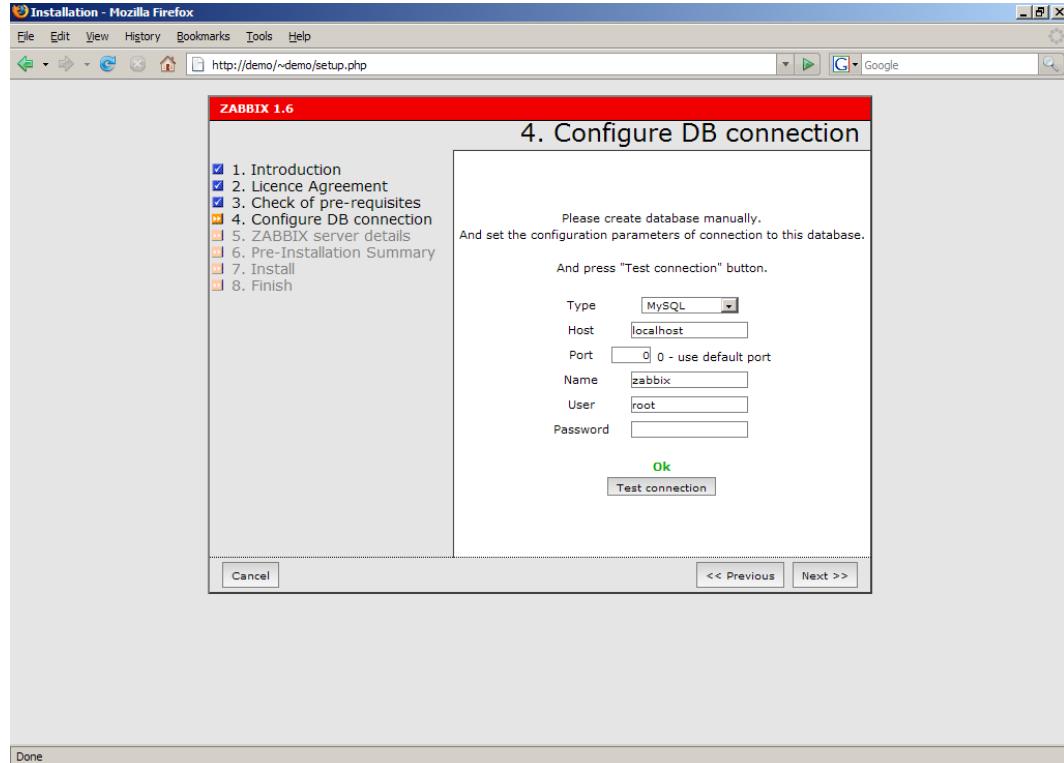


Step 3 Make sure that all software pre-requisites are met.



Pre-requisite	Minimum value	Description
PHP version	4.3.0	
PHP Memory limit	8MB	In php.ini: memory_limit = 128M
PHP post max size	8MB	In php.ini: post_max_size = 8M
PHP max execution time	300 seconds	In php.ini: max_execution_time = 300
PHP database support	One of: MySQL, Oracle, PostgreSQL, SQLite	One of the following modules must be installed: php-mysql, php-sqlora8, php-pgsql, php-sqlite3
PHP BC math	Any	Compiled in PHP5.
GD Version	2.0 or higher	Module php-gd.
Image formats	At least PNG	Module php-gd.

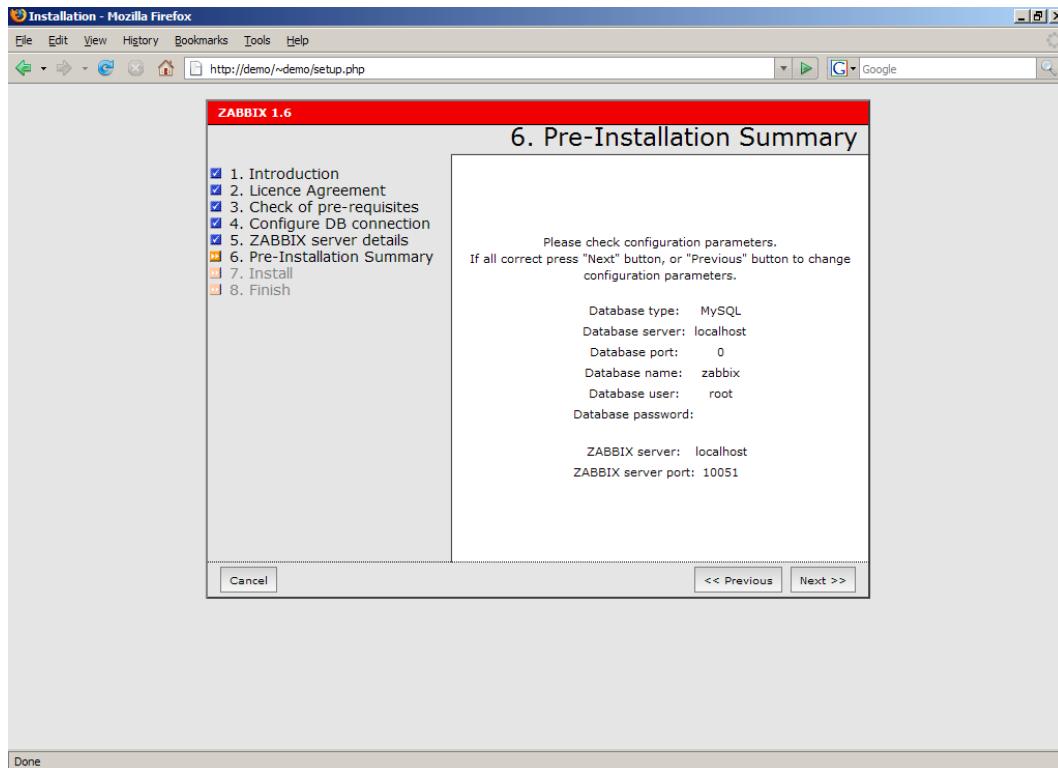
Step 4 Configure database settings. ZABBIX database must already be created.



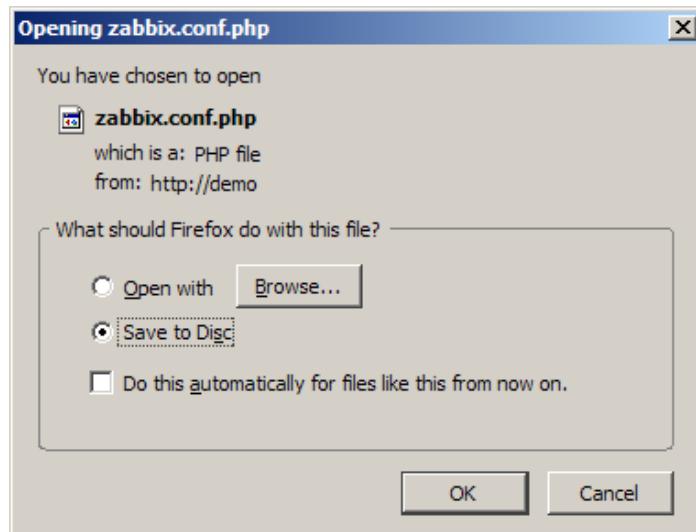
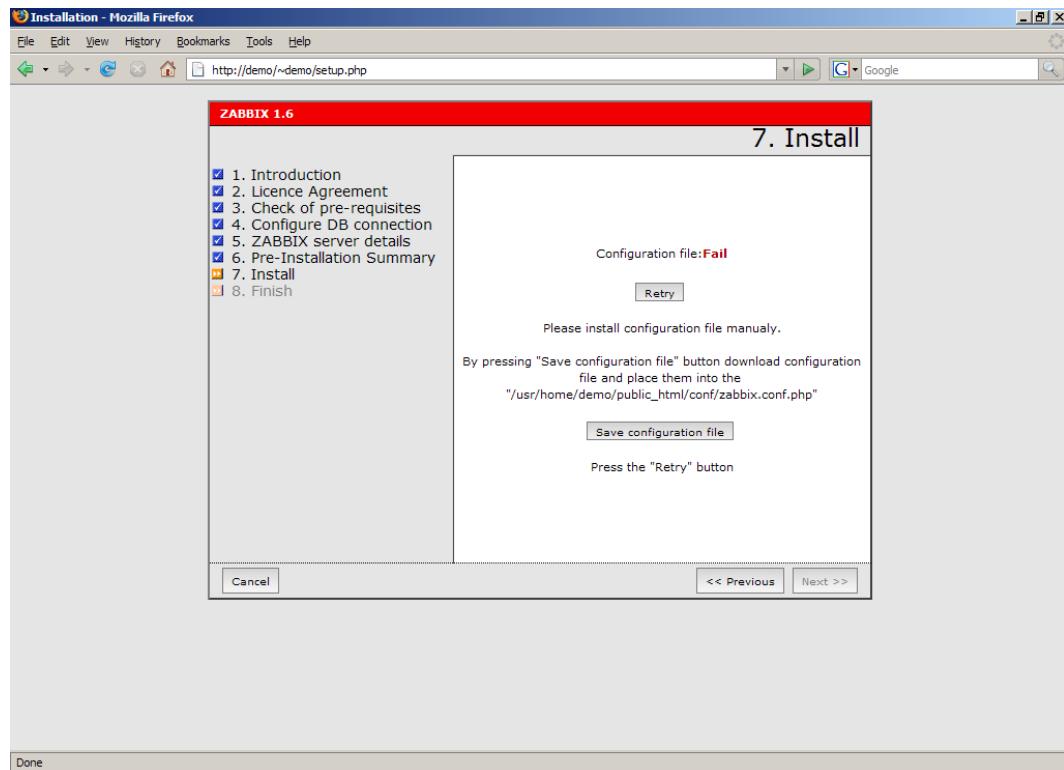
Step 5 Enter ZABBIX Server details.

The screenshot shows a Mozilla Firefox browser window with the title bar "Installation - Mozilla Firefox". The address bar shows the URL "http://demo/~demo/setup.php". The main content area is titled "5. ZABBIX server details". On the left, there is a vertical list of steps: 1. Introduction, 2. Licence Agreement, 3. Check of pre-requisites, 4. Configure DB connection, 5. ZABBIX server details (which is highlighted in orange), 6. Pre-Installation Summary, 7. Install, and 8. Finish. Below this list, a message says "Please enter host name or host IP address and port number of ZABBIX server". There are two input fields: "Host" containing "localhost" and "Port" containing "10051". At the bottom, there are buttons for "Cancel", "<< Previous", "Next >>", and "Done".

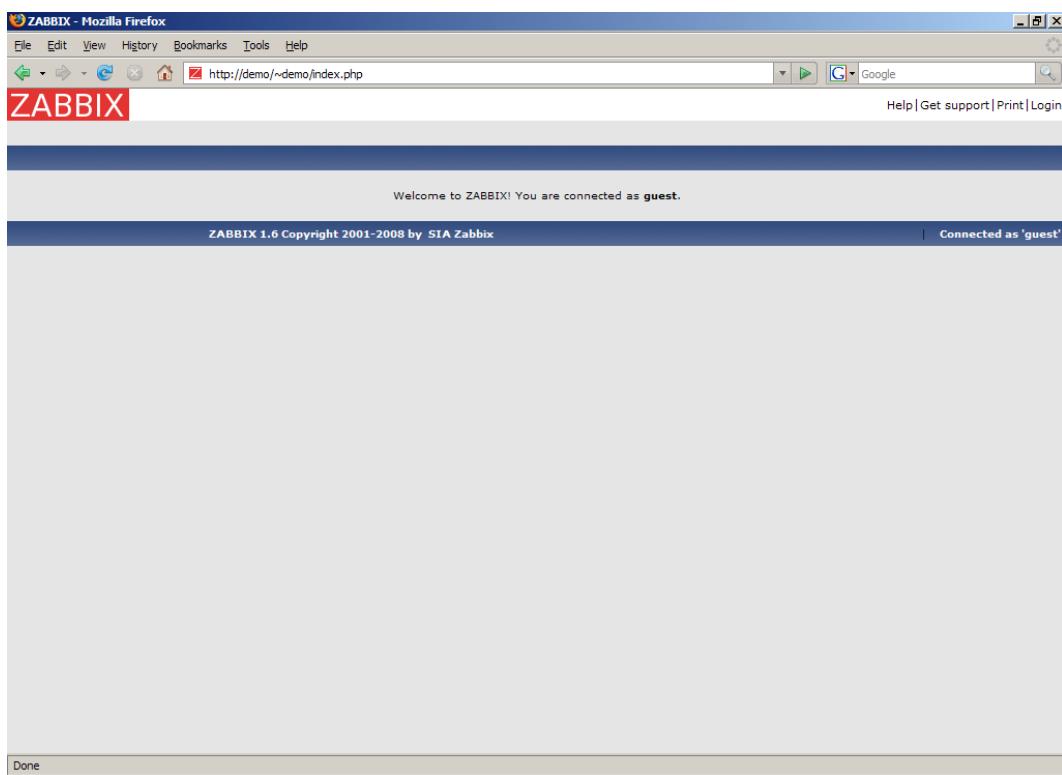
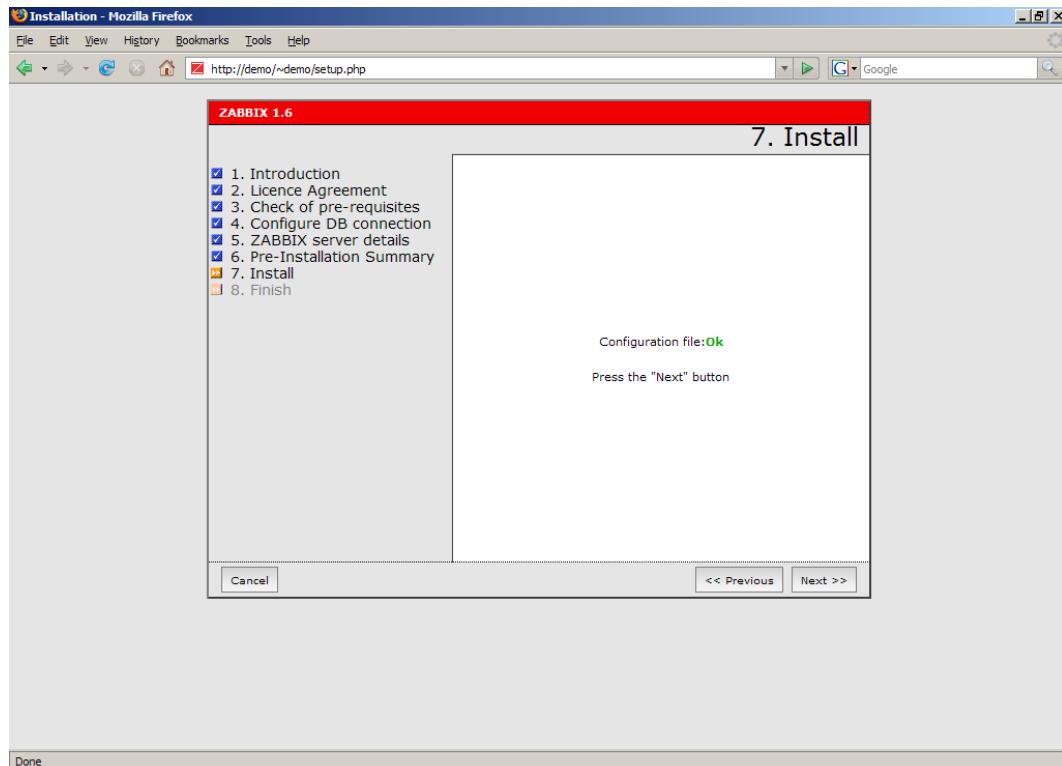
Step 6 See summary of settings.



Step 7 Download configuration file and place it under conf/.



Step 8 Finishing installation.



Step 9 For distributed monitoring only!

If used in a distributed environment you have to run:

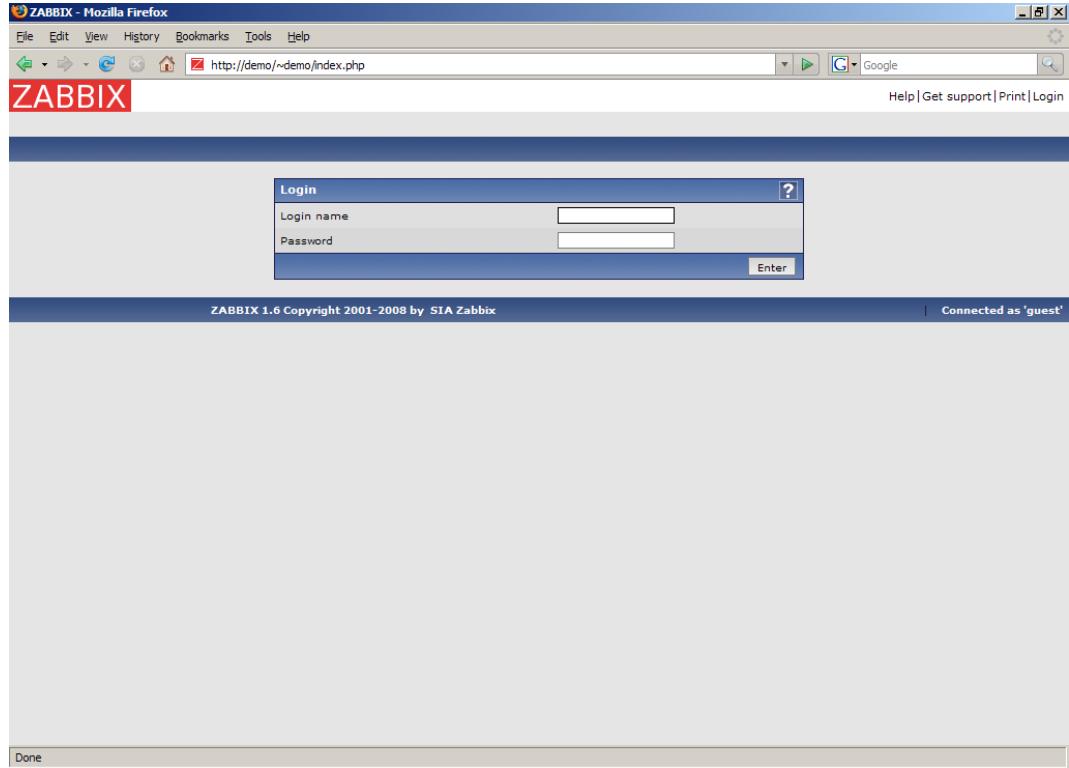
```
shell> ./zabbix_server -n <nodeid>
```

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

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

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

Step 10 ZABBIX frontend is ready! Default user name is '**Admin**', password '**zabbix**'.



2.5.Upgrading

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

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

Database upgrade is usually required for upgrade from one major stable release to another. For example, from 1.4.x to 1.6.x.

For production installations a database backup is required!

2.5.1.Database upgrade

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

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

or

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

Do not forget to upgrade PHP front-end files.

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

3.ZABBIX Processes

3.1.ZABBIX Server

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

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

ZABBIX Server runs as a daemon process.

ZABBIX Server accepts the following command line parameters:

-c --config <file>	specify configuration file, default is <code>/etc/zabbix/zabbix_server.conf</code>
-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 ‘zabbix’.

Parameter	Mandatory	Default value	Description
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.
HousekeepingFrequency	No	1	The parameter defines how often the daemon must perform housekeeping procedure (in hours). If PostgreSQL is used set the value to 24 as it will perform command VACUUM.
Include	No	-	Use this parameter to include a file into the configuration file. Number of parameters Include is not limited. For example: <code>Include=/etc/zabbix/db_conn.conf</code>
ListenIP	No	-	Interface to listen by trapper processes. Trapper will listen

Parameter	Mandatory	Default value	Description
			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 rotates 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.
NodeNoEvents	No	0	If set to '1' local events won't be sent to master node.
NodeNoHistory	No	0	If set to '1' local history won't be sent to master node.
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)
SourceIP	No	-	Set source IP address for all connections established by the process.
StartDBSyncers	No	0	Enable database cache: 0 – Disabled 1 – Enabled
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-

Parameter	Mandatory	Default value	Description
			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 (1-30) Note: Example of the configuration file can be 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 often try to connect to unavailable host
UnreachableDelay	No	15	How often try to connect to unreachable host
UnreachablePeriod	No	45	If a host was unreachable for more than UnreachablePeriod seconds, change host status to Unavailable

3.2.ZABBIX Proxy

ZABBIX Proxy is a process which collects performance and availability data from one or more monitored devices and sends the information to a ZABBIX Server. ZABBIX Proxy can be started by:

```
shell> cd sbin
shell> ./zabbix_proxy
```

ZABBIX Proxy runs as a daemon process.

ZABBIX Proxy accepts the following command line parameters:

-c --config <file> specify configuration file, default is

/etc/zabbix/zabbix_proxy.conf
-h --help give this help
-v --version display version number

In order to get this help run:

```
shell> zabbix_proxy -h
```

Example of command line parameters:

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

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

Parameter	Mandatory	Default value	Description
ConfigFrequency	No	3600 (1 hour)	How often proxy refreshes configuration data in seconds.
DataSenderFrequency	No	10	Proxy will send collected data every N seconds. Possible values 1-3600 seconds.
DBHost	Yes	-	Database name. Usually ‘zabbix’.
DBName	Yes	-	Database name. Usually ‘zabbix’.
DBSocket	No	-	DB socket name. Used for non-TCP connection to MySQL database. Example: /tmp/mysql.sock
DebugLevel	No	3	Debug level, one of 0 – none 1 – critical 2 – errors 3 – warnings 4 – debug

Parameter	Mandatory	Default value	Description
FpingLocation	No	/usr/sbin/fping	Location of ICMP pinger. It must have setuid flag set.
Fping6Location	No	/usr/sbin/fping6	Location of ICMP pinger for TCP6. It must have setuid flag set.
Hostname	Yes	-	Unique proxy name. The name is used to identify proxy on server side.
HeartbeatFrequency	No	60	Frequency of heartbeat messages in seconds. If set to 0, heartbeat messages will be disabled.
HousekeepingFrequency	No	1	The parameter defines how often the daemon must perform housekeeping procedure (in hours). If PostgreSQL is used set the value to 24 as it will perform command VACUUM.
ListenIP	No	-	Interface to listen by trapper processes. Trapper will listen to all interfaces if this parameter is not set.
ListenPort	No	10051	Port number to listen by trapper processes.
LogFile	No	-	Name of log file. If not set, syslog is used.
LogFileSize	No	1	This parameter controls log rotation setting for LogFile . By default, ZABBIX automatically rotates 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_server.pid	Name of file to store PID
ProxyLocalBuffer	No	0	Proxy will keep data locally for N hours. This parameter may be used if local data is used by third party applications.
ProxyOfflineBuff	No	1	Proxy will keep data N hours

Parameter	Mandatory	Default value	Description
er			in case if no connectivity with ZABBIX Server. Older data will be lost.
Server	Yes	30	DNS name or IP address of ZABBIX server thr proxy will report to.
ServerPort	No	10051	The Proxy will connect to this server port.
SourceIP	No	-	Set source IP address for all connections established by the process.
StartDBSyncers	No	0	Enable database cache: 0 – Disabled 1 – Enabled
StartDiscoverers	No	1	Number of discoverers to start (0-255).
StartHTTPPollers	No	5	Number of HTTP pollers to start (0-255).
StartPingers	No	1	Number of ICMP pingers 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)
PingerFrequency	No	30	ZABBIX server ping servers once per PingerFrequency seconds (1-3600).
Timeout	No	5	Do not spend more than Timeout seconds on retrieving requested value (1-255)
TrapperTimeout	No	5	Do not spend more than Timeout seconds on processing of traps (1-255)
UnavailableDelay	No	60	How often try to connect to unavailable host
UnreachableDelay	No	15	How often try to connect to unreachable host

Parameter	Mandatory	Default value	Description
UnreachablePeriod	No	45	If a host was unreachable for more than UnreachablePeriod seconds, change host status to Unavailable

3.3.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 <code>/etc/zabbix/zabbix_agentd.conf</code>
-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
BufferSend	No	5	Do not keep data longer than N seconds in buffer. Number of seconds, 1-3600.
BufferSize	No	100	Maximum number of values in a buffer. The agent will send all collected data to ZABBIX Server or Proxy if the buffer is full.
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 if set to '1'.
DisablePassive	No	0	Disable processing of passive checks. The agent will not listen TCP port. Set this parameter to '1' if you use active checks only.
EnableRemoteCommands	No	0	Enable remote commands. ZABBIX server will be able to send commands for execution by the agent.
Hostname	No	System hostname.	Unique host name. The hostname is used for active checks only. If missing, system hostname (system.hostname) is used.
Include	No	-	Use this parameter to include

Parameter	Mandatory	Default value	Description
			a file into the configuration file. Number of parameters Include is not limited. For example: 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 rotates 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_agente.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 or Proxies. Connections from other IP addresses will be rejected.
ServerPort	No	10051	The agent will connect to this server port for processing active checks. This can be port of ZABBIX Server or a Proxy.
SourceIP	No	-	Set source IP address all connections established by the process.
StartAgents	No	5	Number of agents to start.
Timeout	No	3	Do not spend more than Timeout seconds on getting requested value (1-255). The

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

3.4.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 or Proxies. Connections from other IP addresses will be rejected.
Timeout	No	3	Do not spend more than Timeout seconds on getting requested value (1-255). The agent does not kill timeouted User Parameters processes!
UserParameter	No	-	User-defined parameter to monitor. There can be several user-defined parameters. Example:UserParameter=users,who wc -l

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

3.5.ZABBIX Agent (Windows)

Zabbix_agentd is ZABBIX agent for Win32/64 systems. It will work on Windows NT 4.0, Windows 2000, Windows XP, and Windows Vista.

3.5.1.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.

`zabbix_agentd.exe --install`

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

`zabbix_agentd.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:

`zabbix_agentd.exe --start`

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

3.5.2. Usage

Command line syntax:

```
zabbix_agentd.exe [-Vhp] [-idsx] [-c <file>] [-t <metric>]
```

ZABBIX Windows Agent accepts the following command line parameters:

Options:

- | | |
|--------------------|--|
| -c --config <file> | Specify alternate configuration file (default is c:\zabbix_agentd.conf). |
| -h --help | Display help information. |
| -V --version | Display version number. |
| -p --print | Print list of supported checks (metrics) and exit. |
| -t --test <metric> | Test single check (metric) and exit. |

Functions:

- | | |
|----------------|------------------------------------|
| -i --install | Install ZABBIX agent as a service. |
| -d --uninstall | Uninstall ZABBIX agent service. |
| -s --start | Start ZABBIX agent service. |
| -x --stop | Stop ZABBIX agent service. |

The configuration file (c:/zabbix_agentd.conf) contains configuration parameters for Zabbix_agentd.exe. 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	Mandatory	Default value	Description
			<p>parameter "perf_counter[\Paging File(_Total)\% Usage]", or you may define an alias by adding the following line to configuration file: Alias = pg_usage:perf_counter[\Paging File(_Total)\% Usage] After that you can use parameter 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.</p>
DebugLevel	No	3	<p>Debug level, one of</p> <ul style="list-style-type: none"> 0 – none 1 – critical 2 – errors 3 – warnings 4 – debug
Include	No	-	<p>Use this parameter to include a file into the configuration file. Number of parameters Include is not limited.</p> <p>For example:</p> <pre>Include=c:\user_parameters.conf</pre>
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

Parameter	Mandatory	Default value	Description
			value, warning message will be written to the log file.
NoTimeWait	No	-	The parameter has no effect.
PerfCounter	No	-	<p><parameter_name>,"<perf_counter_path>",<period> Defines new parameter <parameter_name> which is an average value for system performance counter <perf_counter_path> for the specified time period <period> (in seconds).</p> <p>For example, if you wish to receive average number of processor interrupts per second for last minute, you can define new parameter "interrupts" as following:</p> <pre>PerfCounter = interrupts,"\\Processor(0)\\Interrupts/sec",60</pre> <p>Please note double quotes around performance counter path. Samples for calculating average value will be taken every second.</p> <p>You may run typeperf -qx to get list of all performance counters available in Windows.</p>
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.
SourceIP	No	-	Set source IP address all connections established by the process.
StartAgents	No	-	The parameter has no effect.

Parameter	Mandatory	Default value	Description
UserParameter	No	-	User-defined parameter to monitor. There can be several user-defined parameters. Value has form <key>,<shell command>. Do not use spaces around pipe (' ') characters! Example:UserParameter=test,echo 1

3.6.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 -s LinuxDB3 -k db.connections -o 43
```

ZABBIX Sender accepts the following command line parameters:

- z --zabbix-server Hostname or IP address of ZABBIX Server.
<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. Host IP address and DNS name will not work.
- l --source-address <ip address> Specify source IP address
- 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
```

3.7.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.
- I --source-address <ip address> Specify source IP address
- k --key <key of metric> Specify metric name (key) we want to retrieve.
- h --help Give this help.
- v --version Display version number.

In order to get this help run:

```
shell> zabbix_get -h
```

4.Configuration

4.1.Development Environment

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

Four servers are used for test purposes:

- 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
- Ubuntu 6.10, Intel Core2 6400 2.13 GHz, 2GB, SATA

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

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

4.2.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
Name	Unique action name.
Event Source	Source of event. Currently two sources are supported: Triggers – events generated by trigger status changes Discovery – events generated by auto-discovery module
Enable escalations	Enable escalations. If enable, the action will be escalated according to operation steps defined for

Parameter	Description
	operations.
Period (seconds)	Time period for increase of escalation step.
Event Source	Event source: Triggers – action will be executed for events generated by triggers Discovery – action will be executed for discovery events
Default subject	Default notification subject. The subject may contain macros.
Default message	Default notification message. The message may contain macros.
Recovery message	If enabled, ZABBIX will send a recovery message after an original problem is resolved. The messages will be sent to those who received any message for this problem before.
Recovery subject	Subject of the recovery message. It may contain macros.
Recovery message	Recovery message. It may contain macros.
Status	Action status: Enabled – action is active Disabled – action is disabled

4.2.1. 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
Application	=, like, not like	= - event came from Trigger, which is part of the Application like - event came from Trigger, which is part of the Application containing the String not like - event came from Trigger, which is part of the Application not containing the String

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 template	=, <>	Compare against Host Template the trigger belongs to. = - event came from a trigger inherited from this Host Template <> - event did not come from a trigger inherited from this Host Template
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 description (name)	like, not like	Compare against Trigger Name which generated event. like – String can be found in Trigger Name. Case sensitive. not like – String cannot be found in Trigger Name. Case sensitive.
Trigger severity	=, <>, >=, <=	Compare with 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 with Trigger Value. = - equal to trigger value (OK or PROBLEM)
Time period in	in	Event is within time period. in – event time matches the time period Time period is given in format:

Condition type	Supported operators	Description
		<code>dd-dd, hh:mm-hh:mm; dd-dd, hh:mm:hh:mm; ...</code>

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
Service type	=, <>	Check if 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.

Condition type	Supported operators	Description
		<p>>= - uptime/downtime is more or equal <= - uptime/downtime is less or equal Parameter is given in seconds.</p>
Received value	= <> >= <= like not like	<p>Compare with value received from an agent (ZABBIX, SNMP). String comparison.</p> <p>= - 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.</p>

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

Host group = Oracle servers
Host group = MySQL servers
Trigger name like 'Database is down'
Trigger name like 'Database is unavailable'

is evaluated as

(Host group = Oracle servers **or**
Host group = MySQL servers) **and**
(Trigger name like 'Database is down' **or**
Trigger name like 'Database is unavailable')

4.2.2. Operations

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

ZABBIX supports the following operations:

- Send message
- Remote command(s), including IPMI.

Additional operations available for discovery events:

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

Parameter	Description
Step	If escalation is enabled for this action, escalation settings: From – execute for each step starting from this one To – till this (0, for all steps starting from From) Period – increase step number after this period, 0 – use default period.
Operation type	Type of action: Send message – send message to user Execute command – execute remote command
Event Source	
Send message to	Send message to: Single user – a single user User group – to all member of a group
Default message	If selected, default message will be used.
Subject	Subject of the message. The subject may contain macros.
Message	The message itself. The message may contain macros.
Remote command	List of remote commands.

4.2.3. Macros for messages and remote commands

The macros can be used for more efficient reporting.

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'

Example 3

Message:

Latest value:

`{{HOSTNAME}:{TRIGGER.KEY}.last(0)}`

MAX for 15 minutes:

`{{HOSTNAME}:{TRIGGER.KEY}.max(900)}`

MIN for 15 minutes:

`{{HOSTNAME}:{TRIGGER.KEY}.min(900)}`

The message will be replaced by something like:

Latest value: 1.45

MAX for 15 minutes: 2.33

MIN for 15 minutes: 1.01

4.3.Macros

ZABBIX supports number of macros which may be used in various situations. Effective use of macros allows to save time and make ZABBIX configuration more transparent.

4.3.1.List of supported macros

The table contains complete list of macros supported by ZABBIX.

MACRO	Notifications and commands	GUI Scripts	Item key's parameters	Trigger expressions	Trigger names	DESCRIPTION
{DATE}	X					Current date in yyyy.mm.dd. format.
{ESC.HISTORY}	X					Escalation history. Log of previously sent messages.
{EVENT.AGE}	X					Age of the event. Useful in escalated messages.
{EVENT.DATE}	X					Date of the event.
{EVENT.ID}	X					Numeric event ID which triggered this action.
{EVENT.TIME}	X					Time of the event.
{HOSTNAME}	X	X	X	X		Host name of first item of the trigger which caused a notification.
{HOST.CONN}		X	X			IP and host DNS name depending on host settings.
{HOST.DNS}		X	X			Host DNS name.
{IPADDRESS}	X	X	X			IP address of first item of the trigger which caused a notification.
{ITEM.LASTVALUE}	X			X		The latest value of first item of the trigger expression which caused a notification. Supported from ZABBIX 1.4.3. It is alias to {{HOSTNAME}:{TRIGGER.KEY}.last(0)}
{ITEM.NAME}	X					Name of first item of the trigger which caused a notification.
{ITEM.VALUE}				X		The latest value of Nth item of the trigger expression if used for displaying triggers.
{ITEM.VALUE1}						
...						
{ITEM.VALUE9}						Historical (when event happened) value of Nth item of the trigger expression if used for displaying events.
						Supported from ZABBIX 1.4.3.
{PROFILE.CONTACT}	X					Contact from host profile.
{PROFILE.DEVICETYPE}	X					Device type from of host profile.
{PROFILE.HARDWARE}	X					Hardware from host profile.
{PROFILE.NAME}	X					Name from host profile.
{PROFILE.LOCATION}	X					Location from host profile.

{PROFILE.MACADDRESS}	X	Mac Address from host profile.
{PROFILE.NOTES}	X	Notes from host profile.
{PROFILE.OS}	X	OS from host profile.
{PROFILE.SERIALNO}	X	Serial No from host profile.
{PROFILE.SOFTWARE}	X	Software from host profile.
{PROFILE.TAG}	X	Tag from host profile.
{STATUS}	X	Alias for {TRIGGER.STATUS}.
{TIME}	X	Current time in hh:mm:ss.
{TRIGGER.COMMENT}	X	Trigger comment.
{TRIGGER.ID}	X	Numeric trigger ID which triggered this action.
{TRIGGER.KEY}	X	Key of first item of the trigger which caused a notification.
{TRIGGER.NAME}	X	Name (description) of the trigger.
{TRIGGER.SEVERITY}	X	Trigger severity. For example, 'Disaster'.
{TRIGGER.STATUS}	X	Trigger state. ON - if trigger is in TRUE state, OFF - if trigger is in FALSE state.
{TRIGGER.URL}	X	Trigger URL.
{TRIGGER.VALUE}	X	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)}	X	Simple macros as used in trigger expressions.

4.4. Applications

Application is a set 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.

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

4.5. Graphs

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

4.6.Medias

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

4.6.1.EMAIL

Email notification

4.6.2.JABBER

Notifications using Jabber messaging.

4.6.3.SCRIPT

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

4.6.4.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

ZABBIX does not set speed of the serial link. It uses default settings.

- The serial device has read/write access for user **zabbix**.

Run commans **ls -l /dev/ttyS0** to see current permission of the serial device.

- GSM Modem has PIN entered and it preserves it after power reset. Alternatively you may disable PIN on the SIM card.

PIN can be entered by issuing command AT+CPIN=“NNNN” (NNNN is your PIN number, the quotes must present) in a terminal software, such as Unix **minicom** or Windows **HyperTerminal**.

ZABBIX has been tested with the following GSM modems:

- Siemens MC35
- Teltonika ModemCOM/G10

4.7.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. Items, triggers and graphs of the template will be automatically added to the linked hosts. Change definition of a template item (trigger, graph) and the change will be automatically applied to the hosts.

Host template attributes:

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

4.8.Host groups

Host group may have zero, one or more hosts.

Host group attributes:

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

4.9.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 router is down, ZABBIX will not execute actions for trigger “The host is down”.

4.10.Items

Item is a single performance or availability check.

4.10.1.Item key

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.

Allowed characters

The following characters are allowed:

0-9a-zA-Z_,:-\$<space>

Note: Use of the ‘,’ and ‘:’ is not recommended and can be dropped in future releases. Support of Novell parameters will be maintained.

4.10.2. 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	Mac OS/X
agent.ping		X	X	X	X	X	X	X	X	X
agent.version		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	X	-	-	-	-
mode	bytes	-	X	X	X	X	-	-	-	-
	packets	-	X	X	X	X	-	-	-	-
	errors	-	X	X	X	X	-	-	-	-
	dropped	-	X	X	X	-	-	-	-	-
net.if.out[<if><,mode>]		-	X	X	X	X	-	-	-	-
mode	bytes	-	X	X	X	X	-	-	-	-
	packets	-	X	X	X	X	-	-	-	-
	errors	-	X	X	X	X	-	-	-	-
	dropped	-	X	X	-	-	-	-	-	-

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Mac 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	X
net.tcp.service.perf[service<,ip><,port>]	-	X	X	X	X	X	X	X	-	
net.tcp.service[service<,ip><,port>]	-	X	X	X	X	X	X	X	-	
proc.mem[<name><,user><,mode><,cmdline>]	-	X	X	X	X	-	X	X	-	
mode	sum	-	X	X	X	X	-	X	X	-
	avg	-	X	X	X	X	-	X	X	-
	max	-	X	X	X	X	-	X	X	-
	min	-	X	X	X	X	-	X	X	-
proc.num[<name><,user><,state><,cmdline>]	-	X	X	X	X	-	X	X	-	
state	all	-	X	X	X	X	-	X	X	-
	sleep	-	X	X	X	X	-	X	X	-
	zomb	-	X	X	X	X	-	X	X	-
	run	-	X	X	X	X	-	X	X	-
system.boottime		-	X	X	X	-	-	-	-	-
system.cpu.intr		-	X	X	X	X	-	-	-	-
system.cpu.load[<cpu> <,mode>]		X	X	X	X	X	X	-	-	-
mode	avg1	-	X	X	X	X	-	-	-	-
	avg5	-	X	X	X	X	-	-	-	-
	avg15	-	X	X	X	X	-	-	-	-

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Mac OS/X
system.cpu.num		X	X	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	-	-	-
	interrupt	-	-	-	X	-	-	-	-	-
mode	avg1	-	X	X	X	-	X	-	-	-
	avg5	-	X	X	X	-	X	-	-	-
	avg15	-	X	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	X	X	X
system.swap.in[<swap><,type>]		-	-	X	-	X	-	-	-	-
type	count	-	-	-	-	X	-	-	-	-
	pages	-	-	-	-	X	-	-	-	-
system.swap.out[<swap><,type>]		-	-	X	-	X	-	-	-	-

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Mac OS/X
type	count	-	-	-	-	X	-	-	-	-
	pages	-	-	-	-	X	-	-	-	-
<code>system.swap.size[<swap><,type>]</code>		X	X	X	X	X	-	-	X	-
mode	free	-	X	X	X	X	-	-	X	-
	total	-	X	X	X	X	-	-	X	-
<code>system.uname</code>		X	X	X	X	X	X	X	X	-
<code>system.uptime</code>		X	X	X	X	X	-	-	-	-
<code>system.users.num</code>		-	X	X	X	X	X	X	X	-
<code>vfs.dev.read[device<,type><,mode>]</code>		-	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	-	-	-	-	-
<code>vfs.dev.write[device<,type><,mode>]</code>		-	X	X	X	X	-	-	-	-

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Mac OS/X
type	sectors	-	X	X	-	-	-	-	-	-
	operations	-	X	X	-	X	-	-	-	-
	bytes	-	-	-	-	X	-	-	-	-
	ops	-	-	-	X	-	-	-	-	-
	bps	-	-	-	X	-	-	-	-	-
mode	avg1	-	-	-	X	-	-	-	-	-
	avg5	-	-	-	X	-	-	-	-	-
	avg15	-	-	-	X	-	-	-	-	-
vfs.file_cksum[file]		X	X	X	X	X	X	X	X	-
vfs.file_exists[file]		X	X	X	X	X	X	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	X	-
vfs.file_regmatch[file, user]		-	X	X	X	X	X	X	X	-
vfs.file_size[file]		X	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	-

Parameter system		Windows	Linux 2.4	Linux 2.6	FreeBSD	Solaris	HP-UX	AIX	Tru64	Mac OS/X
mode	total	-	X	X	X	X	X	X	X	-
	free	-	X	X	X	X	X	X	X	-
	used	-	X	X	X	X	X	X	X	-
	pfree	-	X	X	X	X	X	X	X	-
	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	-
	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[<mode>]		X	X	X	X	X	X	X	-	-
mode	total	-	X	X	X	X	X	X	X	-
	free	-	X	X	X	X	X	X	X	-
	shared	-	X	X	X	-	X	X	-	-
	buffers	-	X	X	X	-	X	X	-	-
	cached	-	X	X	X	-	X	X	-	-

4.10.3.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 availability.	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 files 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 – regular 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	

Key	Description	Return value	Parameters	Comments
net.if.out[if <,mode>]	Network interface outgoing statistic.	Integer.	if - interface mode – bytes number of bytes (default) packets number of packets errors number of errors dropped number of dropped packets	Examples: net.if.out[eth0,errors] net.if.out[eth0] You may use this key with Delta (speed per second) in order to get bytes per second statistics.
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 (ignored) 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	service - one of ssh, service.ntp, ldap, smtp, ftp, http, pop, nntp, imap, tcp ip - IP address	Example: net.tcp.service.perf[ssh] can be used to test speed of initial response from SSH

Key	Description	Return value	Parameters	Comments
		connecting to the service	(default is 127.0.0.1) port - port number (by default standard service port number is used)	server. Old naming: check_service[*]
proc.mem[<name> <,user> <,mode><,cmdline>]	Memory used by process name running under user user	Memory used by process.	name - process name user - user name (default is all users) mode - one of avg, max, min, sum (default) cmdline - filter by command line	Example: proc.mem[,root] - 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.

Key	Description	Return value	Parameters	Comments
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: <code>system.cpu.load[]</code> Note that returned value is not percentage. Old naming: <code>system.cpu.loadX</code>
system.cpu.num	Number of CPUs.	Number of available processors.		Example: <code>system.cpu.num</code>
system.cpu.switches	Context switches.	Switches count.		Old naming: <code>system[switches]</code>
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: <code>system.cpu.idleX</code> , <code>system.cpu.niceX</code> , <code>system.cpu.systemX</code> , <code>system.cpu.userX</code> Example: <code>system.cpu.util[0,user ,avg5]</code>
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: <code>system.run[ls -l /]</code> - detailed file list of root directory. Note: To enable this functionality, agent configuration file must have EnableRemoteComms=1 option.
system.hostname	Return host name.	String value		Example of returned value <code>www.zabbix.com</code>

Key	Description	Return value	Parameters	Comments
system.locltime	System local time.	Time in seconds.		
system.swap.in[<device> <,type>]	Swap in.	Swap statistics	device - swap device (default is all), type - one of count (default, number of swapins), pages (pages swapped in)	Example: system.swap.in[,bytes] Old naming: swap[in]
system.swap.out[<device> <,type>]	Swap in.	Swap statistics	device - swap device (default is all), type - one of count (default, number of swapouts), pages (pages swapped out)	Example: system.swap.out[,pages] Old naming: swap[out]
system.swap.size[<device> <,mode>]	Swap space.	Number of bytes or percentage	device - swap device (default is all), type - one of free (default, free swap space), total (total swap space), pfree (free 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: <i>FreeBSD localhost 4.4-RELEASE FreeBSD 4.4-RELEASE #0: Tue Sep 18 11:57:08 PDT 2001 murray@builder.FreeBSD.org: /usr/src/sys/compile/GENERIC i386</i>
system.uptime	System's uptime in seconds.	Number of seconds		Use Units s or uptime to get readable values.
system.users.num	Number of users connected.	Number of users		Command who is used on agent side.
vfs.dev.read[device <,type>]	Disk read statistics.	Numeric value	device - disk device (default is all), type - one of sectors (default), operations	Example: vfs.dev.read[,operations]

Key	Description	Return value	Parameters	Comments
				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: 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: b5052decb577e0ffd622d6ddc017e82 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,	Example: vfs.fs.inode[/,pfree] Old naming:

Key	Description	Return value	Parameters	Comments
			percentage), pused (used, percentage)	vfs.fs.inode.free[*], vfs.fs.inode.pfree[*], vfs.fs.inode.total[*]
vfs.fs.size[fs <mode>]	Disk space	Disk space in KB	fs - filesystem, mode - one of total (default), free, used, pfree (free, percentage), pused (used, percentage)	In case of a mounted volume, disk space for local file system is returned. Example: vfs.fs.size[/tmp,free] Old naming: vfs.fs.free[*], vfs.fs.total[*], vfs.fs.used[*], vfs.fs.pfree[*], vfs.fs.pused[*]
vm.memory.size[<mode>]	Memory size	Memory size in bytes	mode - one of total (default), shared, free, 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 occurrence 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-only access to filesystem /proc. Kernel patches from www.grsecurity.org limit access rights of non-privileged users.

WIN32-SPECIFIC PARAMETERS

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

Key	Description	Return value	Comments
<code>agent[avg_collector_time]</code>	Average time spent by collector thread on each sample processing for last minute.	Time in milliseconds	
<code>agent[max_collector_time]</code>	Maximum time spent by collector thread on each sample processing for last minute.	Time in milliseconds	
<code>agent[accepted_requests]</code>	Total number of requests accepted by agent for processing.	Number of requests	
<code>agent[rejected_requests]</code>	Total number of requests rejected by agent for processing.	Number of requests	
<code>agent[timed_out_requests]</code>	Total number of requests timed out in processing.	Number of requests	
<code>agent[accept_errors]</code>	Total number of accept() system call errors.	Number of system calls	
<code>agent[processed_requests]</code>	Total number of requests successfully processed by agent.	Number of requests	
<code>agent[failed_requests]</code>	Total number	Number of	These requests generated ZBX_ERROR

Key	Description	Return value	Comments
quests]	of requests with errors in processing.	requests	return code
agent[unsupported_requests]	Total number of requests for unsupported parameters.	Number of requests	These requests generated ZBX_UNSUPPORTED return code
perf_counter[*]	Value of any performance counter, where parameter is the counter path.	Value of the counter	Performance Monitor can be used to obtain list of available counters. Note that this parameter will return correct value only for counters that require just one sample (like \System\Threads). It will not work as expected for counters that require more than one sample - like CPU utilisation.
service_state[*]	State of service. Parameter is service name.	0 – running 1 – paused 2 - start pending 3 - pause pending 4 - continue pending 5 - stop pending 6 – stopped 7 - unknown 255 – no such service	Parameter must be real service name as it seen in service properties under "Name:" or name of EXE file.
proc_info[<process>,<attribute>,<type>]	Different information about specific process(es).	<process> - process name (same as in proc_cnt[] parameter) <attribute> - requested process attribute.	The following attributes are currently supported: vmsize - Size of process virtual memory in Kbytes wkset - Size of process working set (amount of physical memory used by process) in Kbytes pf - Number of page faults ktime - Process kernel time in milliseconds utime - Process user time in milliseconds io_read_b - Number of bytes read by process during I/O operations io_read_op - Number of read operation performed by process io_write_b - Number of bytes written by process during I/O operations io_write_op - Number of write operation performed by process io_other_b - Number of bytes transferred by process during operations other than read and write operations io_other_op - Number of I/O

Key	Description	Return value	Comments
			operations performed by process, other than read and write operations gdiobj - Number of GDI objects used by process userobj - Number of USER objects used by process <type> - representation type (meaningful when more than one process with the same name exists). Valid values are: min - minimal value among all processes named <process> max - maximal value among all processes named <process> avg - average value for all processes named <process> sum - sum of values for all processes named <process> Examples: 1. In order to get the amount of physical memory taken by all Internet Explorer processes, use the following parameter: proc_info[iexplore.exe,wkset,sum] 2. In order to get the average number of page faults for Internet Explorer processes, use the following parameter: proc_info[iexplore.exe,pf,avg] Note: All io_XXX,gdiobj and userobj attributes available only on Windows 2000 and later versions of Windows, not on Windows NT 4.0.

4.10.4. 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

4.10.5. Simple checks

Simple checks

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

All simple check accepts two optional parameters:

`ip` - IP address. Default value is `127.0.0.1`

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

Examples of using simple checks:

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

List of supported simple checks:

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

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

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

4.10.5.1.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.

4.10.5.2.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, ICMP 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
```

4.10.6.Internal Checks

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

Key	Description	Comments
zabbix[boottime]	Startup time of ZABBIX server process in seconds.	In seconds since the epoch.
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	Do not use if MySQL InnoDB, Oracle or PostgreSQL is used!

Key	Description	Comments
	HISTORY_STR	
zabbix[items]	Number of items in ZABBIX database	
zabbix[items_unsupported]	Number of unsupported items in ZABBIX database	
zabbix[log]	Stores warning and error messages generated by ZABBIX server.	Character. Add item with this key to have ZABBIX internal messages stored.
zabbix[proxy,<name>,<param>]	Access to Proxy related information.	<name> - Proxy name List of supported parameters (<param>): lastaccess – timestamp of last heart beat message received from Proxy For example, zabbix[proxy,"Germany",lastaccess]
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	
zabbix[uptime]	Uptime of ZABBIX server process in seconds.	

4.10.7. 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"]
```

4.10.8.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 will find and execute the script in directory defined in configuration parameter **ExternalScripts**. First command line parameter is host name, other parameters are substituted by **parameters**.

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`”. Host name ‘`www1.company.com`’.

```
check_oracle.sh [-h 192.168.1.4]
```

ZABBIX will execute:

```
check_oracle.sh www1.company.com -h 192.168.1.4.
```

4.11.User Parameters

Functionality of ZABBIX agents can be enhanced by defining user parameters (`UserParameter`) in agent's configuration file.

4.11.1.Simple user parameters

In order to define a new parameter for monitoring, one line has to be added to configuration file of ZABBIX agent and the agent must be restarted.

User parameter has the following syntax:

UserParameter=key,command

Parameter	Description
Key	Unique item key.

Parameter	Description
Command	Command to be executed to evaluate value of the Key.

Example 1 Simple command

```
UserParameter=ping,echo 1
```

The agent will always return ‘1’ for item with key ‘ping’.

Example 2 More complex example

```
UserParameter=mysql.ping,mysqladmin -uroot ping|grep alive|wc -l
```

The agent will return ‘1’, if MySQL server is alive, ‘0’ – otherwise.

4.11.2.Flexible user parameters

Flexible user parameters can be used for more control and flexibility.

For flexible user parameters,

```
UserParameter=key[*],command
```

Parameter	Description
Key	Unique item key. The [*] defines that this key accepts parameters.
Command	Command to be executed to evaluate value of the Key. ZABBIX parses content of [] and substitutes \$1,...,\$10 in the command.

Example 1 Something very simple

```
UserParameter=ping[*,echo $1
```

We may define unlimited number of items for monitoring all having format `ping[something]`.

`ping[0]` – will always return ‘0’

`ping[aaa]` – will always return ‘aaa’

Example 2 Let's add more sense!

```
UserParameter=mysql.ping[*],mysqladmin -u$1 -p$2 ping|grep alive|wc -l
```

This parameter can be used for monitoring availability of MySQL database. We can pass user name and password:

```
mysql.ping[zabbix,our_password]
```

Example 3 How many lines matching a regular expression in a file?

```
UserParameter=wc[*],grep "$2" $1|wc -l
```

This parameter can be used to calculate number of lines in a file.

```
wc[/etc/passwd,root]
```

```
wc[/etc/services|zabbix]
```

4.12.Windows performance counters

Windows performance counter can be effectively monitored using `perf_counter[]`.

For example:

```
perf_counter["Processor(0)\Interrupts/sec"]
```

In order to get full list of performance counter available for monitoring you may run:

```
typeperf -qx
```

Unfortunately, depending on local settings naming of the performance counters can be different on different Windows servers. This introduce certain problem when creating a template for monitoring number of Windows machines having different locales.

Every performance counter can be translated into numeric form, which is unique and exactly the same regardless of language settings.

Run **regedit**, the find HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Perflib\009.

The registry entry contains information like:

```
1  
1847  
2  
System  
4  
Memory  
6  
% Processor Time  
10  
File Read Operations/sec  
12  
File Write Operations/sec  
14  
File Control Operations/sec  
16  
File Read Bytes/sec  
18  
File Write Bytes/sec  
....
```

So, in order to translate string name of a performance counter into numeric form, find corresponding numbers for each part of the performance counter, like:

System -> 2
% Processor Time -> 6
/System/% Processor Time
Then use these numbers to create a numeric format:
/2/6

4.12.1.Simple user parameters

In order to define a new parameter for monitoring, one line has to be added to configuration file of ZABBIX agent and the agent must be restarted.

4.13.Triggers

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

Trigger status (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: <ul style="list-style-type: none">▪ server is unreachable▪ trigger expression cannot be evaluated▪ trigger expression has been recently changed

4.13.1. 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 (**descending priority of execution**):

PRIORITY	OPERATOR	DEFINITION
1	/	Division
2	*	Multiplication
3	-	Arithmetical minus
4	+	Arithmetical plus
5	<	Less than
6	>	More than
7	#	Not equal. The operator is defined as: $A=B \Leftrightarrow (A < B - 0.000001) \mid (A > B + 0.000001)$
8	=	Is equal. The operator is defined as: $A=B \Leftrightarrow (A > B - 0.000001) \& (A < B + 0.000001)$

9	&	Logical AND
10		Logical OR

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 or #num	float, int, log, str	<p>Number of historical values for period of time in seconds or number of last #num values matching condition.</p> <p>The function accepts second optional parameter pattern and third parameter operation.</p> <p>For example,</p> <p>count(600,12) will return exact number of values equal to '12' stored in the history.</p> <p>Integer items: exact match</p> <p>Float items: match within 0.00001</p> <p>String, text and log items: matches if contains pattern.</p> <p>Third parameter works for integer and float values only.</p> <p>Supported operators:</p> <ul style="list-style-type: none"> eq – equal ne – not equal gt – greater ge – greater or equal lt – less le – less or equal <p>For example,</p> <p>count(600,12,"gt") will return exact number of values which are more than '12' stored in the history for the last 600 seconds.</p> <p>Another example:</p> <p>count(#10,12,"gt") will return exact number of values which are more than '12' stored in the history among last 10 values.</p> <p>Parameter #num is supported from ZABBIX 1.6.1.</p>

FUNCTION	ARGUMENT	SUPPORTED VALUE TYPES	DEFINITION
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: <ul style="list-style-type: none"> ▪ 1 – last and previous values differ ▪ 0 – otherwise
fuzzytime	sec	float, int	Returns 1 if timestamp (item value) does not differ from ZABBIX server time for more than N seconds, 0 – otherwise. Usually used with system.localtime to check that local time is in sync with local time of ZABBIX server.
iregexp	1 st – string 2 nd – sec or #num	str, log, text	This function is non case-sensitive analogue of regexp .
last	ignored	float, int, str, text	Last (most recent) value. Parameter is ignored.
logseverity	ignored	log	Returns log severity of the last log entry. Parameter is ignored. <ul style="list-style-type: none"> ▪ 0 – default severity ▪ N – severity (integer, useful for Windows event logs). ZABBIX takes log severity from field Information of Windows event log.
logsource	string	log	Check if log source of the last log entry matches parameter. <ul style="list-style-type: none"> ▪ 0 – does not match ▪ 1 – matches
			Normally used for Windows event logs. For example, logsource("VMWare Server")
max	sec, #num	float, int	Maximal value for period of time. Parameter defines length of the period in seconds.

FUNCTION	ARGUMENT	SUPPORTED VALUE TYPES	DEFINITION
min	sec, #num	float, int	Minimal value for period of time. Parameter defines length of the period in seconds.
nodata	sec	any	Returns: <ul style="list-style-type: none">▪ 1 – if no data received during period of time in seconds. The period should not be less than 30 seconds.▪ 0 - otherwise
now	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.
regexp	1 st – string 2 nd – sec or #num	str, log, text	Check if last value matches regular expression. Parameter defines regular expression, Posix style. Second optional parameter is number of seconds or number of lines to analyse. In this case more than one value will be processed. This function is case-sensitive.
str	1 st – string 2 nd – sec or #num	str, log, text	Returns: <ul style="list-style-type: none">▪ 1 – found▪ 0 - otherwise Find string in last (most recent) value. Parameter defines string to find. Case sensitive! Second optional parameter is number of seconds or number of lines to analyse. In this case more than one value will be processed.
sum	sec, #num	float, int	Returns: <ul style="list-style-type: none">▪ 1 – found▪ 0 – otherwise 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 some of the functions 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
<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 from 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)}=1
```

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].min(300)}>2) & ({zabbix: system.cpu.load[all,avg1].time(0)}>000000) & ({zabbix: system.cpu.load[all,avg1].time(0)}<060000)
```

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

4.13.2.Trigger dependencies

Trigger dependencies can be used to define relationship between triggers.

Trigger dependencies is a very convenient way of limiting number of messages to be sent in case if an event belongs to several resources.

For example, a host Host is behind router Router2 and the Router2 is behind Router1.

ZABBIX - Router1 – Router2 - Host

If the Router1 is down, then obviously the Host and the Router2 are also unreachable. One does not want to receive three notifications about the Host, the Router1 and the Router2. This is when Trigger dependencies may be handy.

In this case, we define these dependencies:

- trigger ‘Host is down’ depends on trigger ‘Router2 is down’
- trigger ‘Router2 is down’ depends on trigger ‘Router1 is down’

Before changing status of trigger ‘Host is down’, ZABBIX will check if there are corresponding trigger dependencies defined. If so, and one of the triggers is in TRUE state, then trigger status will not be changed and thus actions will not be executed and notifications will not be sent.

ZABBIX perform this check recursively. If Router1 or Router2 is unreachable, the Host trigger won’t be updated.

4.13.3.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 green.
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.

4.13.4.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 trigger value.

4.14.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.

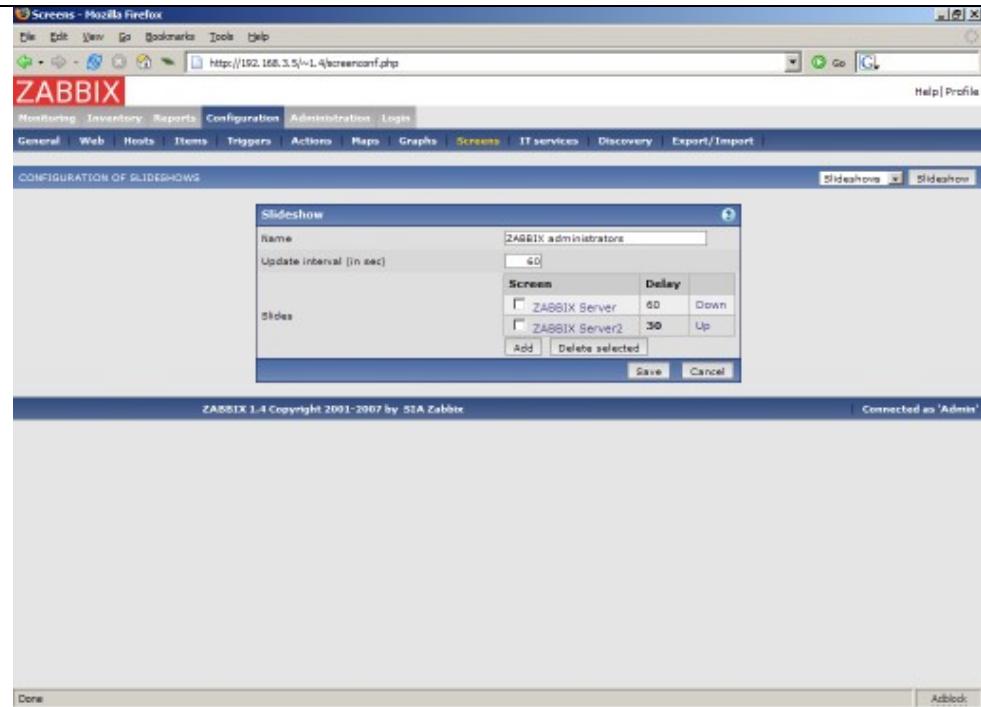
Screen is a table which may contain the following elements in each cell:

- 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 will 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 following order:

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

4.15. 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 login name and a password. All user passwords are encrypted and stored on the ZABBIX database. Users can not use their user id and password to log directly into the UNIX server unless they have also been set up accordingly to UNIX. Communication between the Web Server and the user's browser can be protected using SSL.

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

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

[To be finished...]

4.16.User permissions

4.16.1.Overview

ZABBIX has a flexible user permission schema which can be efficiently used to manage user permission within one ZABBIX installation or in a distributed environment.

Permissions are granted to user groups on a host group level.

ZABBIX supports several types of users. The type controls what administrative functions a user has permission to.

4.16.2.User types

User types are used to define access to administrative functions and to specify default permissions.

USER TYPE	Description
ZABBIX User	The user has access to Monitoring menu. The user has no access to any resources by default. Permissions to host groups must be explicitly given.
ZABBIX Admin	The user has access to Monitoring and Configuration . The user has Read-Write access to all host groups by default. Permissions can be revoked by denying access to specific host groups.
ZABBIX Super Admin	The user has access to Monitoring , Configuration and Administration . The user has Read-Write access to all host groups by default. Permissions can be revoked by denying access to specific host groups.

4.17.The Queue

4.17.1.Overview

ZABBIX Queue displays items that are waiting for a refresh. The Queue is just a **logical** representation of data from the database. There is no IPC queue or any other queue mechanism in ZABBIX.

Statistics shown by the Queue is a good indicator of performance of ZABBIX server.

4.17.2.How to read

The Queue on a standalone application or when displayed for a master node shows items waiting for a refresh.

Items	5 seconds	10 seconds	30 seconds	1 minute	5 minutes	More than 5 minutes
ZABBIX agent	18	0	0	0	0	0
ZABBIX agent (active)	0	0	0	0	0	1
SNMPv1 agent	0	0	0	0	0	0
SNMPv2 agent	0	0	0	0	0	0
SNMPv3 agent	0	0	0	0	0	0
Simple check	0	0	0	0	0	0
ZABBIX internal	0	0	0	0	0	0
ZABBIX aggregate	0	0	0	0	0	0
External check	0	0	0	0	0	0

In this case, we see that we have three items of type **ZABBIX agent** waiting to be refreshed 0-5 seconds, and one item of type **ZABBIX agent (active)** waiting more than five minutes (perhaps the agent is down?).

Note that information displayed for a child node is not up-to-date. The master node receives historical data with a certain delay (normally, up-to 10 seconds for inter-node data transfer), so the information is delayed.

Items	5 seconds	10 seconds	30 seconds	1 minute	5 minutes	More than 5 minutes
ZABBIX agent	0	0	0	0	0	93
ZABBIX agent (active)	0	0	0	0	0	0
SNMPv1 agent	0	0	0	0	0	0
SNMPv2 agent	0	0	0	0	0	0
SNMPv3 agent	0	0	0	0	0	0
Simple check	0	0	0	0	0	0
ZABBIX internal	0	0	0	0	0	0
ZABBIX aggregate	0	0	0	0	0	0
External check	0	0	0	0	0	0

On the screenshot we see that there are 93 items waiting more than 5 minutes for refresh on node "Child", however we should not trust the information as it depends on:

- performance of the Child node
- communications between Master and Child nodes
- possible local time difference between Master and Child nodes

Note: A special item key **zabbix[queue]** can be used to monitor health of the queue by ZABBIX.

4.18.Utilities

4.18.1.Start-up scripts

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

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

4.18.2.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:

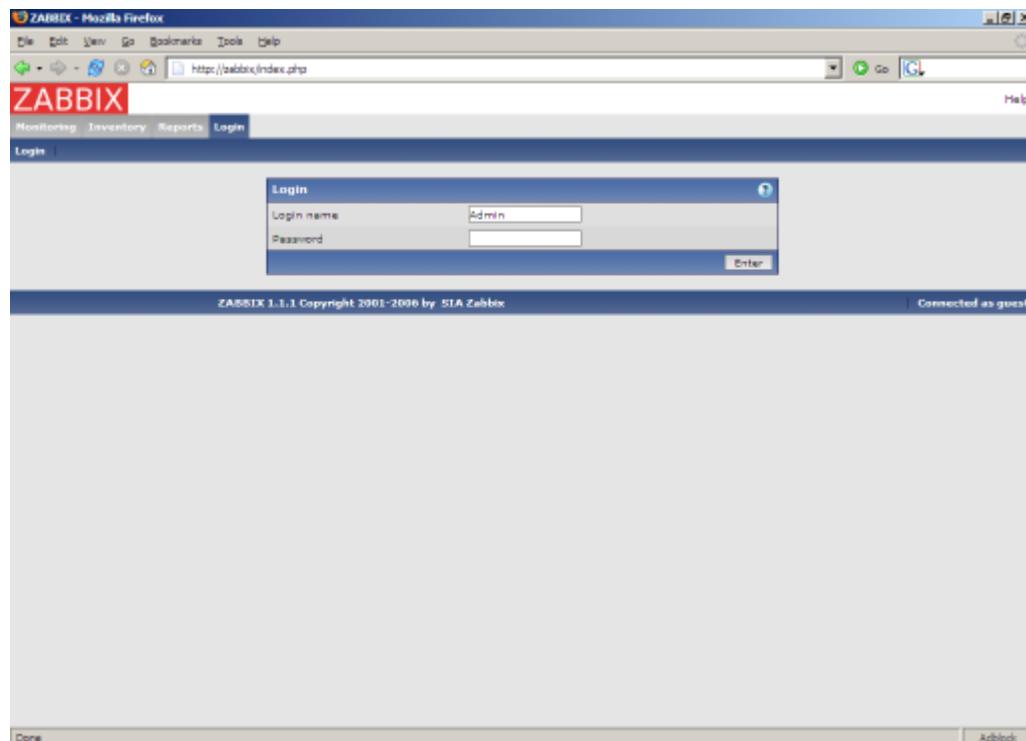
```
traphandle default /bin/bash /home/zabbix/bin/snmptrap.sh
```

- 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`

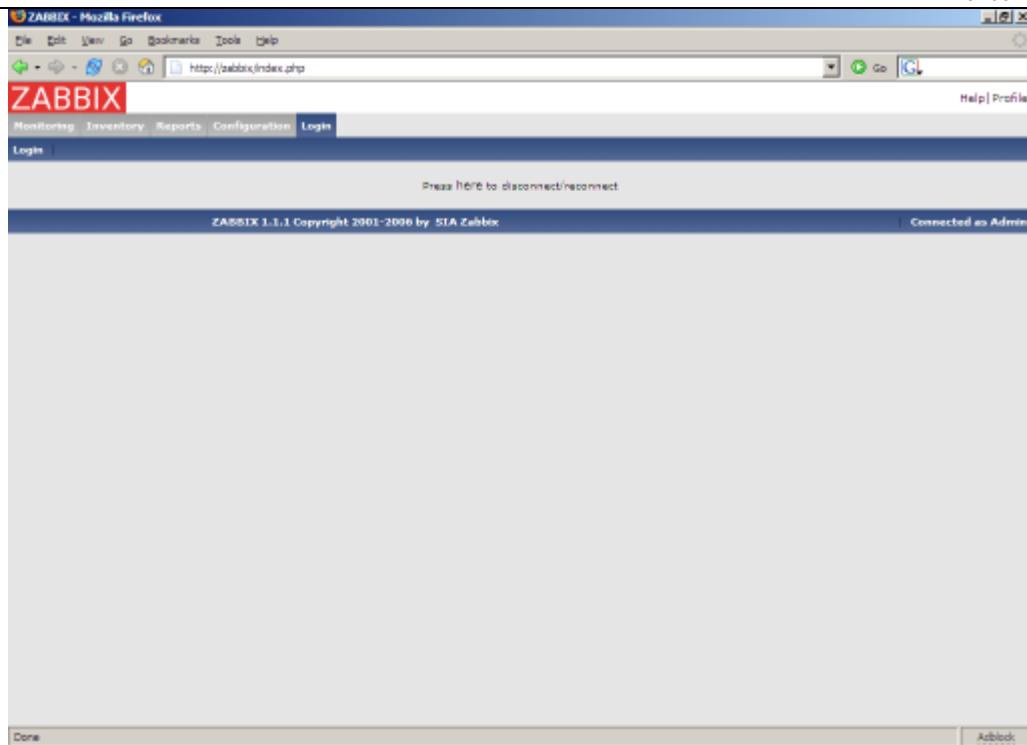
7.Quick Start Guide

7.1.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:



7.1.1. Protection against brute force attacks

In case of five consecutive failed login attempts, ZABBIX interface will pause for 60 seconds within next 15 minutes in order to prevent brute force and dictionary attacks.

IP address of a failed login attempt will be displayed after successful login.

7.2. Add user

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

The screenshot shows the Zabbix web interface with the title 'ZABBIX' at the top. Below it is a navigation bar with links: Monitoring, Inventory, Reports, Configuration, Login, General, Users, Audit, Hosts, Items, Triggers, Actions, Maps, Graphs, Screens, IT services, and Bulkloader. The 'Users' link is highlighted. The main content area is titled 'CONFIGURATION OF USERS AND USER GROUPS'. It contains a table with columns: Id, Alias, Name, Surname, Is online?, and Actions. Two users are listed: '1 Admin Zabbix Administrator Yes Nedit' and '2 guest Default User No Nedit'. At the bottom of the table is the text 'ZABBIX 1.1.1 Copyright 2001-2006 by SIA Zabbix'. To the right of the table, it says 'Connected as Admin'. Below the table is a 'Create User' button.

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

The screenshot shows the Zabbix web interface with the title 'ZABBIX' at the top. Below it is a navigation bar with links: Monitoring, Inventory, Reports, Configuration, Login, General, Users, Audit, Hosts, Items, Triggers, Actions, Maps, Graphs, Screens, IT services, and Bulkloader. The 'Users' link is highlighted. The main content area is titled 'CONFIGURATION OF USERS AND USER GROUPS'. A 'User' dialog box is open, containing fields for Alias (Alexei), Name (Alexei), Surname (Meditshev), Password (aaaaaa), Password (once again) (aaaaaa), Language (English (US)), Auto-logout (in seconds) (500), URL (after login) (empty), and Refresh (in seconds) (30). At the bottom of the dialog box are 'Save' and 'Cancel' buttons. The 'Save' button is highlighted.

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

Permission	Right	Resource name	Actions
Default permission	Read only	-	Delete

The user is added.

User	Id	Alias	Name	Surname	In online?	Actions
Admin	1	Zabbix	Administrator		Yes	Media
Alexei	3	Alexei	Vladishev		No	Media
guest	2	Default	User		No	Media

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

User group	Name	Members
Database administrators		
Head of IT department		
Network administrators		
Security specialists		
UNIX administrators		
WEB administrators		
Zabbix administrators		

Click on a group to change membership of the group.

User group "Zabbix administrators"

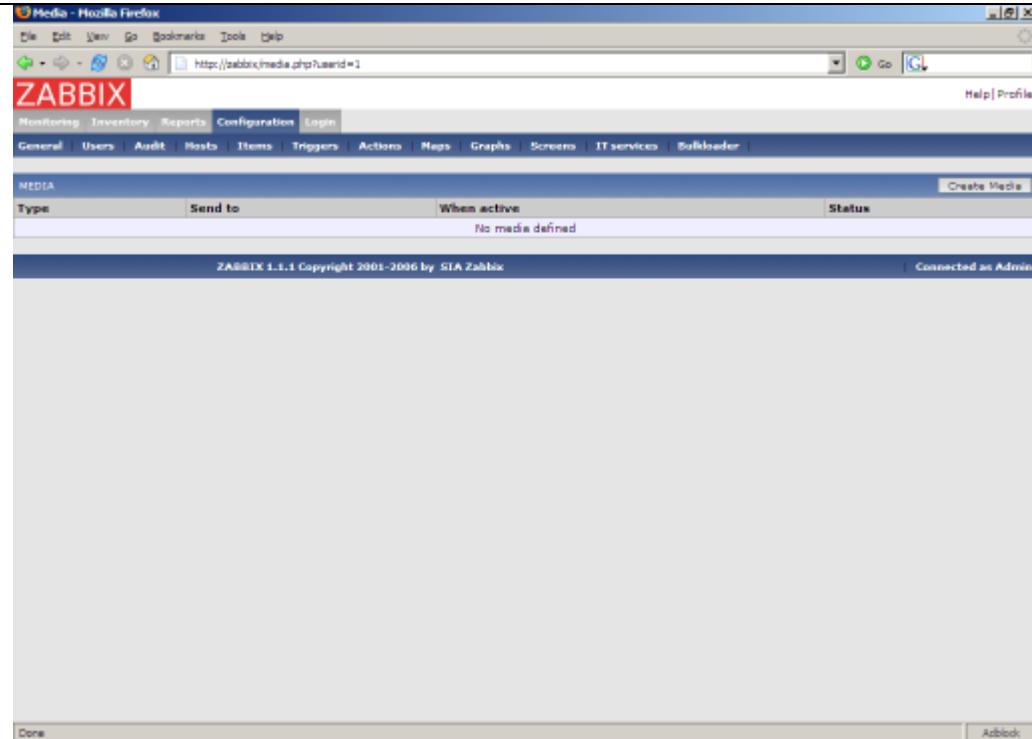
Group name:

Users:

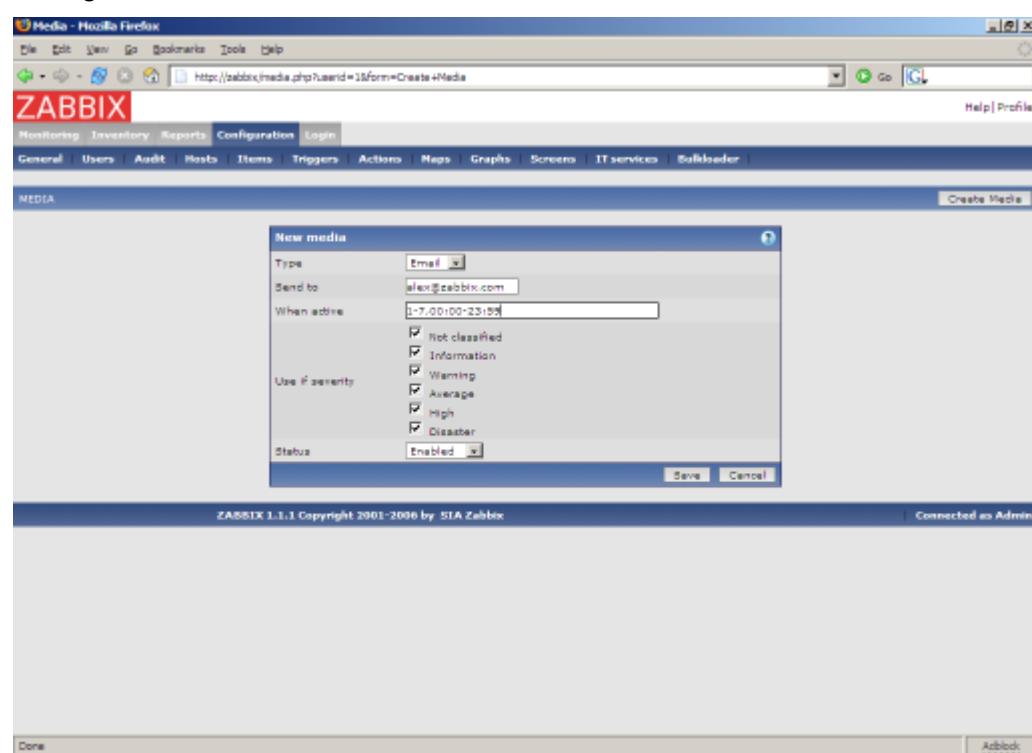
- Admin
- Alexei
- guest

[Save](#) [Delete](#) [Cancel](#)

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



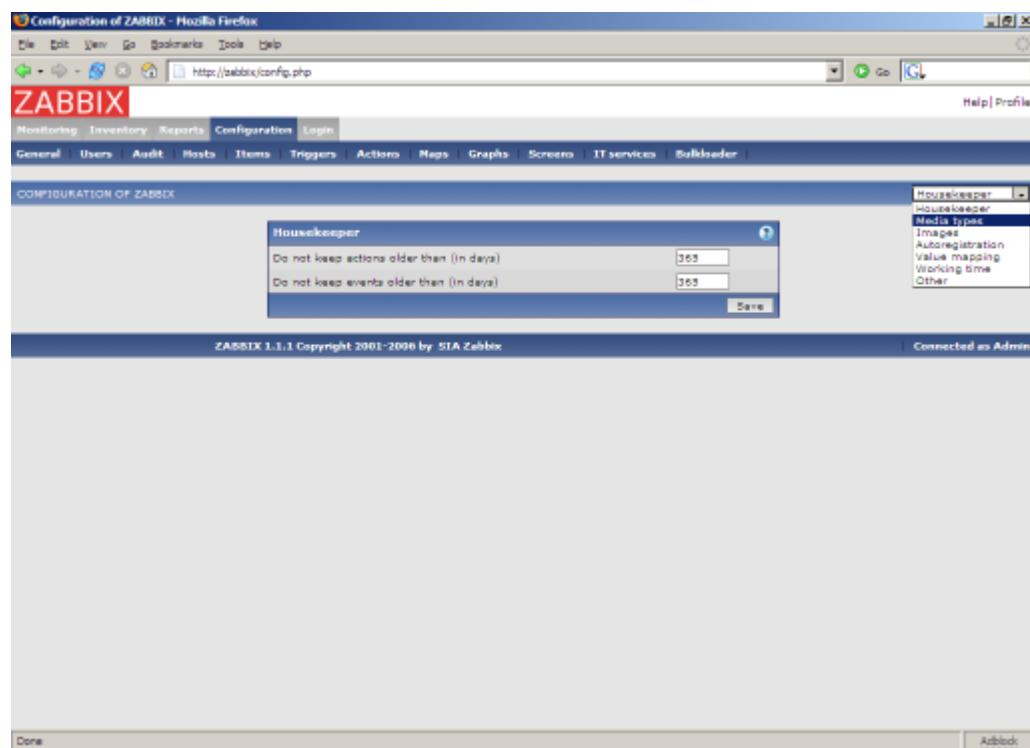
Configure email address, list of severities for which the media will be active.



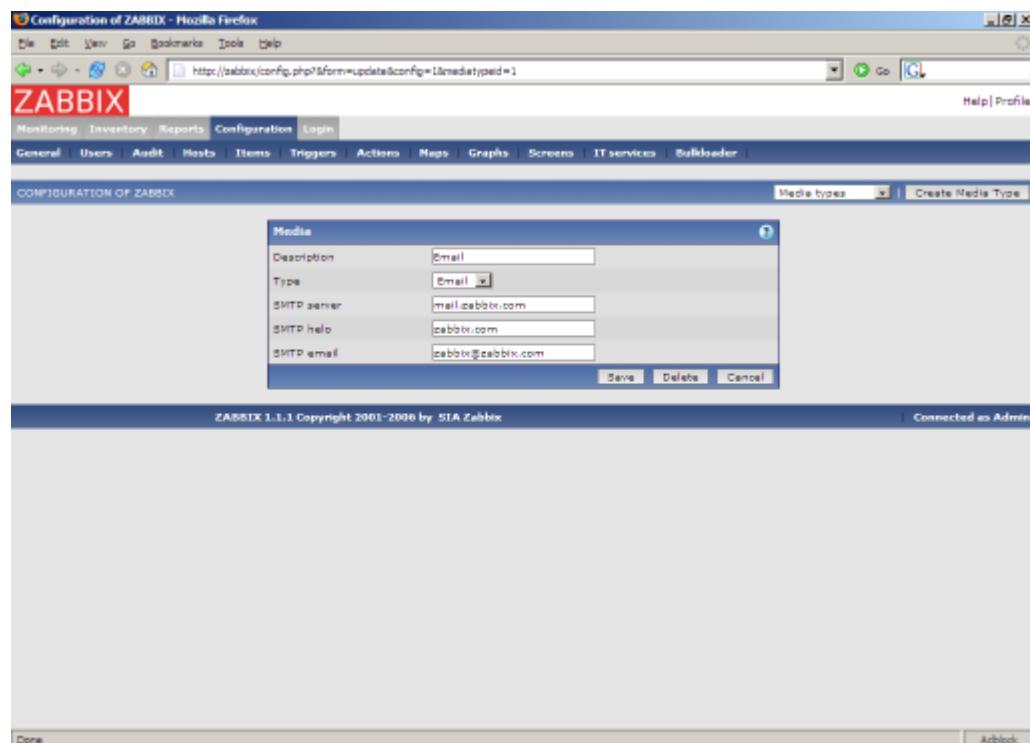
Done! You may try to log in.

7.3.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.

The screenshot shows a Mozilla Firefox browser window displaying the ZABBIX configuration interface. The title bar reads "Configuration of ZABBIX - Mozilla Firefox". The address bar shows the URL "http://zabbix/config.php?form=update&form_refresh=1&mediatypeid=1&config=1&exec_path=\$gsm_modem&description=Email". The main menu includes "Monitoring", "Inventory", "Reports", "Configuration", "Login", "General", "Users", "Audit", "Hosts", "Items", "Triggers", "Actions", "Maps", "Graphs", "Screens", "IT services", and "Bulkloader". A message "[Media type updated]" is displayed above a table titled "MEDIA TYPES". The table has two columns: "Description" and "Type". A single row is shown with "Email" in both columns. A "Create Media Type" button is located at the top right of the table area. The footer of the page displays "ZABBIX 1.3.1 Copyright 2001-2006 by ZIA Zabbix" and "Connected as Admin". At the bottom left is a "Done" button, and at the bottom right is an "Adblock" link.

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

7.4.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.

The screenshot shows the ZABBIX web interface with the title 'HOSTS - Mozilla Firefox'. The URL is <http://zabbix/hosts.php>. The top navigation bar includes 'Monitoring', 'Inventory', 'Reports', 'Configuration', 'Login', 'General', 'Users', 'Audit', 'Hosts', 'Items', 'Triggers', 'Actions', 'Maps', 'Graphs', 'Screens', 'IT services', and 'Bulkloader'. A sub-navigation bar for 'HOSTS' includes 'Name', 'IP', 'Port', 'Status', 'Availability', 'Error', and 'Show'. Below this is a search bar for 'Hosts' and a 'Create Host' button. The main content area is titled 'CONFIGURATION OF HOSTS, GROUPS AND TEMPLATES' and contains a table header for 'HOSTS' with columns 'Name', 'IP', 'Port', 'Status', 'Availability', 'Error', and 'Show'. A message 'No hosts defined' is displayed. At the bottom of the page, there are buttons for 'Activate selected', 'Disable selected', and 'Delete selected'. The footer includes 'ZABBIX 1.1.1 Copyright 2001-2008 by SIA Zabbix' and 'Connected as Admin'. The status bar at the bottom right shows 'Adblock'.

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 screenshot shows the ZABBIX web interface with the title 'HOSTS - Mozilla Firefox'. The URL is [http://zabbix/hosts.php?form/Create+Host&form_refresh=1&config=0&groupid=0&p=device&tname=Servers&os=Linux&ts=1](http://zabbix/hosts.php?form>Create+Host&form_refresh=1&config=0&groupid=0&p=device&tname=Servers&os=Linux&ts=1). The top navigation bar and sub-navigation bar for 'HOSTS' are identical to the previous screenshot. The main content area is titled 'HOST' and contains a form for creating a new host. The fields are: Name (zabbix), Groups (Templates checked, ZABBIX Servers), New group (empty), Use IP address (checked), IP address (127.0.0.1), Port (10050), Status (Monitored), Link with Template (Unix_t checked), and Use profile (empty). At the bottom of the form are 'Save' and 'Cancel' buttons. The footer and status bar are the same as the previous screenshot.

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

The screenshot shows the Zabbix configuration interface for hosts. A message at the top says "[Host added]". Below it is a list of 30 new items that were added:

- Added new item zabbix:agent.ping
- Added new item zabbix:agent.version
- Added new item zabbix:disk_read_ops15[hda]
- Added new item zabbix:disk_read_ops15[hdb]
- Added new item zabbix:disk_read_ops1[hda]
- Added new item zabbix:disk_read_ops1[hdb]
- Added new item zabbix:disk_read_ops2[hda]
- Added new item zabbix:disk_read_ops2[hdb]
- Added new item zabbix:disk_write_ops15[hda]
- Added new item zabbix:disk_write_ops15[hdb]
- Added new item zabbix:disk_write_ops1[hda]
- Added new item zabbix:disk_write_ops1[hdb]
- Added new item zabbix:disk_writes_ops15[hda]
- Added new item zabbix:disk_writes_ops15[hdb]
- Added new item zabbix:filesize[/var/log/syslog]
- Added new item zabbix:io[disk_io]
- Added new item zabbix:io[disk_wblk]
- Added new item zabbix:io[disk_rw]
- Added new item zabbix:io[disk_wblk]
- Added new item zabbix:load[maxfiles]
- Added new item zabbix:kern[maxproc]
- Added new item zabbix:net.tcp.service[ftp]
- Added new item zabbix:net.tcp.service[http]
- Added new item zabbix:net.tcp.service[imap]
- Added new item zabbix:net.tcp.service[ntp]
- Added new item zabbix:net.tcp.service[pop]
- Added new item zabbix:net.tcp.service[smtp]
- Added new item zabbix:net.tcp.service[ssh]
- Added new item zabbix:net.ifadmin[eth0]
- Added new item zabbix:net.ifadmin[eth1]
- Added new item zabbix:net.loads[lo]

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

The screenshot shows the Zabbix configuration interface for hosts. At the top, there's a search bar and a 'Create Host' button. Below is a table titled 'HOSTS' with one row:

Name	IP	Port	Status	Availability	Error	Show
/Unix_t/zabbix	127.0.0.1	10050	Monitored	Unknown		Items Triggers Graphs

At the bottom of the screen, the footer says "ZABBIX 1.1.1 Copyright 2001-2009 by SIA Zabbix" and "Connected as Admin".

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

The screenshot shows the 'ITEMS' section of the Zabbix configuration interface. It lists various monitoring items for the host 'zabbix'. The columns include Id, Description, Key, Update interval, History, Trends, Type, Status, Applications, and Error.

ID	Description	Key	Update interval	History	Trends	Type	Status	Applications	Error
17313	Unix_t:Buffers memory	vm.memory.size[buffers]	30	7	365	ZABBIX agent	Active		
17314	Unix_t:Cached memory	vm.memory.size[cached]	30	7	365	ZABBIX agent	Active		
17280	Unix_t:Checksum of ./etc/inetd.conf	vfs.file_cksum[/etc/inetd.conf]	600	7	365	ZABBIX agent	Active		
17281	Unix_t:Checksum of ./etc/passwd	vfs.file_cksum[/etc/passwd]	600	7	365	ZABBIX agent	Active		
17282	Unix_t:Checksum of ./etc/services	vfs.file_cksum[/etc/services]	600	7	365	ZABBIX agent	Active		
17283	Unix_t:Checksum of /usr/bin/ssh	vfs.file_cksum[/usr/bin/ssh]	600	7	365	ZABBIX agent	Active		
17284	Unix_t:Checksum of /usr/sbin/sshd	vfs.file_cksum[/usr/sbin/sshd]	600	7	365	ZABBIX agent	Active		
17285	Unix_t:Checksum of /vmlinuz	vfs.file_cksum[/vmlinuz]	600	7	365	ZABBIX agent	Not supported		
17236	Unix_t:Email (SMTP) server is running	net.tcp.service[smtp]	60	7	365	ZABBIX agent	Active		
17296	Unix_t:Free disk space on /	vfs.fs.size[/free]	30	7	365	ZABBIX agent	Active		
17299	Unix_t:Free disk space on /home	vfs.fs.size[/home/free]	30	7	365	ZABBIX agent	Active		
17300	Unix_t:Free disk space on /opt	vfs.fs.size[/opt/free]	30	7	365	ZABBIX agent	Active		

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

The screenshot shows the 'TRIGGERS' section of the Zabbix configuration interface. It lists various triggers for the host 'zabbix'. The columns include Name, Expression, Severity, Status, and Error.

Name	Expression	Severity	Status	Error
Unix_t:/etc/inetd.conf has been changed on server zabbix	{zabbix vfs.file_cksum[/etc/inetd.conf].diff(0)}>0	Warning	Enabled	
Unix_t:/etc/passwd has been changed on server zabbix	{zabbix vfs.file_cksum[/etc/passwd].diff(0)}>0	Average	Enabled	
Unix_t:/etc/services has been changed on server zabbix	{zabbix vfs.file_cksum[/etc/services].diff(0)}>0	Average	Enabled	
Unix_t:/usr/bin/ssh has been changed on server zabbix	{zabbix vfs.file_cksum[/usr/bin/ssh].diff(0)}>0	Average	Enabled	
Unix_t:/usr/sbin/sshd has been changed on server zabbix	{zabbix vfs.file_cksum[/usr/sbin/sshd].diff(0)}>0	Average	Enabled	
Unix_t:/vmlinuz has been changed on server zabbix	{zabbix vfs.file_cksum[/vmlinuz].diff(0)}>0	Warning	Enabled	
Unix_t:Apache is not running on zabbix	{zabbix proc_ont[httpd].last(0)}<1	Average	Enabled	
Unix_t:Configured max number of opened files is too low on zabbix	{zabbix kern[nfiles].last(0)}<512	Information	Enabled	
Unix_t:Configured max number of processes is too low on zabbix	{zabbix kern[maxproc].last(0)}<256	Information	Enabled	
Unix_t:Email (SMTP) server is down on zabbix	{zabbix inet.tcp.service[smtp].last(0)}=0	Average	Enabled	
Unix_t:FTP server is down on zabbix	{zabbix inet.tcp.service[ftpd].last(0)}=0	Average	Enabled	
Unix_t:Host information was changed on zabbix	{zabbix system.uname.diff(0)}>0	Information	Enabled	
Unix_t:Hostname was changed on zabbix	{zabbix system.hostname.diff(0)}>0	Information	Enabled	
Unix_t:INAP server is down on zabbix	{zabbix inet.tcp.service[inap].last(0)}=0	Average	Enabled	
Unix_t:Inetd is not running on zabbix	{zabbix proc_ont[inetd].last(0)}<1	Average	Enabled	
Unix_t:Lack of free memory on server zabbix	{zabbix vm.memory.size[free].last(0)}<100000	Average	Enabled	
Unix_t:Lack of free swap space on zabbix	{zabbix system.swap.size[free].last(0)}<100000	High	Enabled	

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

Latest values [refreshed every 30 sec] - Mozilla Firefox

ZABBIX

Monitoring Inventory Reports Configuration Login

Overview Latest data Triggers Queue Events Actions Maps Screens IT services

LATEST DATA

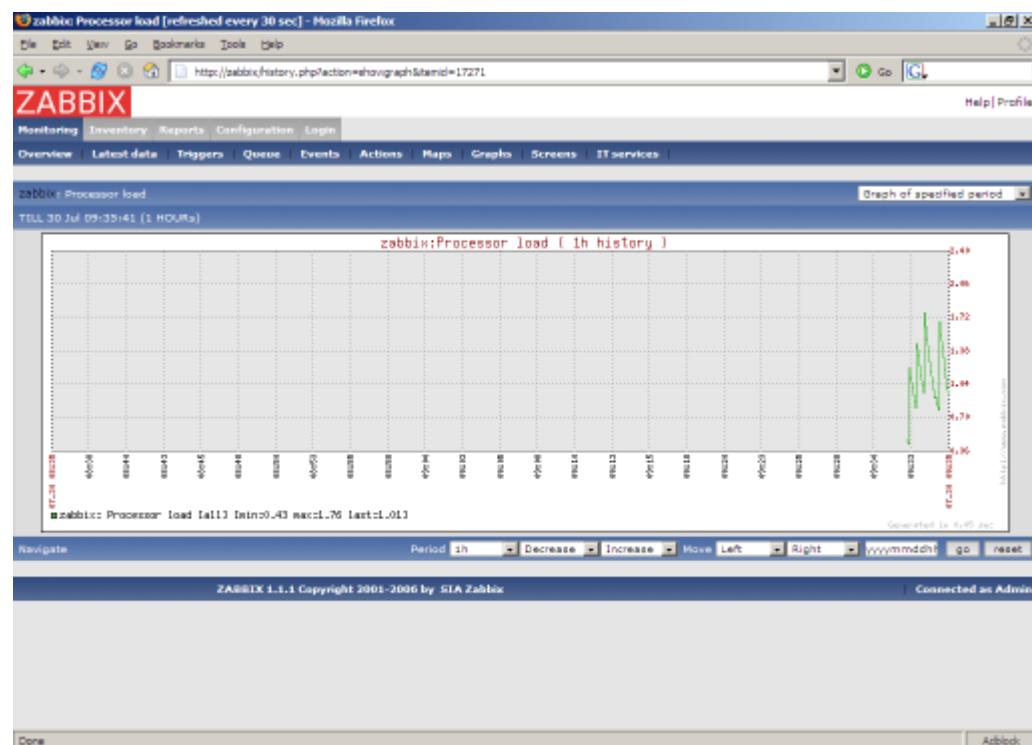
Show items with description like Show

Group Host zabbix

Description	Last check	Last value	Change	History
Buffers memory	30 Jul 09:35:00	222.25 kB	-	Graph
Cached memory	30 Jul 09:35:00	1.16 GB	+28 kB	Graph
Checksum of /etc/inittab.conf	30 Jul 09:32:55	1782859668	-	Graph
Checksum of /etc/passwd	30 Jul 09:32:54	1127549486	-	Graph
Checksum of /etc/services	30 Jul 09:32:54	2095574442	-	Graph
Checksum of /usr/bin/ssh	30 Jul 09:32:55	890698524	-	Graph
Checksum of /usr/sbin/sshd	30 Jul 09:32:55	2842161037	-	Graph
Email (SNTP) server is running	30 Jul 09:35:00	1	-	Graph
Free disk space on /	30 Jul 09:35:00	5.36 kB	-	Graph
Free disk space on /home	30 Jul 09:35:00	5.36 kB	-	Graph
Free disk space on /opt	30 Jul 09:35:00	5.36 kB	-	Graph
Free disk space on /tmp	30 Jul 09:35:00	5.36 kB	-	Graph
Free disk space on /var	30 Jul 09:35:00	5.36 kB	-	Graph
Free memory	30 Jul 09:35:00	145.25 kB	+732 kB	Graph
Free number of inodes on /	30 Jul 09:35:00	1741309	-	Graph
Free number of inodes on /home	30 Jul 09:35:00	1741309	-	Graph
Free number of inodes on /opt	30 Jul 09:35:00	1741309	-	Graph
Free number of inodes on /tmp	30 Jul 09:35:00	1741309	-	Graph
Free number of inodes on /var	30 Jul 09:35:00	1741309	-	Graph
Free swap space	30 Jul 09:35:00	0 kB	-	Graph
FTP server is running	30 Jul 09:35:00	0	-	Graph
Host information	30 Jul 09:32:54	Linux ubuntu 2.6.12- ...	-	History
Host name	30 Jul 09:32:55	ubuntu	-	History

Done

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



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

The screenshot shows a Mozilla Firefox browser window displaying the Zabbix web interface. The title bar reads "Status of triggers [refreshed every 30 sec] - Mozilla Firefox". The main content area is titled "ZABBIX" and shows a table of triggers. The table has columns: Name, Status, Severity, Last change, Acknowledged, and Comments. There are six rows listed, all with "TRUE" in the Status column and "High" in the Severity column. The last row is "Too many processes running on zabbix". At the bottom of the table, it says "Total: 6". Below the table, the footer reads "ZABBIX 1.4.1 Copyright 2001-2006 by SIA Zabbix" and "Connected as Admin".

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

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

- Modifying list of monitored items
- Modifying list of triggers items
- Adjusting refresh rate for items
- Adding user notification rules

7.5. Set-up 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

The screenshot shows the Zabbix web interface for configuration. The title bar says "Configuration of actions - Mozilla Firefox". The main menu includes "Monitoring", "Inventory", "Reports", "Configuration", "Login", "General", "Users", "Audit", "Hosts", "Items", "Triggers", "Actions", "Maps", "Graphs", "Screens", "IT services", and "Bulkloader". A sub-menu "CONFIGURATION OF ACTIONS" is open. Below it, a table titled "ACTIONS" has columns for "Source", "Conditions", "Send message to", "Subject", "Repeats", and "Status". A message "No actions defined" is displayed. At the bottom of the table are buttons for "Enable selected", "Disable selected", and "Delete selected". The footer of the browser window shows "ZABBIX 1.1.1 Copyright 2001-2008 by SIA Zabbix" and "Connected as Admin". The status bar at the bottom of the browser says "Done" and "Adblock".

No actions defined yet. Press "Create Action":

The screenshot shows the "Action" configuration dialog box. It has the following fields:

- Action type: Send message
- Source: Trigger
- Conditions: No conditions defined
- Condition: Host group = Templates (with an "add" button)
- Send message to: Single user (set to Alexei)
- User: Alexei
- Subject: {TRIGGER.NAME}: {STATUS}
{TRIGGER.NAME}: {STATUS}
- Message: (empty text area)
- Repeat: No repeats
- Status: Enabled

At the bottom are "Save" and "Cancel" buttons. The footer of the browser window shows "ZABBIX 1.1.1 Copyright 2001-2008 by SIA Zabbix" and "Connected as Admin". The status bar at the bottom of the browser says "Done" and "Adblock".

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

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

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

The screenshot shows the Zabbix web interface for configuring actions. The title bar reads "Configuration of actions - Mozilla Firefox". The main navigation menu includes "Monitoring", "Inventory", "Reports", "Configuration", "Login", "General", "Users", "Audit", "Hosts", "Items", "Triggers", "Actions", "Maps", "Graphs", "Screens", "IT services", and "Bulkloader". The "Actions" tab is selected. A message at the top says "[Action added]". Below it is a table titled "CONFIGURATION OF ACTIONS" with the following data:

ACTIONS					
Source	Conditions	Send message to	Subject	Repeats	Status
<input type="checkbox"/> Source		Alexei	{TRIGGER.NAME}: {STATUS}	No repeats	Enabled
<input type="checkbox"/> Trigger					

Buttons at the bottom of the table include "Enable selected", "Disable selected", and "Delete selected". The footer of the page displays "ZABBIX 1.4.1 Copyright 2001-2006 by SIA Zabbix" and "Connected as Admin".

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

8.XML Import and Export

8.1.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.

8.2.Overview

ZABBIX Import/Export processes the following data:

- Hosts
- Applications
- Items
- Triggers
- Custom graphs

8.3.Data export

Menu->Configuration->Export/Import

Step 1

Select elements for export

The screenshot shows the Zabbix web interface with the 'HOSTS' table selected in the 'EXPORT' section. The 'Template_Linux' host is selected, and all its items and triggers are checked. The 'Export' button is visible at the bottom.

Name	DNS	IP	Port	Status	Items	Triggers	Graphs
Template_AIX	-	-	-	Template	102	44	-
Template_App_MySQL	-	-	-	Template	6	-	-
Template_FreeBSD	-	-	-	Template	102	44	-
Template_HPUX	-	-	-	Template	102	44	-
Template_Linux	-	-	-	Template	102	44	-
Template_MacOS_X	-	-	-	Template	102	44	-
Template_Netware	-	-	-	Template	102	44	-
Template_OpenBSD	-	-	-	Template	102	44	-
Template_SNMPv1_Device	-	-	-	Template	207	207	-
Template_SNMPv2_Device	-	-	-	Template	207	207	-
Template_Solaris	-	-	-	Template	102	44	-
Template_Standalone	-	-	-	Template	8	7	-
Template_Trus4	-	-	-	Template	102	44	-
Template_Windows	-	-	-	Template	29	13	-
ZABBIX Server	127.0.0.1	10050	Not monitored	102	44	4	-

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

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

The screenshot shows the Zabbix web interface with the 'Elements' table for the selected 'Template_Linux' host. It lists various system monitoring items like ping, process counts, and network traffic.

Host	Elements
Template_Linux	Item Ping to the server (TCP) Item Version of zabbix_agentd running Item Size of \$1 Item Maximum number of opened files Item Maximum number of processes Item Incoming traffic on interface \$1 Item Incoming traffic on interface \$1 Item Incoming traffic on interface \$1 Item Outgoing traffic on interface \$1 Item Outgoing traffic on interface \$1 Item Outgoing traffic on interface \$1 Item FTP server is running Item WEB (HTTP) server is running Item IMAP server is running Item News (NNTP) server is running Item POP3 server is running Item Email (SMTP) server is running Item SSH server is running Item Number of running processes Item Number of running processes apache Item Number of running processes inited Item Number of running processes mysqld Item Number of running processes send

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):

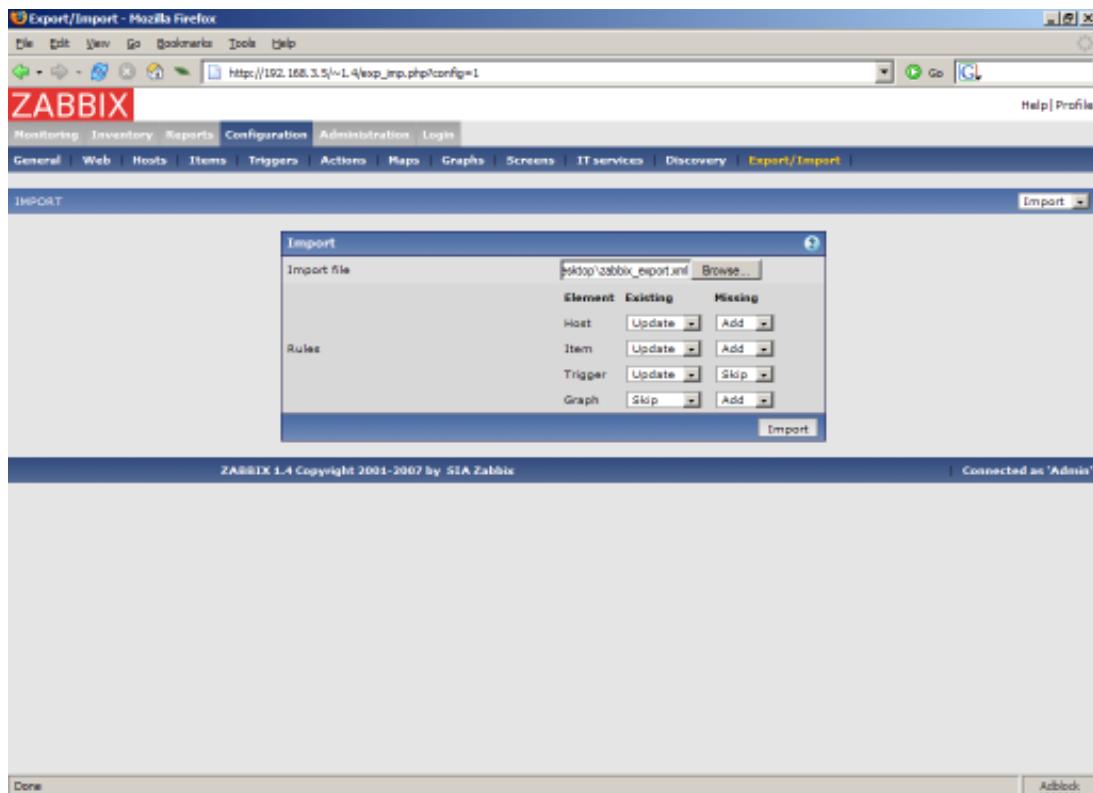
```
<?xml version="1.0"?>
<zabbix_export version="1.0" date="11.05.07" time="11.11">
  <hosts>
    <host name="ZABBIX Server">
      <useip>1</useip>
      <ip>127.0.0.1</ip>
      <port>10050</port>
      <status>1</status>
      <groups>
        </groups>
      <items>
        <item type="0" key="agent.ping" 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) }>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>
```

8.4.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.

9.Tutorials

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

9.1.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.

9.2.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]
Type of information	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.
Update interval (in sec)	Must be set to 'log'. 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.

9.3.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 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 a 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 may contain macros!

Syntax of remote commands:

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

Syntax of IMPI remote commands:

REMOTE COMMAND	Description
<host>:IPMI <ipmi control> [value]	<p>The syntax is for execution of IPMI command on a single host.</p> <p>Supported ipmi controls: "reset", "power"</p> <p>Supported values: "on", "off" or number (1, by default)</p> <p>Examples:</p> <p>Server restart: host:IPMI reset on</p> <p>Server reboot: host:IPMI power off</p>
<group>#IPMI <ipmi control> [value]	The syntax is for execution of IPMI command for all hosts of a host 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 privileged 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.

9.4.Monitoring of Windows services

This tutorial provides step-by-step instructions how to setup monitoring of Windows services. It is assumed that ZABBIX server and ZABBIX agent are configured and operational.

Step 1 Get service name

You can get that name by going to the services mmc and bring up the properties of the service you want to monitor it's up/down status. In the General tab you should see a field called Service name. The value that follows that you put in the brackets above. For example, if I wanted to monitor the "workstation" service then my service would be **lanmanworkstation**.

Step 2 Add item for monitoring of the service

Add item with a key **service_state[lanmanworkstation]**, value type **Integer**, value mapping **Windows service state**.

10.Escalations and repeated notifications

10.1.Goals

ZABBIX Escalations is aimed to the following goals:

- Keep users periodically notified in case if a problem (a trigger in TRUE state) exists
- Repeated notifications
- Escalate problems to other user groups
- Execute actions (both notifications and remote commands) if a problem exists for more than N hours (seconds, minutes, etc).
- Recovery message to all interested parties
- Escalations based on conditions (for example, do not escalate acknowledged events)

10.2.Overview

ZABBIX provides effective and very flexible functionality for escalations and repeated notifications. Depending on configuration, ZABBIX will automatically escalate (increase escalation step) unresolved problems and executed actions assigned to each escalation step.

11.WEB Monitoring

11.1.Goals

ZABBIX WEB Monitoring is aimed to the following goals:

- Performance monitoring of WEB applications
- Availability monitoring of WEB applications
- Support of HTTP and HTTPS
- Support of complex scenarios consisting of many steps (HTTP requests)

11.2.Overview

ZABBIX provides effective and very flexible WEB monitoring functionality. The module periodically executes WEB scenarios and keeps collected data in the database. The data is automatically used for graphs, triggers and notifications.

The following information is collected per each step of WEB scenario:

- Response time
- Download speed per second
- Response code

ZABBIX also checks if a retrieved HTML page contains a pre-defined string.

ZABBIX WEB monitoring supports both HTTP and HTTPS.

11.3.WEB Scenario

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

WEB Scenario is linked to a host application for grouping.

WEB Scenario is periodically executed and consists of one or more Steps.

All cookies are preserved during execution of a single scenario.

Example 1 Monitoring of ZABBIX GUI

If we want to monitor availability and performance of ZABBIX GUI, we have to login, check how quickly Overview and Status of Triggers screens work and then logout.

The scenario may have the following steps:

1. Login
2. Go to Overview screen
3. Go to Status of Triggers screen
4. Logout

If a step cannot be performed, execution of scenario fails.

Parameter	Description
Application	WEB scenario will be linked to this application. The application must exist. For example: ZABBIX Server
Name	Name of the WEB scenario. The name will appear in Monitoring -> Web For example: ZABBIX GUI
Update interval	How often this scenario will be executed, in seconds. For example: 60
Agent	ZABBIX will pretend to be the selected browser. Useful for monitoring of WEB sites which generate different content for different WEB browsers. For example: Opera 9.02 on Linux
Status	Active: active scenario, it will be executed Disabled: disabled scenario, it will NOT be executed
Variables	List of macros to be used in configuration of the steps. Syntax: <code>{macro}=value</code> The macro <code>{macro}</code> will be replaced by "variable" in Step's URL and Post variables. For example: <code>{user}=guest</code> <code>{password}=guest</code>
Steps	Steps of the scenario.

As soon as a scenario is created, ZABBIX automatically adds the following items for monitoring and links them to the selected application. Actual scenario name will be used instead of "Scenario".

Item	Description
Download speed for scenario 'Scenario'	This item will collect information about download speed (bytes per second) of the whole scenario, i.e. average for all steps. Item key: web.test.in[Scenario,,bps] Type: float
Failed step of scenario 'Scenario'	This item keeps number of failed step of the scenario. If all steps are executed successfully, 0 is returned. Item key: web.test.fail[Scenario] Type: integer

These items can be used to create triggers and define notification conditions.

Example 1 Trigger "WEB scenario failed"

The trigger expression can be defined as: {host: web.test.fail[Scenario]}.last(0)#0
Do not forget to replace the Scenario with real name of your scenario.

Example 2 Trigger "WEB application is slow"

The trigger expression can be defined as: {host: web.test.in[Scenario,,bps]}.last(0)<10000

Do not forget to replace the Scenario with real name of your scenario.

11.4.WEB Step

Step is basically a HTTP request. Steps are executed in a pre-defined order.

Parameter	Description
Name	Name of the step. For example: Login
URL	URL For example: www.zabbix.com
Post	HTTP POST variables, if any.

Parameter	Description
	<p>For example:</p> <p>id=2345&userid={user}</p> <p>If {user} is defined as a macro of the WEB scenario, it will be replaced by its value when the step is executed.</p> <p>The information will be sent as is.</p>
Timeout	<p>Do not spend more than Timeout seconds for execution of the step. Actually this parameter defines maximum time for making connection to the URL and maximum time for performing an HTTP request. Therefore, ZABBIX will not spend more than 2xTimeout seconds on the step.</p> <p>For example: 15</p>
Required	<p>The string (given as Posix regular expression) must exist in retrieved content. Otherwise this step fails. If empty, any content will be accepted.</p> <p>For example: Homepage of ZABBIX</p>
Status codes	<p>List of HTTP status codes to be considered as success. If retrieved status code is not in the list, this step fails.</p> <p>If empty, any status code is accepted.</p> <p>For example: 200,210</p>

As soon as a step is created, ZABBIX automatically adds the following items for monitoring and links them to the selected application. Actual scenario and step names will be used instead of "Scenario" and "Step" respectively.

Item	Description
Download speed for step 'Step' of scenario 'Scenario'	<p>This item will collect information about download speed (bytes per second) of the step.</p> <p>Item key: web.test.in[Scenario,Step,bps]</p> <p>Type: float</p>
Response time for step 'Step' of scenario 'Scenario'	<p>This item will collect information about response time of the step in seconds.</p> <p>Item key: web.test.time[Scenario,Step]</p> <p>Type: float</p>
Response code for step 'Step' of scenario 'Scenario'	<p>This item will collect response codes of the step.</p> <p>Item key: web.test.rspcode[Scenario,Step]</p> <p>Type: integer</p>

These items can be used to create triggers and define notification conditions.

Example 1 Trigger “ZABBIX GUI login is too slow”

The trigger expression can be defined as: `{zabbix: web.test.time[ZABBIX GUI>Login]}.last(0)>3`

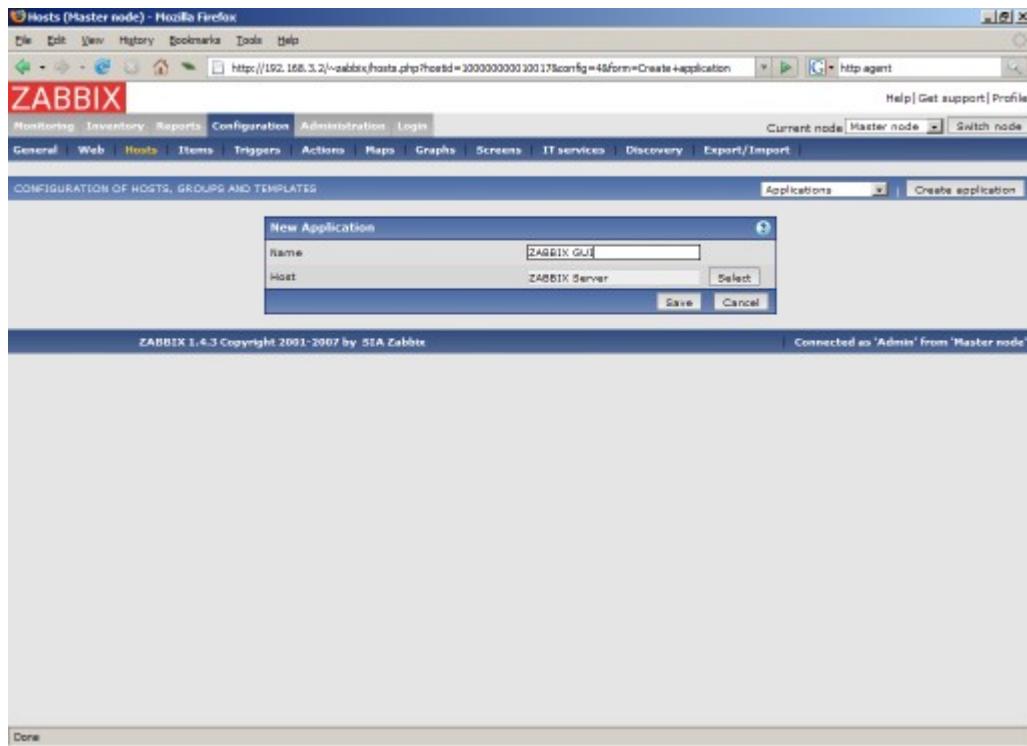
11.5. Real life scenario

Let's use ZABBIX WEB Monitoring for monitoring of ZABBIX WEB interface. We want to know if it is available, provides right content and how quickly it works.

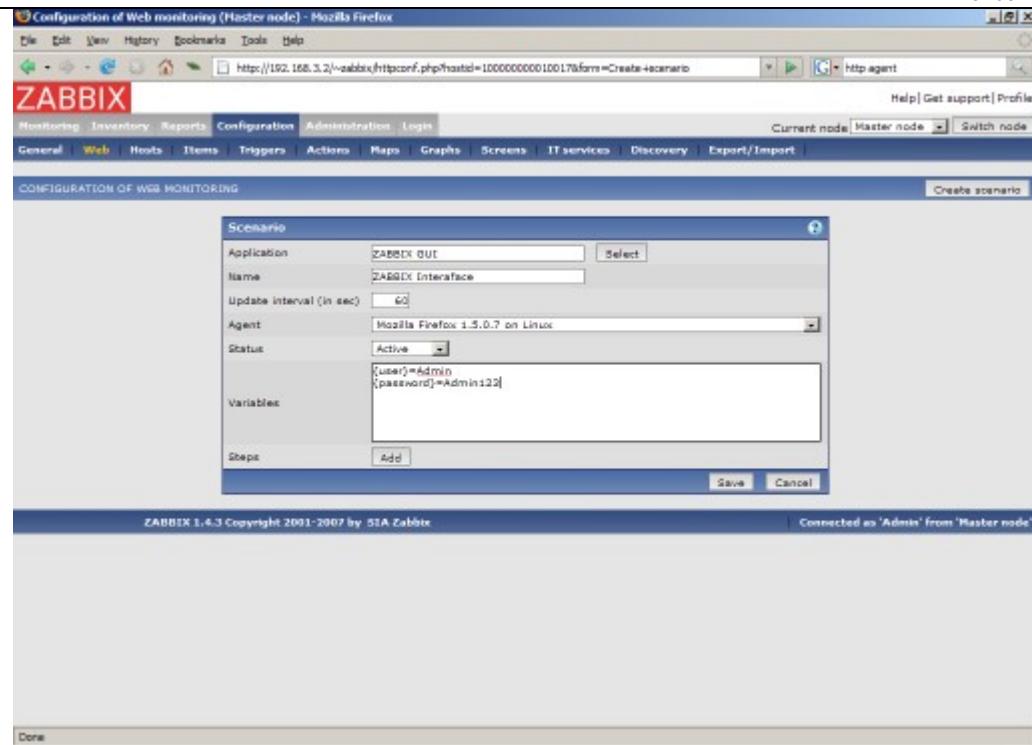
So, first we make a login with our user name and password and then we will try to access Configuration->General page.

Step 1 Add new host application.

This step is not required if you already have a suitable application. You may also want to create a host if one does not exist.

**Step 2** Add new WEB scenario.

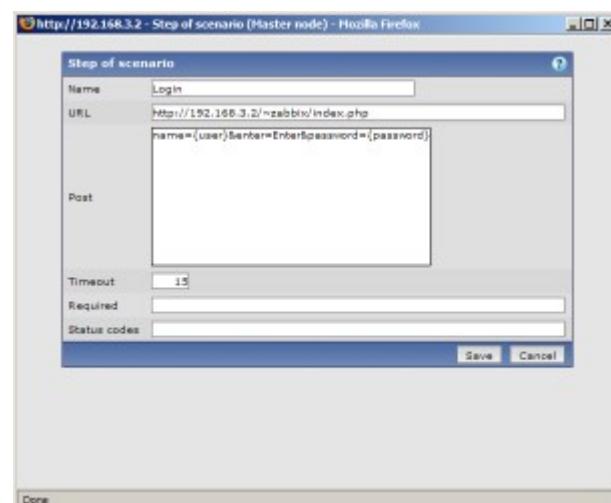
We add a new scenario for monitoring of ZABBIX WEB interface. The scenario will execute number of steps.



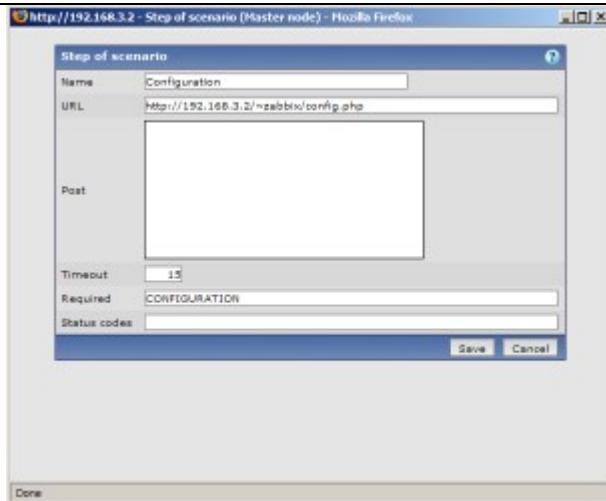
Note that we also created two macros, {user} and {password}.

Step 3 Define steps for the scenario.

Add steps for monitoring.



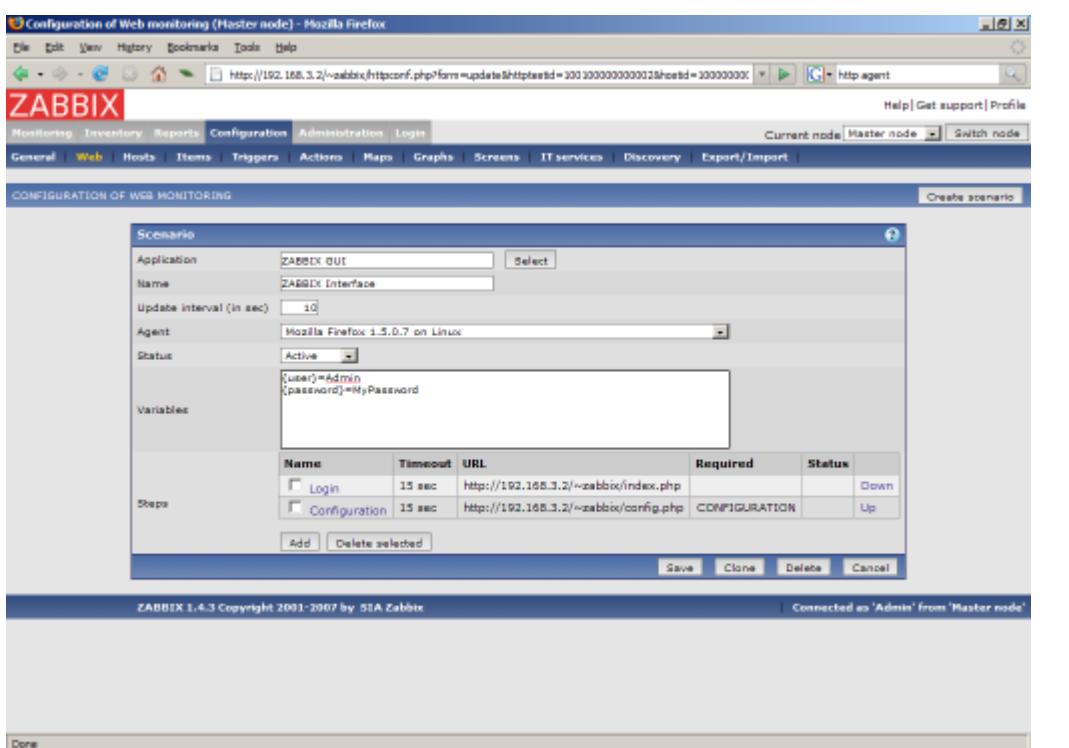
Scenario step 1. Note use of macros {user} and {password}.



Scenario step 2.

Step 4

Save Scenario.



The list of applications and linked scenarios will appear in Monitoring->WEB:

ZABBIX 1.4.3 Copyright 2001-2007 by SIA Zabbix

Connected as 'Admin' from 'Master node'

Done

Click on a scenario to see nice statistics:

Step	Speed	Response time	Response code	Status
Login	813 bps	0.11s	200	OK
Configuration	72.76 Kbps	0.08s	200	OK
TOTAL		0.2s		OK

History "ZABBIX Interface"

2008/10/17 00:00:00 - 2008/10/17 23:59:59 (1h history..)

Speed

ZABBIX Server: Download speed for step 'Configuration' of scenario 'ZABBIX Interface' (avg1 lmin10 bps max:77.86 Kbps last:72.76 Kbps)
 ZABBIX Server: Download speed for step 'Login' of scenario 'ZABBIX Interface' (avg1 lmin10 bps max:813 bps last:813 bps)

2008/10/17 00:00:00 - 2008/10/17 23:59:59 (1h history..)

Done

12.Log File Monitoring

12.1.Overview

ZABBIX can be used for centralised monitoring and analysis of log files. Notifications can be used to warn users when a log file contains certain strings or string patterns.

12.2.How it works

Monitoring of log files requires ZABBIX Agent running on a host. An item used for monitoring of a log files must have type **ZABBIX Agent (Active)**, its value type must be **Log** and key set to **log[path to log file<,pattern>]**.

Important notes:

- The server and agent keep a trace of the monitored log's size in a counter.
- The agent starts reading the log file from the point it stopped the previous time.
- The number of bytes already analyzed (the counter) is stored in the ZABBIX database and is sent to the agent, to make sure it starts reading the log file from this point.
- Whenever the log file becomes smaller than the log counter known by the agent, the counter is reset to zero and the agent starts reading the log file from the beginning.
- ZABBIX Agent processes new records of a log file once per **Refresh period** seconds.
- ZABBIX Agent does not send more than **10** lines of a log file per second. The limit prevents overloading of network and CPU resources.

13. Auto-discovery

13.1. 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.

13.2. 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, POP3, 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

13.3.How it works

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

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

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

13.3.1.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.

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

ZABBIX generates the following events:

Event	When generated
Service Up	Every time ZABBIX detects active service.
Service Down	Every time ZABBIX cannot detect service.
Host Up	If at least one of the services is UP for the IP.
Host Down	If all services are not responding.
Service Discovered	If the service is back after downtime or discovered for the first time.
Service Lost	If the service is lost after being up.
Host Discovered	If host is back after downtime or discovered for the first time.
Host Lost	If host is lost after being up.

13.3.2.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.

13.4.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 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 executed by ZABBIX server Disable – the rule is not active. It won’t be executed.

13.5.Real life scenario

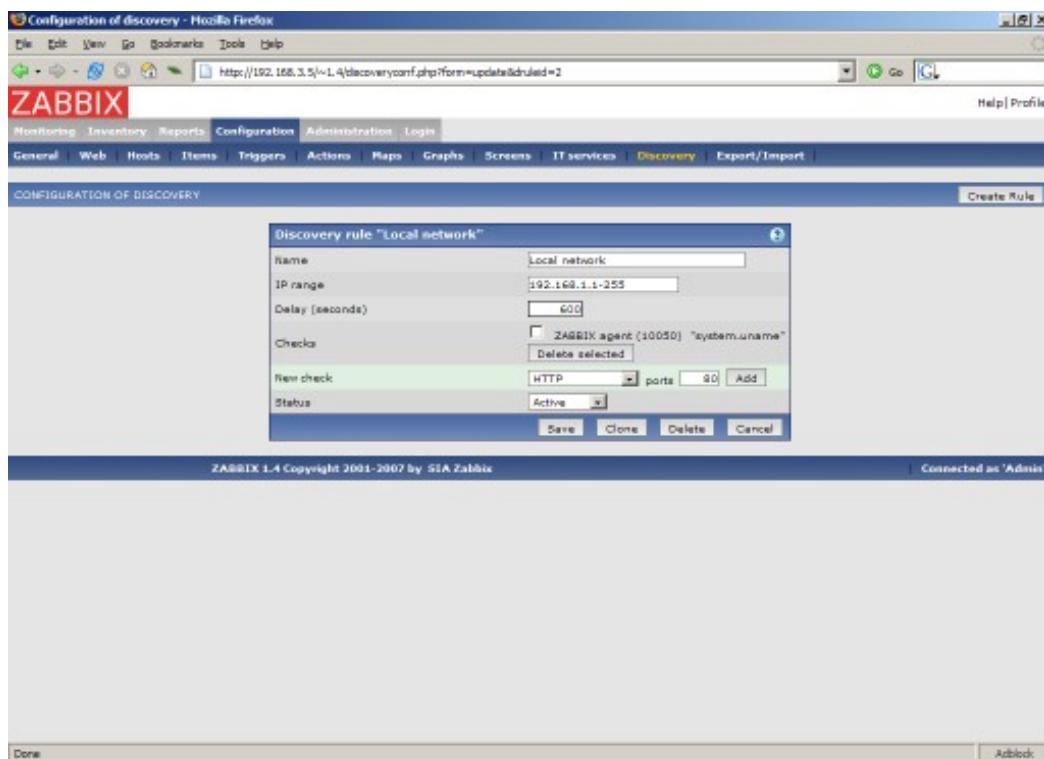
Suppose we would like to setup auto-discovery for local network having IP range of 192.168.1.1-192.168.1.255. In our scenario we want to:

- 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.



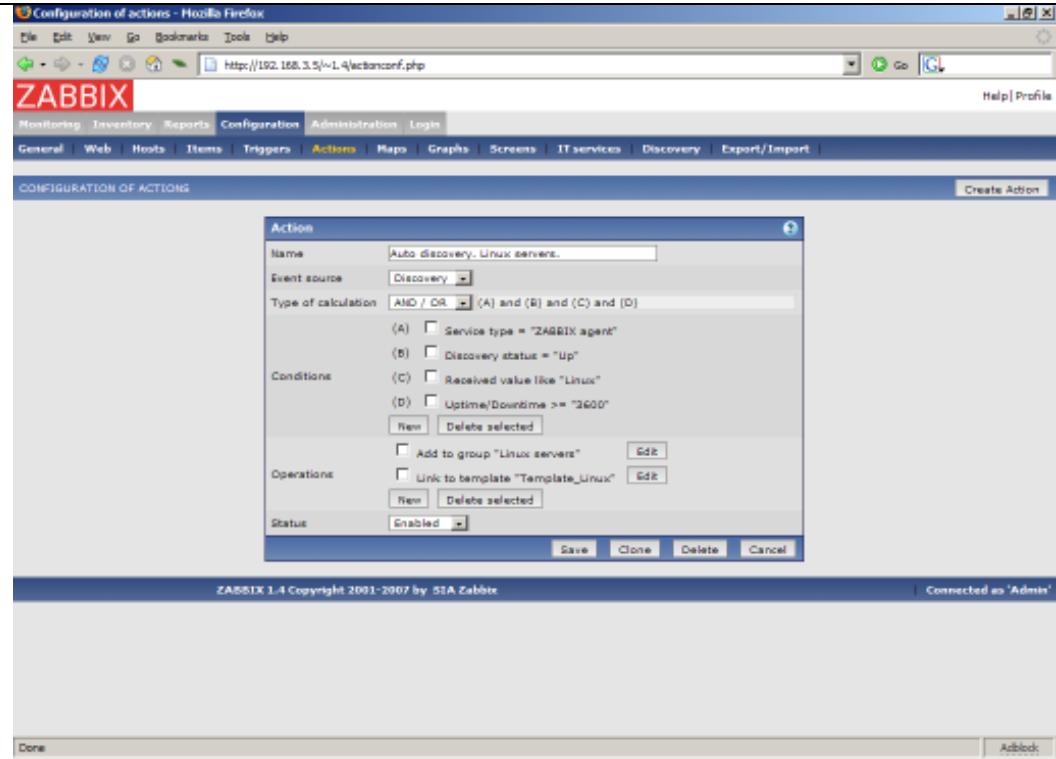
ZABBIX will try to discover hosts in IP range of 192.168.1.1-192.168.1.255 by connecting to ZABBIX Agents and getting system.uname. A value received from an agent can be used to apply different actions for different operating systems. For example, link Windows boxes to Windows_Template, Linux boxes to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

The screenshot shows the 'Configuration of actions' page in a Firefox browser window. The URL is <http://192.168.3.5/~1.4/actionconf.php>. The page title is 'ZABBIX'. The navigation menu includes Monitoring, Inventory, Reports, Configuration, Administration, and Login. The sub-menu for Configuration shows General, Web, Hosts, Items, Triggers, Actions (which is selected), Maps, Graphs, Screens, IT services, Discovery, and Export/Import.

The main content area is titled 'CONFIGURATION OF ACTIONS' and contains a form for defining an action named 'Auto discovery. Windows servers.'. The form fields include:

- Name:** Auto discovery. Windows servers.
- Event source:** Discovery
- Type of calculation:** AND / OR. (A) and (B) and (C) and (D)
 - (A) Service type = "ZABBIX agent"
 - (B) Discovery status = "Up"
 - (C) Received value like "Windows"
 - (D) Uptime/Downtime >= "3600"
- Conditions:** (None)
- Operations:**
 - Add to group "Windows servers" [Edit]
 - Link to template "Template_Windows" [Edit]
- Status:** Enabled

At the bottom of the form are buttons for Save, Clone, Delete, and Cancel.

The footer of the browser window displays 'ZABBIX 1.4 Copyright 2003-2007 by SIA Zabbix' and 'Connected as 'Admin''. A toolbar at the bottom of the page includes 'Done' and 'Adblock'.

Step 4

Define an action for removing lost servers.

The screenshot shows a configuration dialog titled 'Action' within the Zabbix interface. The 'Name' field contains 'Auto discovery. Remove lost servers.'. The 'Event source' is set to 'Discovery'. The 'Type of calculation' is 'AND / OR' with '(A) and (B) and (C)' selected. Under 'Conditions', there are three checkboxes: '(A)' (Service type = "ZABBIX agent"), '(B)' (Discovery status = "Down"), and '(C)' (Uptime/Downtime >= "86400"). Below these are 'Run' and 'Delete selected' buttons. Under 'Operations', there is a checkbox for 'Remove host' with 'Edit' and 'Run' buttons. At the bottom, the 'Status' is set to 'Enabled'. There are 'Save' and 'Cancel' buttons at the bottom right.

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

14. Advanced SNMP monitoring

14.1. Special MIBs

Some of the most used SNMP MIBs are translated automatically to a numeric representation by ZABBIX. For example, **ifIndex** is translated to **1.3.6.1.2.1.2.2.1.1**, **ifIndex.0** is translated to **1.3.6.1.2.1.2.2.1.1.0**.

The table contains list of the special MIBs.

Special MIB	Identifier	Description
ifIndex	1.3.6.1.2.1.2.2.1.1	A unique value for each interface.
ifDescr	1.3.6.1.2.1.2.2.1.2	A textual string containing information about the interface. This string should include the name of the manufacturer, the product name and the version of the hardware interface.
ifType	1.3.6.1.2.1.2.2.1.3	The type of interface, distinguished according to the physical/link protocol(s) immediately 'below' the network layer in the protocol stack.
ifMtu	1.3.6.1.2.1.2.2.1.4	The size of the largest datagram which can be sent / received on the interface, specified in octets.
ifSpeed	1.3.6.1.2.1.2.2.1.5	An estimate of the interface's current bandwidth in bits per second.
ifPhysAddress	1.3.6.1.2.1.2.2.1.6	The interface's address at the protocol layer immediately 'below' the network layer in the protocol stack.
ifAdminStatus	1.3.6.1.2.1.2.2.1.7	The current administrative state of the interface.
ifOperStatus	1.3.6.1.2.1.2.2.1.8	The current operational state of the interface.
ifInOctets	1.3.6.1.2.1.2.2.1.10	The total number of octets received on the interface,

Special MIB	Identifier	Description
		including framing characters.
ifInUcastPkts	1.3.6.1.2.1.2.2.1.11	The number of subnetwork-unicast packets delivered to a higher-layer protocol.
ifInNUcastPkts	1.3.6.1.2.1.2.2.1.12	The number of non-unicast (i.e., subnetwork-broadcast or subnetwork-multicast) packets delivered to a higher-layer protocol.
ifInDiscards	1.3.6.1.2.1.2.2.1.13	The number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. One possible reason for discarding such a packet could be to free up buffer space.
ifInErrors	1.3.6.1.2.1.2.2.1.14	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
ifInUnknownProtos	1.3.6.1.2.1.2.2.1.15	The number of packets received via the interface which were discarded because of an unknown or unsupported protocol.
ifOutOctets	1.3.6.1.2.1.2.2.1.17	The total number of octets transmitted out of the interface, including framing characters.
ifOutNUcastPkts	1.3.6.1.2.1.2.2.1.18	The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including those that were discarded or not sent.
ifOutDiscards	1.3.6.1.2.1.2.2.1.19	The number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being transmitted. One possible reason for discarding such a packet could be to free up buffer space.
ifOutErrors	1.3.6.1.2.1.2.2.1.20	The number of outbound packets that could not be transmitted because of errors.

Special MIB	Identifier	Description
ifOutQLen	1.3.6.1.2.1.2.2.1.21	The length of the output packet queue (in packets).

14.2. Use of dynamic indexes

A special syntax for item OID can be used in order to deal with dynamic data (random IDs of network interfaces, etc).

The syntax:

<base OID of data>[“index”, “<base OID of index>”, “<string to search for>”]

For example, to get the ifInOctets value for the GigabitEthernet0/1 interface on a Cisco device, yo may following OID:

ifInOctets[“index”, “ifDescr”, “GigabitEthernet0/1”]

Parameter	Description
base OID of data	Base OID to use for data retrieval.
index	Method of processing. Currently one method is supported: index – search for index and append it to the base OID
base OID of index	The OID will be used to make a lookup for the string.
string to search for	The string is used for exact match with a value when doing lookup. Case sentitive.

Another example, getting memory usage of apache process:

HOST-RESOURCES-MIB::hrSWRunPerfMem[“index”, “HOST-RESOURCES-MIB::hrSWRunPath”, “/usr/sbin/apache2”]

...

HOST-RESOURCES-MIB::hrSWRunPath.5376 = STRING: "/sbin/getty"

HOST-RESOURCES-MIB::hrSWRunPath.5377 = STRING: "/sbin/getty"

HOST-RESOURCES-MIB::hrSWRunPath.5388 = STRING: "/usr/sbin/apache2"

HOST-RESOURCES-MIB::hrSWRunPath.5389 = STRING: "/sbin/sshd"

...

Now we have index, 5388. The index will be appended to the Data OID in order to receive value we are interested in:

HOST-RESOURCES-MIB::hrSWRunPerfMem.5376 = INTEGER: 528 KBytes

HOST-RESOURCES-MIB::hrSWRunPerfMem.5377 = INTEGER: 528 KBytes

HOST-RESOURCES-MIB::hrSWRunPerfMem.5388 = INTEGER: 31468 KBytes

HOST-RESOURCES-MIB::hrSWRunPerfMem.5389 = INTEGER: 31740 KBytes

HOST-RESOURCES-MIB::hrSWRunPerfMem.5390 = INTEGER: 32116 KBytes

HOST-RESOURCES-MIB::hrSWRunPerfMem.5391 = INTEGER: 30420 KBytes

HOST-RESOURCES-MIB::hrSWRunPerfMem.5392 = INTEGER: 32560 Kbytes

Note:

Use dynamic indexes with care as it leads to more SNMP queries. ZABBIX does not perform caching, so the lookup is performed anytime the item value is retrieved.

15. Monitoring of IPMI devices

15.1. Goals

There are several goals of ZABBIX IPMI monitoring:

- Monitoring of health and availability of IPMI devices
- Remote IPMI based management functions

Remote restart, shutdown, halt, and other commands can be executed either automatically or manually from ZABBIX front-end.

15.2. IPMI parameters

ZABBIX IPMI monitoring works only for devices having IPMI support (HP iLO, Sun hardware, etc).

In order to use IPMI monitoring, a host must be configured to process IPMI commands. IPMI agent's IP address, port number, user name and password must be configured properly.

See configuration of hosts for more details.

15.3. IPMI actions

Two types of actions can be defined:

- automatic actions, which are executed automatically
- IPMI scripts, can be executed manually from ZABBIX GUI

See corresponding sections of the Manual for more details.

16. Use of Proxies

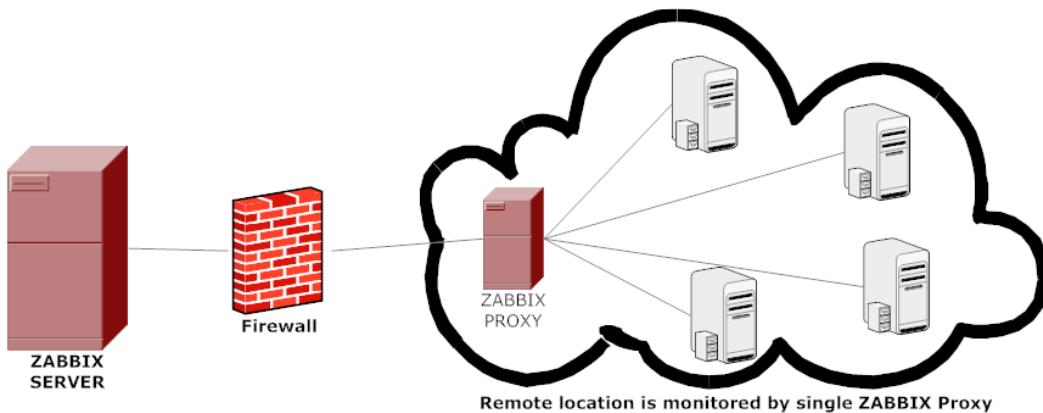
ZABBIX Proxies may greatly simplify maintenance of ZABBIX environment and increase performance of central ZABBIX server.

Also, use of ZABBIX Proxies is the easiest way of implementing centralized and distributed monitoring, when all Agents and Proxies report to one ZABBIX server and all data is collected centrally.

16.1. Why use Proxy

ZABBIX Proxy can be used for many purposes:

- Offload ZABBIX Server when monitoring thousands of devices
- Monitor remote locations



- Monitor locations having unreliable communications
- Simplify maintenance of distributed monitoring

16.2. Proxy v.s. Node

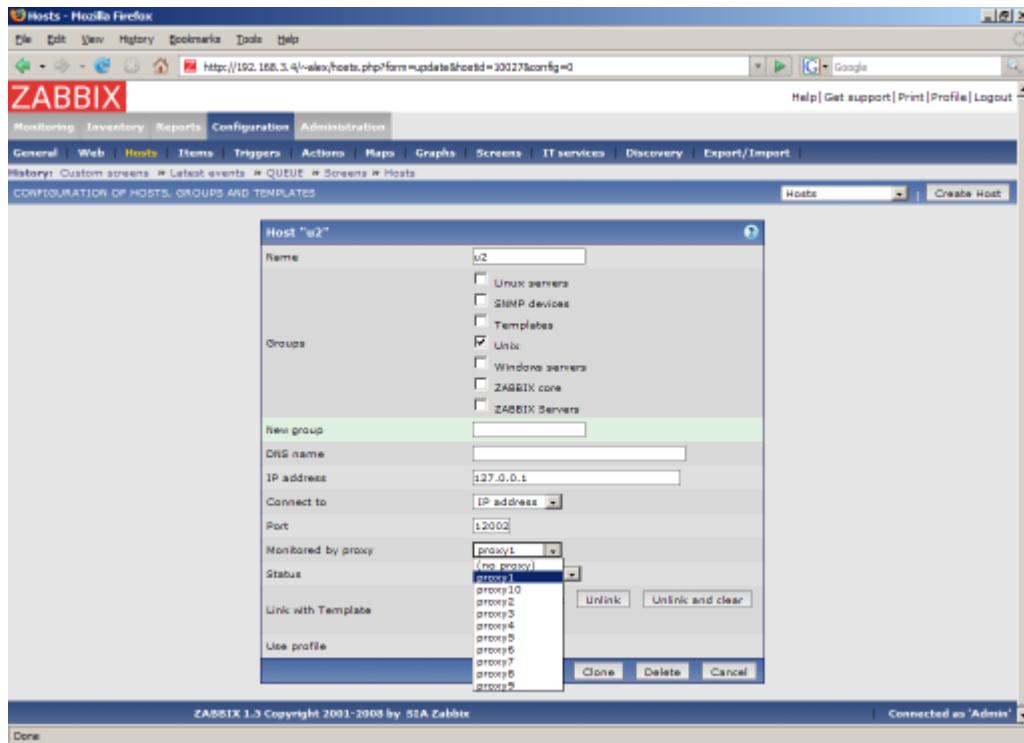
When making a choice between use of a Proxy or a Node, several considerations must be taken into account.

	Lightweight	GUI	Works independently	Easy maintenance	Automatic DB creation	Local administration	Ready for embedded hardware	One way TCP connections	Centralised configuration	Generates notifications
--	-------------	-----	---------------------	------------------	-----------------------	----------------------	-----------------------------	-------------------------	---------------------------	-------------------------

Node	No	Yes	Yes	No	No	Yes	No	Yes	No	Yes
Proxy	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	No

16.3.Configuration

Every host can be monitored either by ZABBIX Server or by ZABBIX Proxy. This is configured in host definition screen:



If a host is configured to be monitored by a Proxy, the Proxy will perform gathering of performance and availability data for the host. The data will be collected by the Proxy and sent to ZABBIX Server for further processing.

17.Distributed Monitoring

ZABBIX can be configured to support **hierarchical** distributed monitoring.

17.1.Goals

There are several goals of the distributed monitoring:

- Get control of whole monitoring from a single or several locations

ZABBIX administrator may control configuration of all Nodes from a single ZABBIX WEB front-end.

- Hierarchical monitoring

This is for monitoring of complex multi-level environments.

- 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!

17.2.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 Child Nodes. Configuration of Child Nodes can be done in off line mode, i.e. when there are no connectivity between Master and Child Node.

Hierarchical distributed monitoring allows having tree-like structure of Nodes. Each Node reports to its Master Node only.

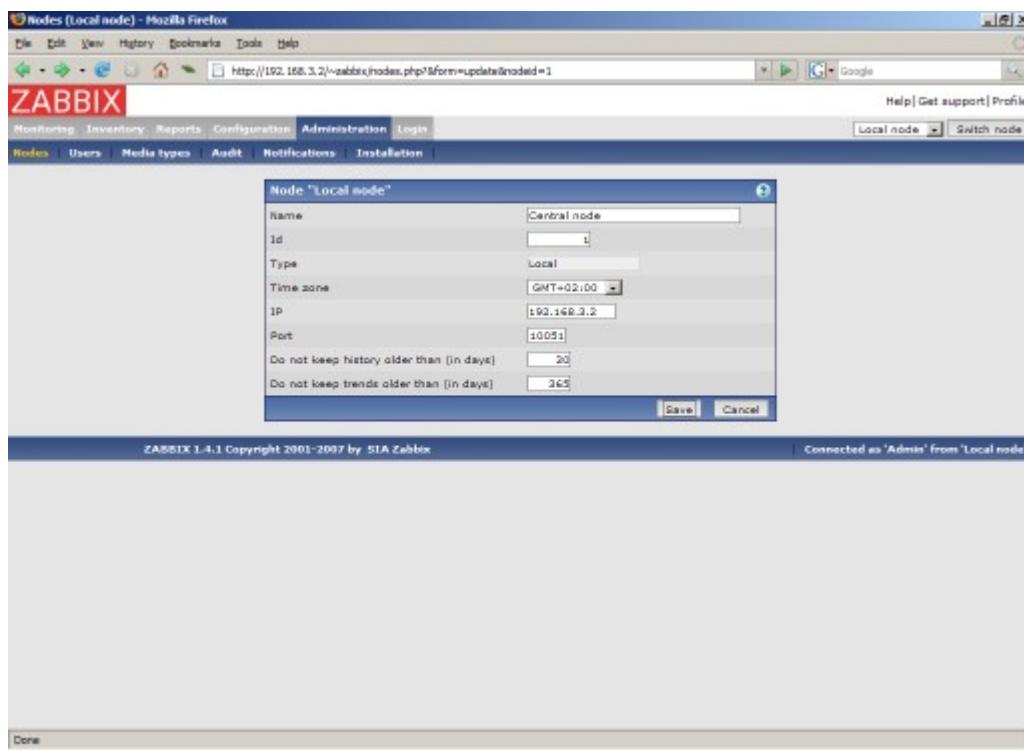
All Nodes may work even in case of communication problems. Historical information and events are stored locally. When communication is back, Child Nodes will optionally send the data to Master Node.

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.

17.3.Configuration

17.3.1.Configuration of Nodes



Parameters of a Node:

Parameter	Description
Name	Unique node name.
Id	Unique Node ID.
Type	Local – Local node Remote – Remote node
Time zone	Time zone of the Node. ZABBIX automatically converts time stamps to local timezone when transferring time related data across nodes.
IP	Node IP address. ZABBIX trapper must be listening on this IP address.
Port	Node Port number. ZABBIX trapper must be listening on this port number. Default is 10051.
Do not keep history older than (in sec)	For non local historical data only. ZABBIX won't keep history of the node longer than N seconds.
Do not keep trends older than (in sec)	For non local trend data only. ZABBIX won't keep trends of the node longer than N seconds.

17.3.2.Simple configuration

Our simple configuration consists of a Central Node and a Child One.

Central Node will have total control over configuration of Child Node. ChildNode will report to central node events, history and trends.

Central Node will have NodeID=1, while Child Node's NodeID=2.

Central Node IP: 192.168.3.2, Port: 10051

Child Node IP: 192.168.3.5, Port: 15052

For Central Node:

Step 1 Install ZABBIX.

Follow standard installation instructions to create database, install ZABBIX frontend and binaries.

Step 2 Setup NodeID in server configuration file.

In file zabbix_server.conf:

NodeID=1

Step 3 Convert database data.

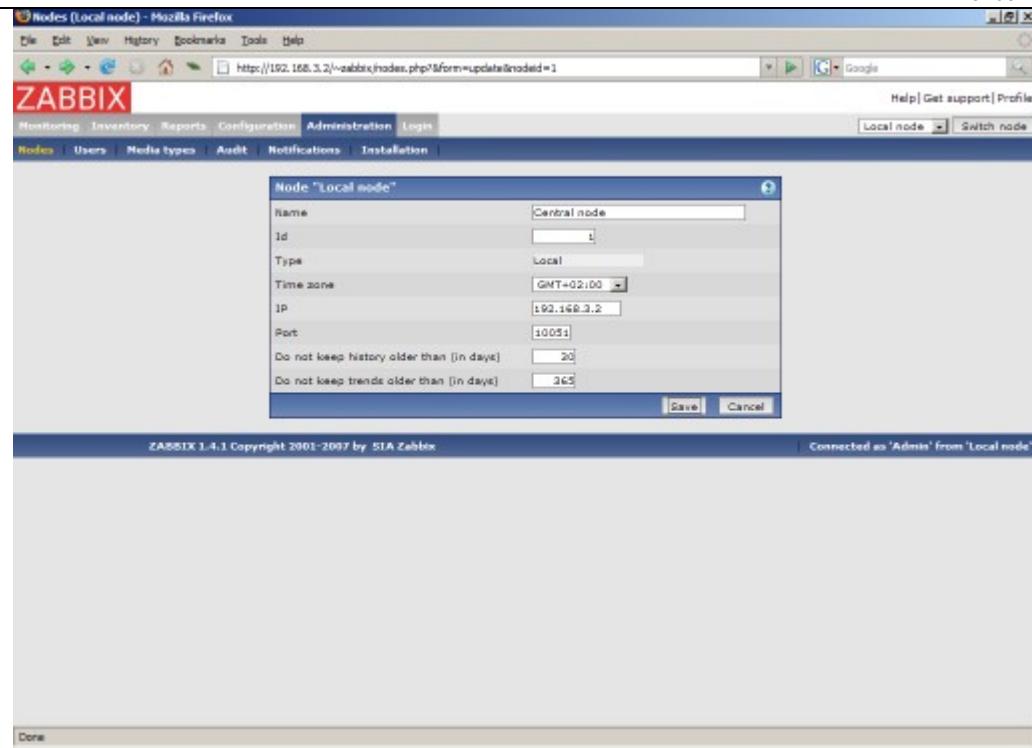
ZABBIX server has to be executed to convert unique IDs for use by first node.

```
cd bin  
./zabbix_server -n 1 -c /etc/zabbix/zabbix_server.conf  
Converting tables ..... done.
```

Conversion completed.

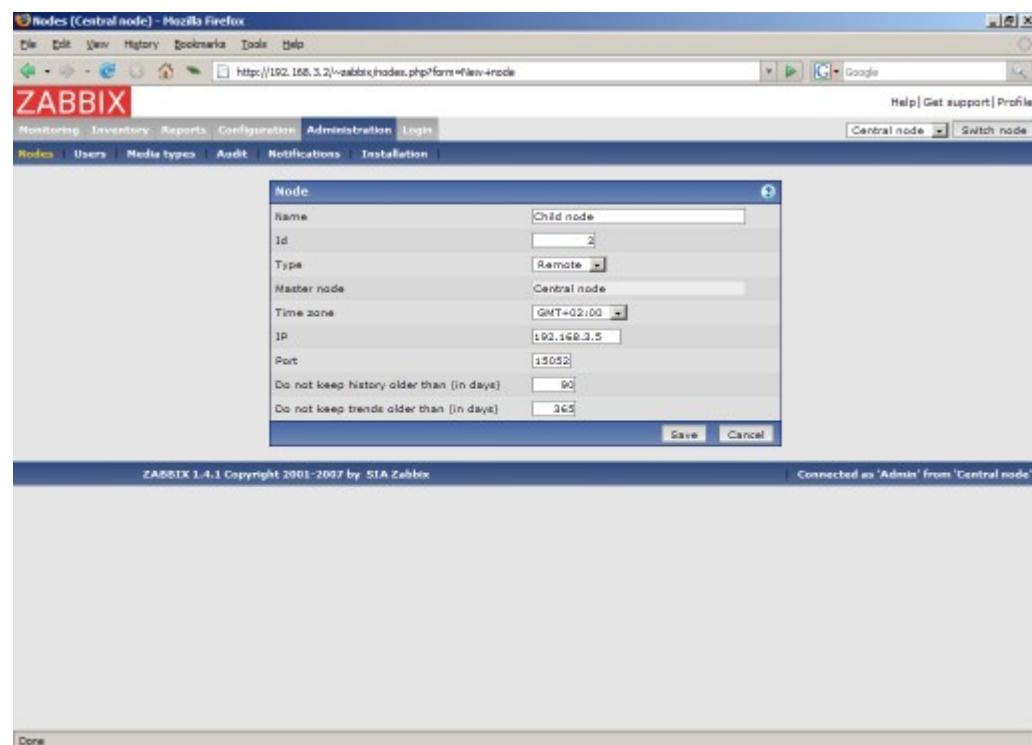
Note: This should be executed only once. This option is not required to start ZABBIX server!

Step 4 Configure Node parameters.



Step 5

Add child node.



Step 6 Start Master Node.

We should see NodeID in startup messages of server log file:

```
31754:20070629:150342 server #16 started [Node watcher. Node ID:1]
```

For Child Node:**Step 1** Install ZABBIX.

Follow standard installation instructions to create database, install ZABBIX frontend and binaries.

Step 2 Setup NodeID in server configuration file.

In file zabbix_server.conf:

```
NodeID=2
```

Step 3 Convert database data.

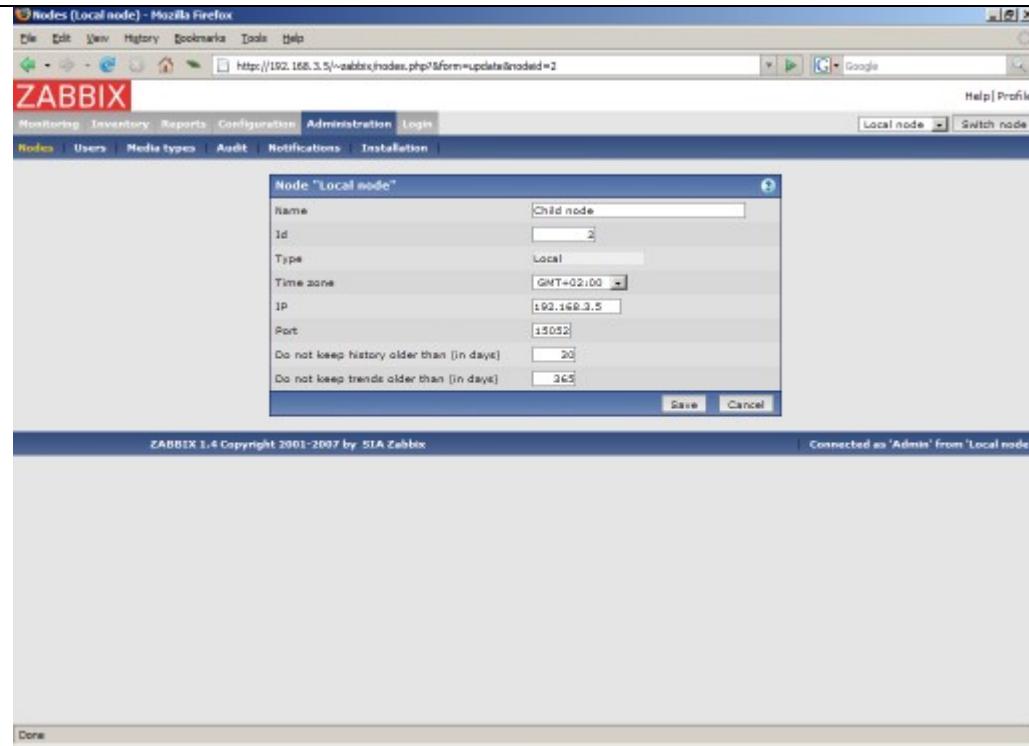
ZABBIX server has to be executed to convert unique IDs for use by first node.

```
cd bin  
./zabbix_server -n 2 -c /etc/zabbix/zabbix_server.conf  
Converting tables ..... done.
```

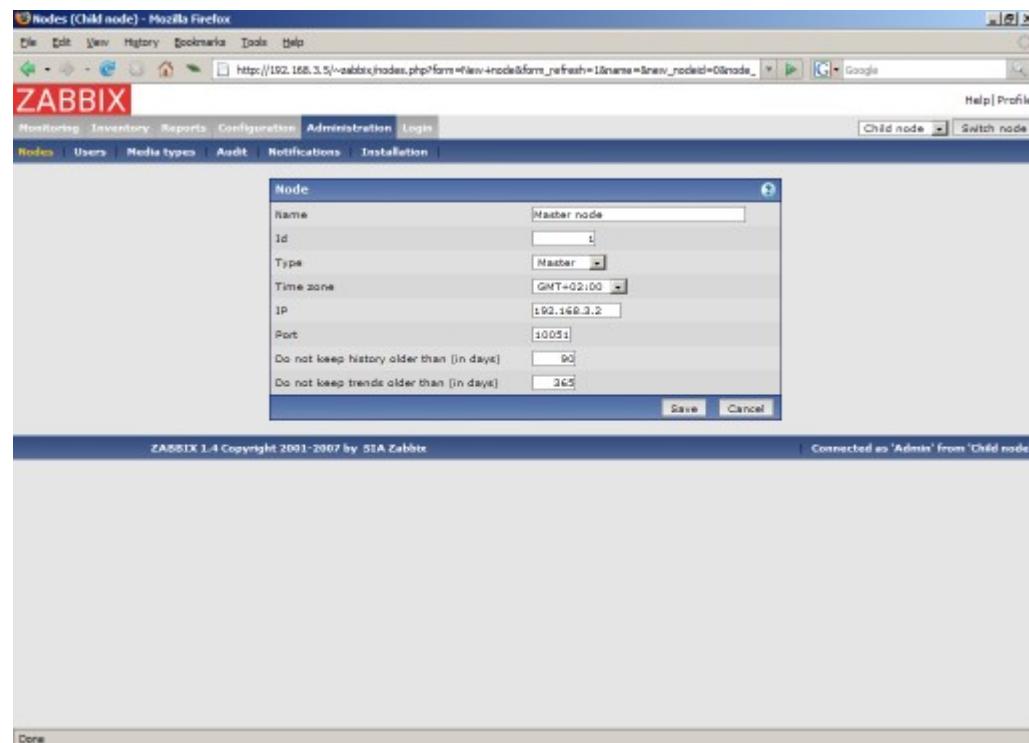
Conversion completed.

Note: This should be executed only once. This option is not required to start ZABBIX server!

Step 4 Configure Node parameters.



Step 5 Add master node.



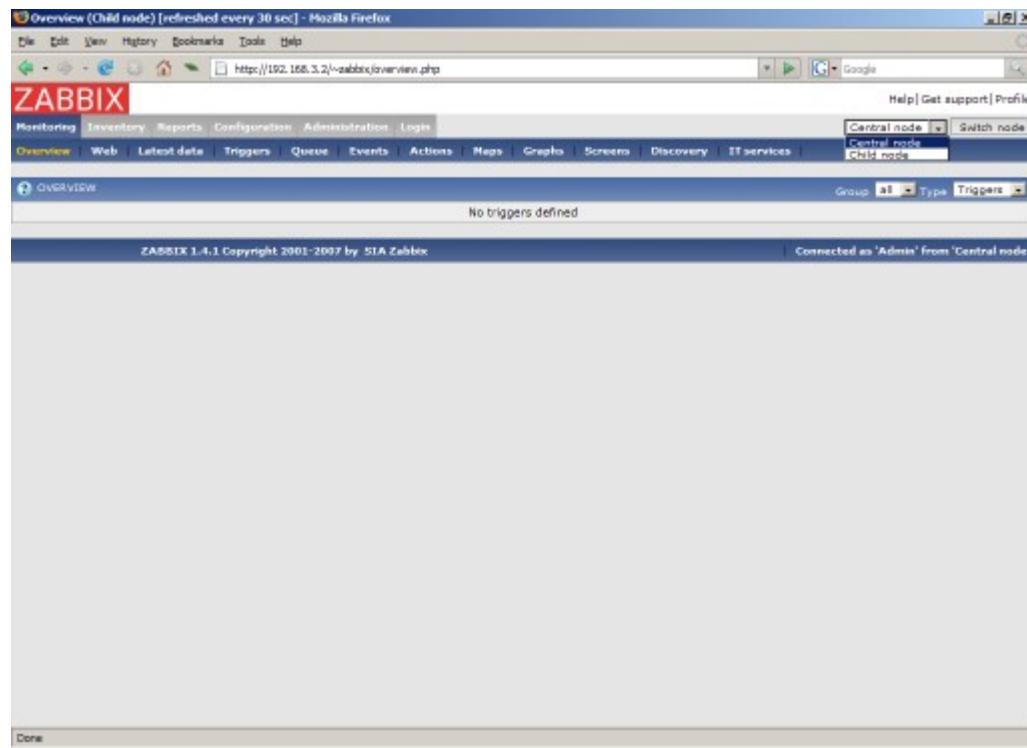
Step 6 Start Child Node.

We should see NodeID in startup messages of server log file:

27524:20070629:150622 server #9 started [Node watcher. Node ID:2]

Does it work?

Selection of active nodes will appear automatically after nodes are defined:

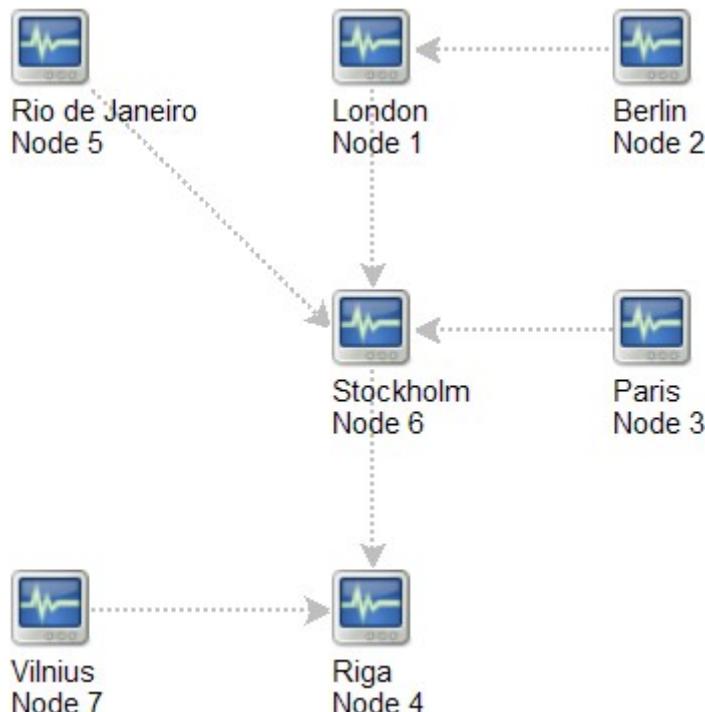


Add host for monitoring for Child Node node and see events coming to Master Node:

Time	Description	Value	Severity
2007.Jun.29 15:21:27	/usr/sbin/sshd has been changed on server ZABBIX Server	ON	Average
2007.Jun.29 15:21:26	/usr/bin/ssh has been changed on server ZABBIX Server	ON	Average
2007.Jun.29 15:21:25	/etc/services has been changed on server ZABBIX Server	ON	Average
2007.Jun.29 15:21:24	/etc/passwd has been changed on server ZABBIX Server	ON	Average
2007.Jun.29 15:21:23	/etc/inetd.conf has been changed on server ZABBIX Server	ON	Warning
2007.Jun.29 15:19:45	ZABBIX Server has just been restarted	ON	Information
2007.Jun.29 15:19:45	Apache is not running on ZABBIX Server	OFF	Average
2007.Jun.29 15:19:45	Email (SMTP) server is down on ZABBIX Server	ON	Average
2007.Jun.29 15:19:45	FTP server is down on ZABBIX Server	OFF	Average
2007.Jun.29 15:19:45	IMAP server is down on ZABBIX Server	OFF	Average
2007.Jun.29 15:19:45	Inetd is not running on ZABBIX Server	OFF	Average
2007.Jun.29 15:19:45	Lack of free memory on server ZABBIX Server	ON	Average
2007.Jun.29 15:19:45	Mysqld is not running on ZABBIX Server	ON	Average
2007.Jun.29 15:19:45	News (NNTP) server is down on ZABBIX Server	OFF	Average
2007.Jun.29 15:19:45	POP3 server is down on ZABBIX Server	OFF	Average
2007.Jun.29 15:19:45	SSH server is down on ZABBIX Server	ON	Average
2007.Jun.29 15:19:45	Sehd is not running on ZABBIX Server	ON	Average
2007.Jun.29 15:19:45	Syslogd is not running on ZABBIX Server	ON	Average
2007.Jun.29 15:19:45	Too many processes running on ZABBIX Server	ON	Average
2007.Jun.29 15:19:45	Too many users connected on server ZABBIX Server	ON	Average
2007.Jun.29 15:19:45	WEB (HTTP) server is down on ZABBIX Server	ON	Average
2007.Jun.29 15:19:45	Zabbix_agentd is not running on ZABBIX Server	ON	Average

17.3.3. More complex 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 child nodes. It may also optionally collect historical information as well.

17.4. Platform independence

A node may use its own platform (OS, hardware) and database engine independently of other nodes. Also child 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 a better hardware with MySQL InnoDB, Oracle or PostgreSQL backend.

17.5. Configuration of a single Node

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

Additional steps

Step 1 Follow standard installation procedure.

Follow standard installation procedure but do not start ZABBIX Server. ZABBIX front end must be installed and configured. ZABBIX database must be created and populated with data from data.sql.

Step 2 Configure zabbix_server.conf.

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

Step 3 Configure Master and Child Nodes.

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

Step 4 Start ZABBIX Node.

Start ZABBIX Server:

```
shell> ./zabbix_server
```

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

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

17.6.Switching between nodes

When connecting to a node in distributed setup, a list of available child nodes is accessible in right-upper corner of the GUI. It displays current node.

All information available in the GUI belongs to the selected node.

17.7.Data flow

17.7.1.Child to Master

Each Child Node periodically sends configuration changes, historical data and events to its Master Node.

Data	Frequency
Configuration changes	Every 120 seconds.
Events	Every 10 seconds.
History	Every 10 seconds.

Child Node will resend data in case of communication problems.

Trends are calculated locally based on received historical data.

ZABBIX does not send operational data across the nodes. For example, item-related information (last check, last value, etc) exists only locally.

Note: Sending of Events and History can be controlled by configuration parameters **NodeNoEvents** and **NodeNoHistory**.

17.7.2.Master to Child

Each Master Node (a node with at least one child) periodically sends configuration changes to Child Nodes either directly or via other Child Nodes directly connected to the Master Node.

Data	Frequency
Configuration changes	Every 120 seconds.

ZABBIX does not send configuration of a Master Node to Childs.

17.7.3. Firewall settings

Inter-node communications use TCP protocol only.

Data flow	Source port	Destination port
Child to Master	Any	10051
Master to Child	Any	10051

This is default port used by ZABBIX trapper process.

17.8. Performance considerations

Any node requires more processing resources in a distributed setup. Master Node must be powerful enough to process and store not only local data but also data received from its all Child Nodes. Network communications must be also fast enough for timely transfer of new data.

18. Maintenance mode for ZABBIX GUI

ZABBIX GUI can be temporarily disabled in order to prohibit access to the front-end. This can be useful for protection of ZABBIX database from any changes initiated by users, thus protecting integrity of database.

ZABBIX database can be stopped while ZABBIX GUI is in the maintenance mode.

18.1. Goals

There are several goals of the maintenance mode:

- Protect ZABBIX database from any changes initiated by users
- Perform database maintenance
- Inform users about reason of the maintenance work
- Users from a range of IP addresses will be able to work with the GUI during the maintenance mode normally
- Automatic return to normal mode when maintenance is over

18.2. Configuration

In order to enable maintenance mode, file **conf/maintenance.conf.php** must be modified to uncomment the following lines:

```
// Maintenance mode
define('ZBX_DENY_GUI_ACCESS',1);

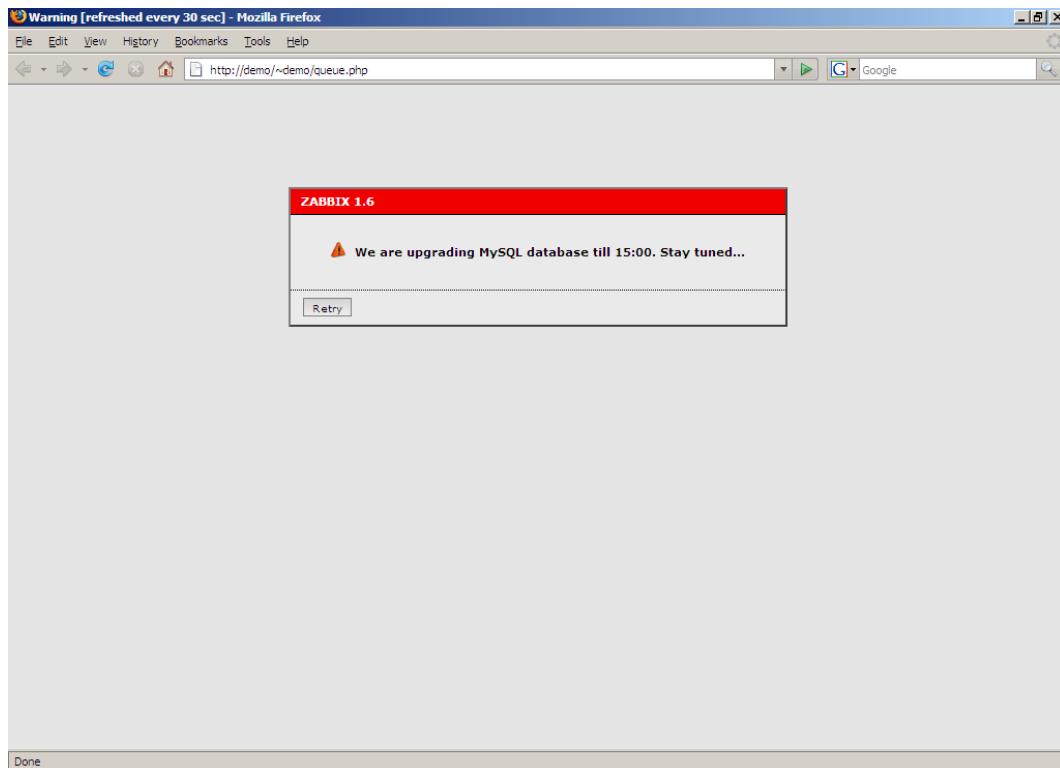
// IP range, who allowed to connect to FrontEnd
$ZBX_GUI_ACCESS_IP_RANGE = array('127.0.0.1');

// MSG showed on Warning screen!
$_REQUEST['warning_msg'] = 'ZABBIX is under maintenance.';
```

Parameter	Details
ZBX_DENY_GUI_ACCESS	Enable maintenance mode: 1 – maintenance mode is enabled, disabled otherwise
ZBX_GUI_ACCESS_IP_RANGE	Connections from these IP addresses will be allowed with no maintenance mode. For example: 192.168.1.1-255
warning_msg	Informative message.

18.3. How it looks like

The following screen will be displayed while in maintenance mode. The screen is refreshed every 30 seconds in order to return to normal state without user intervention when maintenance is over.



19.WEB Interface

There are several useful features of ZABBIX WEB interface:

- almost all screens support full-screen mode
- Ctrl + Mouse click make possible selection of multiple list elements (hosts, items, triggers, etc)
- sound alarm can be switched on and off in Status of Triggers view
- a new theme can be created to match your preferences or a company color schema

19.1.Creating your own theme

By default, ZABBIX provides number of predefined themes. You may follow this step-by-step procedure in order to create your own. Feel free to share result of your work with ZABBIX community if you created something nice.

Step 1 Create your own CSS file.

The file can be based on existing CSS files coming with ZABBIX. For example, you may take Black&Blue CSS file from `styles/css_bb.css` and create new `css_new.css`.

Step 2 Place the new CSS file into correct location.

The file you created, `css_new.css`, into directory `styles/`.

Step 3 Edit `include/forms.inc.php`.

Open this file for editing, search for `css_bb.css`. There are two pieces of code that have to be amended.

Original code:

```
$cmbTheme = new CComboBox('theme',$theme);
$cmbTheme->AddItem(ZBX_DEFAULT_CSS,S_SYSTEM_DEFAULT);
$cmbTheme->AddItem('css_ob.css',S_ORIGINAL_BLUE);
$cmbTheme->AddItem('css_bb.css',S_BLACK_AND_BLUE);
```

Modified code:

```
$cmbTheme = new CComboBox('theme',$theme);
$cmbTheme->AddItem(ZBX_DEFAULT_CSS,S_SYSTEM_DEFAULT);
$cmbTheme->AddItem('css_ob.css',S_ORIGINAL_BLUE);
$cmbTheme->AddItem('css_bb.css',S_BLACK_AND_BLUE);
$cmbTheme->AddItem('css_new.css','MY_COOL_THEME');
```

Step 4

Activate new theme.

In ZABBIX GUI, you may either set this theme to be a default one or change your theme in user profile.

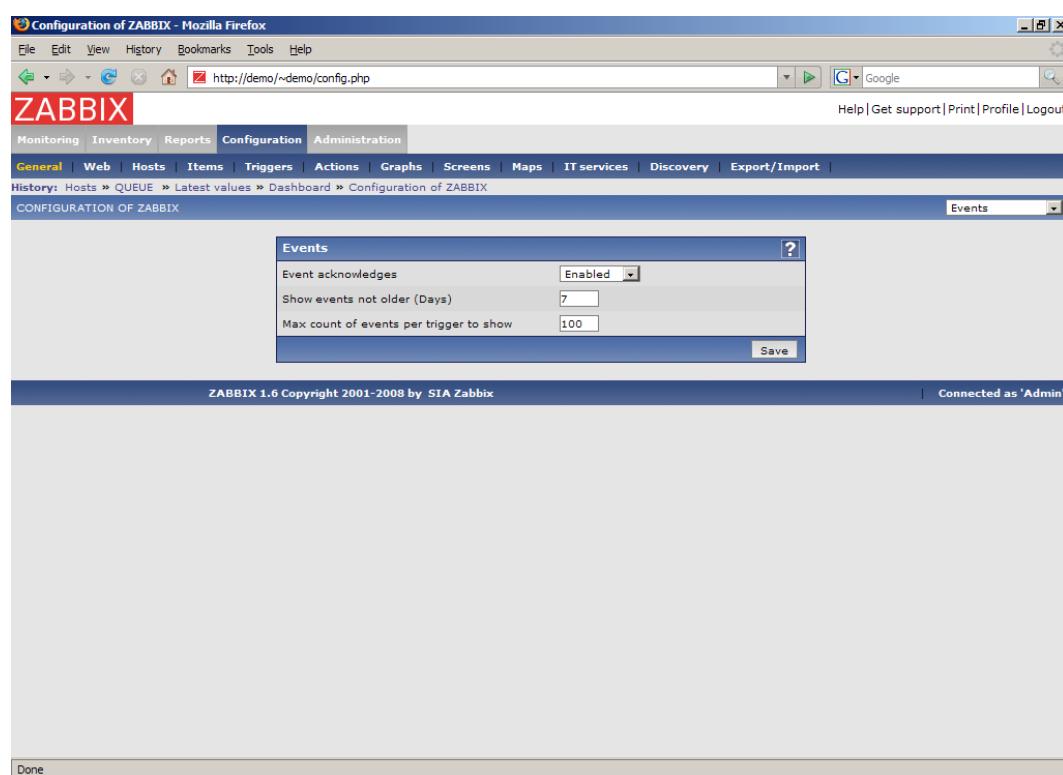
Enjoy new look and feel!

19.2.Configuration

19.2.1.General

19.2.1.1.Events

The screen defines event related settings.

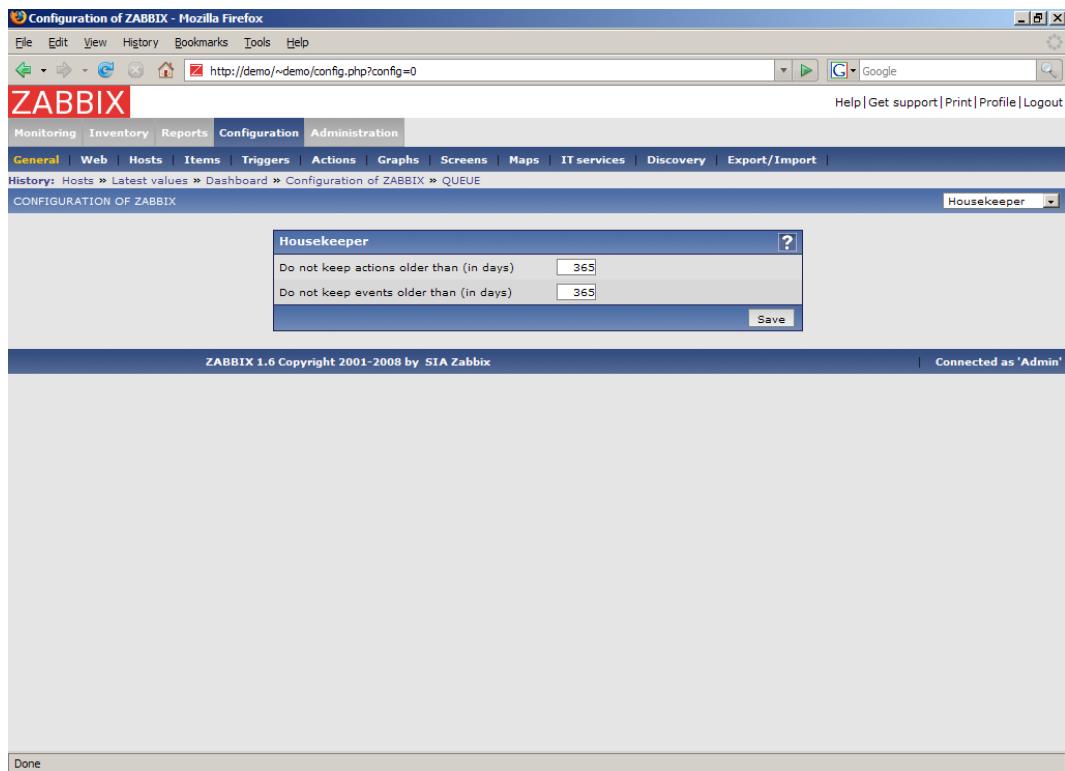


Configuration parameters:

Parameter	Description
Event acknowledges	This parameter defines if event acknowledges are activated in ZABBIX interface.
Show events no older (Days)	This parameter defines for how many days event are displayed in Status of Triggers screen. Default is 7 days.
Max count of events per trigger to show	Maximum number of event to show for each trigger in Status of Triggers screen. Default is 100.

19.2.1.2.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 will be removed.

19.2.1.3.Images

List of images

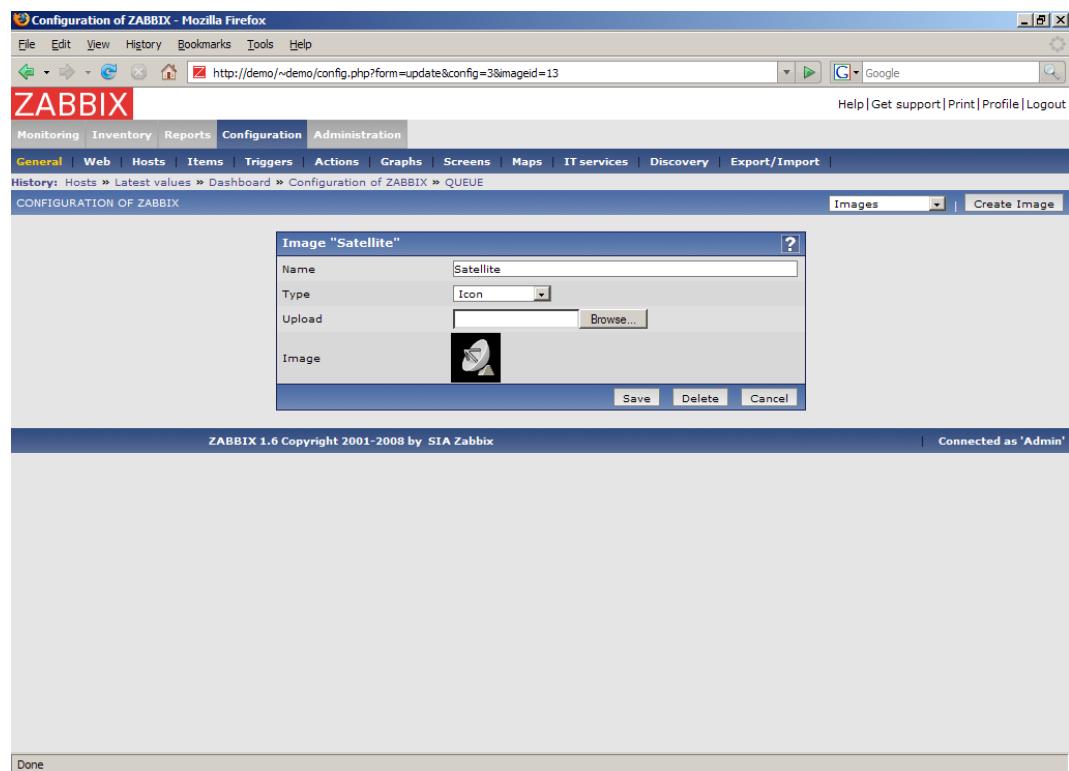
The screenshot shows a Mozilla Firefox browser window displaying the Zabbix configuration interface. The URL is <http://demo/~demo/config.php?config=3>. The page title is "Configuration of ZABBIX - Mozilla Firefox". The main menu includes Monitoring, Inventory, Reports, Configuration (selected), Administration, Help, Get support, Print, Profile, and Logout. The sub-menu under Configuration includes General, Web, Hosts, Items, Triggers, Actions, Graphs, Screens, Maps, IT services, Discovery, and Export/Import. The current view is "QUEUE" under "HOSTS". A toolbar at the top right has "Images" and "Create Image" buttons. The main content area is titled "CONFIGURATION OF ZABBIX" and contains a table titled "IMAGES". The table has columns "Name", "Type", and "Image". The "Name" column lists various network device icons: Hub, Hub (small), Network, Network (small), Notebook, Notebook (small), Phone, Phone (small), Printer, Printer (small), Router, Router (small), Satellite, Satellite (small), Server, Server (small), and UPS. Each entry has an "Icon" type and a corresponding small icon to its right.

Name	Type	Image
Hub	Icon	
Hub (small)	Icon	
Network	Icon	
Network (small)	Icon	
Notebook	Icon	
Notebook (small)	Icon	
Phone	Icon	
Phone (small)	Icon	
Printer	Icon	
Printer (small)	Icon	
Router	Icon	
Router (small)	Icon	
Satellite	Icon	
Satellite (small)	Icon	
Server	Icon	
Server (small)	Icon	
UPS	Icon	
Done		

Image definition

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.

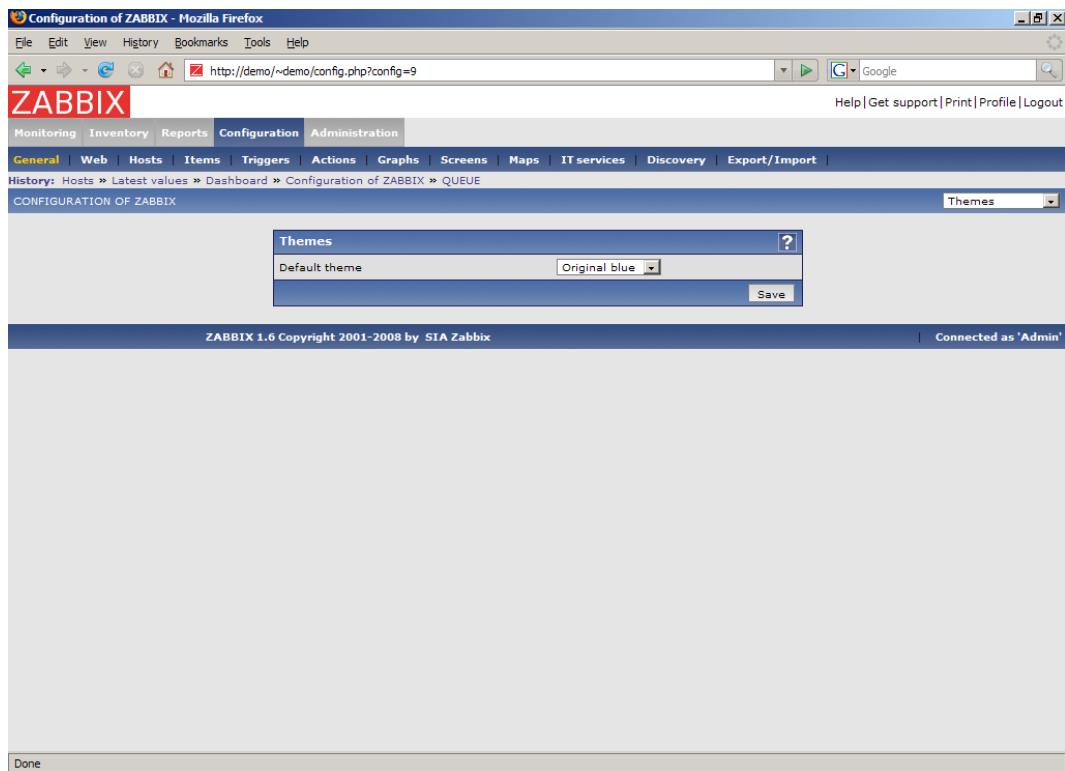
Image attributes:

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: 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.

19.2.1.4.Themes

ZABBIX support themes, which are used to customize look and feel of ZABBIX front-end.



Possible parameters:

Parameter	Description
Default theme	Theme used for all users. Default theme is "Original blue". An user may override the default theme in user profile.

19.2.1.5.Value mapping

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

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

The screenshot shows the ZABBIX configuration interface in Mozilla Firefox. The URL is <http://demo/~demo/config.php?config=6>. The page title is "Configuration of ZABBIX - Mozilla Firefox". The main menu includes Monitoring, Inventory, Reports, Configuration (selected), Administration, General, Web, Hosts, Items, Triggers, Actions, Graphs, Screens, Maps, IT services, Discovery, and Export/Import. A sub-menu bar under Configuration includes History, Hosts, Latest values, Dashboard, Configuration of ZABBIX, and QUEUE. The main content area is titled "CONFIGURATION OF ZABBIX" and contains a "Value mapping" table. The table has two columns: "Name" and "Value map". The "Name" column lists various items: APC Battery Replacement Status, APC Battery Status, Dell Open Manage System Status, Host status, HP Insight System Status, Service state, and Windows service state. The "Value map" column provides the mapping for each item. For example, "Host status" maps 0 to "Up" and 2 to "Unreachable". "Service state" maps 0 to "Down" and 1 to "Up". "Windows service state" maps 0 to "Running", 1 to "Paused", 3 to "Pause pending", 4 to "Continue pending", 5 to "Stop pending", 6 to "Stopped", 7 to "Unknown", and 255 to "No such service". At the bottom of the page, it says "ZABBIX 1.6 Copyright 2001-2008 by SIA Zabbix" and "Connected as 'Admin'". A "Done" button is at the bottom left.

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 mapping definition

The screenshot shows the Zabbix Configuration interface with the 'Value mapping' dialog open. The dialog title is 'Value map "Windows service state"'. It has two main sections: 'Name' and 'Mapping'. In the 'Name' section, the value 'Windows service state' is entered. In the 'Mapping' section, there is a list of mappings from numerical values to service states:

Value	Description
0	Running
1	Paused
3	Pause pending
4	Continue pending
5	Stop pending
6	Stopped
7	Unknown
255	No such service

Below the mapping list is a 'New mapping' input field with a 'Save' button. At the bottom of the dialog are 'Save', 'Delete', and 'Cancel' buttons.

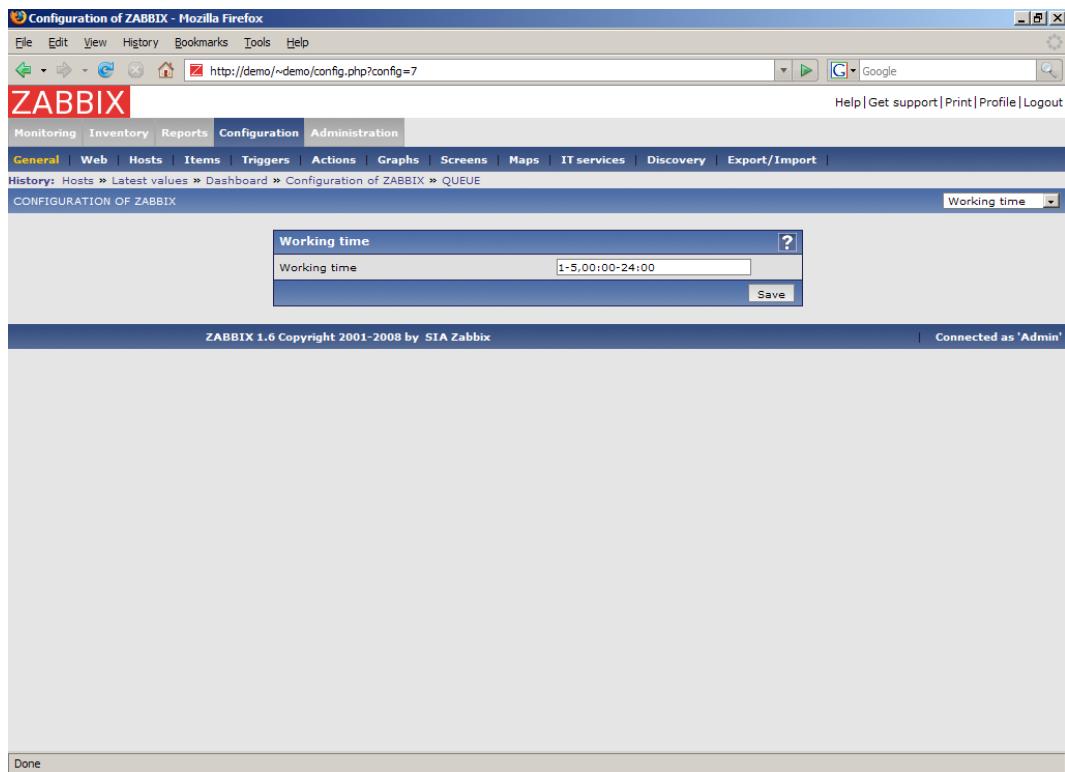
Parameters of a value mapping:

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

19.2.1.6. Working time

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

Currently this is used for graphs only. 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

19.2.1.7.Other

Refresh unsupported items

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

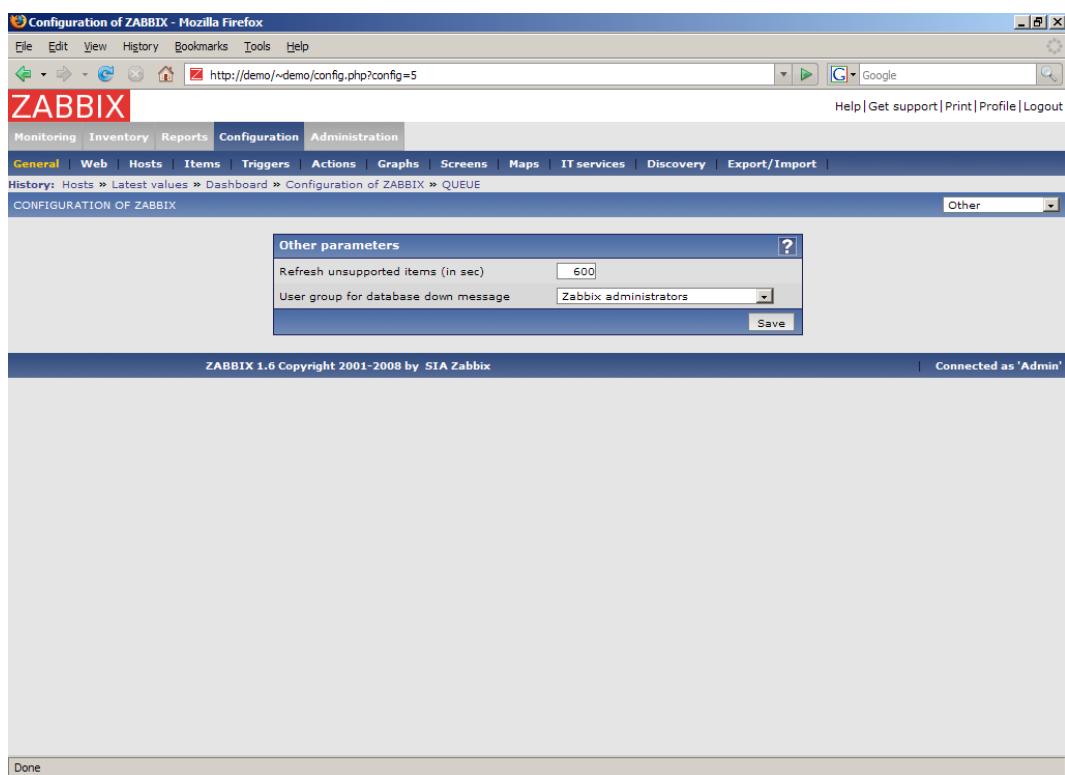
ZABBIX can be configured to periodically make unsupported items active.

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
Refresh unsupported items (in sec)	ZABBIX will activate unsupported item every N seconds. If set to 0, the automatic activation will be disabled. Proxies check unsupported items every 10 minutes. This is not configurable for Proxies.

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

Note: Database watchdog is supported for MySQL only!

19.2.2.WEB

The screen can be used to manage monitoring of WEB scenarios.

List of WEB scenarios

It provides list of active WEB scenarios.

The screenshot shows the Zabbix configuration interface for web monitoring. The top navigation bar includes links for Monitoring, Inventory, Reports, Configuration (which is selected), Administration, General, Web, Hosts, Items, Triggers, Actions, Graphs, Screens, Maps, IT services, Discovery, Export/Import, Help, Get support, Print, Profile, and Logout. Below the navigation is a breadcrumb trail: History > Latest values > History > QUEUE > Configuration of ZABBIX > Configuration of Web monitoring. A 'Create scenario' button is located at the top right of the main content area. The main content displays a table titled 'CONFIGURATION OF WEB MONITORING' under the heading 'SCENARIOS'. The table has columns for Name, Number of steps, Update interval, and Status. It lists three scenarios: 'bbc.co.uk' (1 Scenario) with two steps and an update interval of 120, 'google.com' (1 Scenario) with two steps and an update interval of 60, and 'zabbix.com' (1 Scenario) with two steps and an update interval of 60. All scenarios are marked as 'Active'. At the bottom of the table are buttons for 'Activate selected', 'Disable selected', 'Clean history selected scenarios', and 'Delete selected'. The footer of the page includes the text 'ZABBIX 1.6 Copyright 2001-2008 by SIA Zabbix' and 'Connected as 'Admin''. A 'Done' button is visible at the bottom left.

Displayed data:

Parameter	Description
Name	Unique name of a WEB scenario.
Number of steps	Number of individual steps (HTTP requests) the scenario consists of.
Update interval	Frequency of execution of the WEB scenario.

Parameter	Description
Status	Status of the scenario: Active – the scenario is active Disabled – the scenario is disabled. Note that disabled scenarios are not displayed by default.

WEB scenarios configuration

The screen is used to define parameters of an individual WEB scenario.

The screenshot shows a Mozilla Firefox browser window with the ZABBIX web interface. The URL is <http://demo/~demo/httpconf.php?form=update&httpitestid=2&hostid=20046&groupid=6>. The page title is "Configuration of Web monitoring". The navigation menu includes Monitoring, Inventory, Reports, Configuration, Administration, General, Web, Hosts, Items, Triggers, Actions, Graphs, Screens, Maps, IT services, Discovery, Export/Import. The current section is "Configuration of Web monitoring". A sub-menu for "Configuration" is open, showing "Scenario". The main content area displays a "Scenario" configuration dialog. The "Application" field is set to "google.com". The "Name" field is "Availability of Google". The "Update interval (in sec)" is "60". The "Agent" is "Internet Explorer 6.0 on Windows XP SP2 with .NET Framework 2.0 installed". The "Status" is "Active". Below this, there is a "Variables" section which is currently empty. Under "Steps", there is a table with two rows:

Name	Timeout	URL	Required	Status
Home	15 sec	http://www.google.com		Down
About	15 sec	http://www.google.com/intl/en/about.html		Up

Buttons at the bottom of the dialog include "Add", "Delete selected", "Save", "Clone", "Delete", and "Cancel". At the bottom of the browser window, it says "ZABBIX 1.6 Copyright 2001-2008 by SIA Zabbix" and "Connected as 'Admin'".

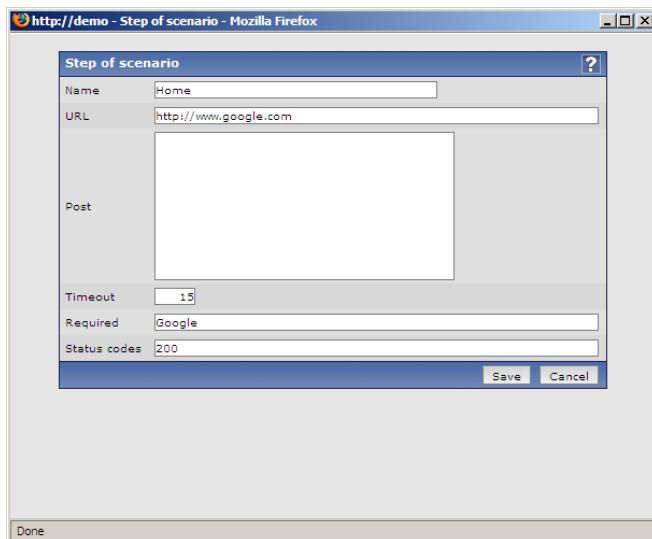
Configuration parameters:

Parameter	Description
Application	Host application the scenario is linked to.
Name	Unique name of the WEB scenario.
Update interval (in sec)	Frequency of execution of the WEB scenario.
Agent	Client agent string. ZABBIX will pretend that it is Firefox, MS Explorer or any other application. Useful when WEB site returns different content for different browsers.
Status	Status of the scenario:

Parameter	Description
	Active – the scenario is active Disabled – the scenario is disabled. Note that disabled scenarios are not displayed by default.
Variables	<p>List of variables (macros) that can be used in scenario steps (URL and Post variables).</p> <p>It has the following format:</p> <p>{macro1}=value1 {macro2}=value2</p> <p>For example:</p> <p>username=Alexei password=kj3h5kJ34bd</p> <p>The macros can be referenced as {username} and {password}. ZABBIX will automatically replace them with actual values.</p>
Steps	<p>List of steps executed by the scenario:</p> <p>Name – step name</p> <p>Timeout – timeout</p> <p>URL – location to connect to</p> <p>Required – required string</p> <p>Status – step status</p>

WEB step configuration

The screen is used to define parameters of each individual step of the WEB scenario.



Configuration parameters:

Parameter	Description
Name	Unique step name.
URL	URL to connect and retrieve data. For example: http://www.zabbix.com https://www.google.com
Post	List of POST variables. GET variables can be passed in the URL parameter.
Timeout	ZABBIX will not spend more than Timeout second on processing the URL.
Required	Required string. Retrieved content (HTML) must contain this string, otherwise the step will fail. If empty, no check is performed.
Status codes	List of expected HTTP codes. If ZABBIX get a code, which is not in the list, the step will fail. If empty, no check is performed. For example: 200,201,210-299

19.2.3.Hosts

19.2.3.1.Hosts

The screen is used to manage host related information.

List of Hosts

The screen provides list of monitored hosts..

Name	DNS	IP	Port	Templates	Status	Availability	Error	Actions
Netherlands:nl_001	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_002	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_003	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_004	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_005	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_006	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_007	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_008	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_009	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_010	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_011	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_012	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_013	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_014	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_015	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_016	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_017	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_018	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select
Netherlands:nl_019	-	192.168.3.2	10050	Template_Server	Monitored	Show Items Triggers Graphs Groups Add to group Remove from group	-	Select

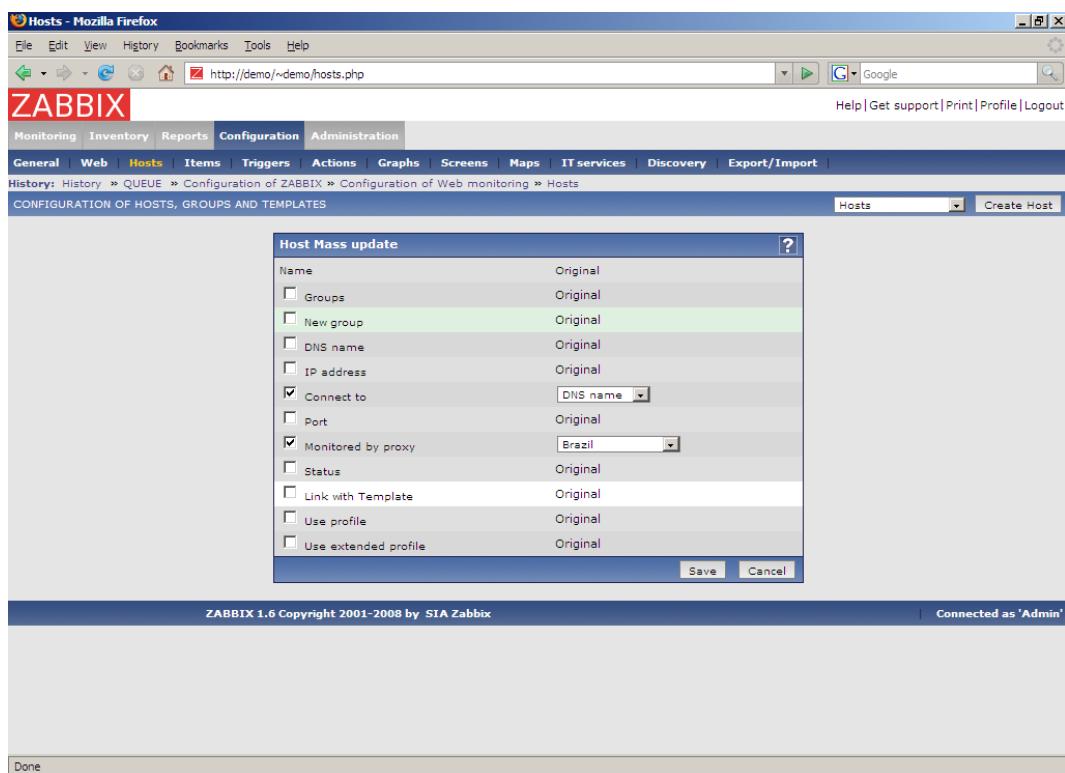
Displayed data:

Parameter	Description
Name	Unique host name.
DNS	Host DNS name if used.
IP	Host IP address if used.
Port	ZABBIX Agent port number. It is ignored by ZABBIX if no agent used.
Templates	List of templates linked to the host.
Status	Host Status:

Parameter	Description
	Monitored – Host is active and being monitored Disabled – Host disabled
Availability	Agent (Zabbix, SNMP) availability: Available – agent is up and running Unknown – agent is not available
Error	Any errors related to use of agent based checks.

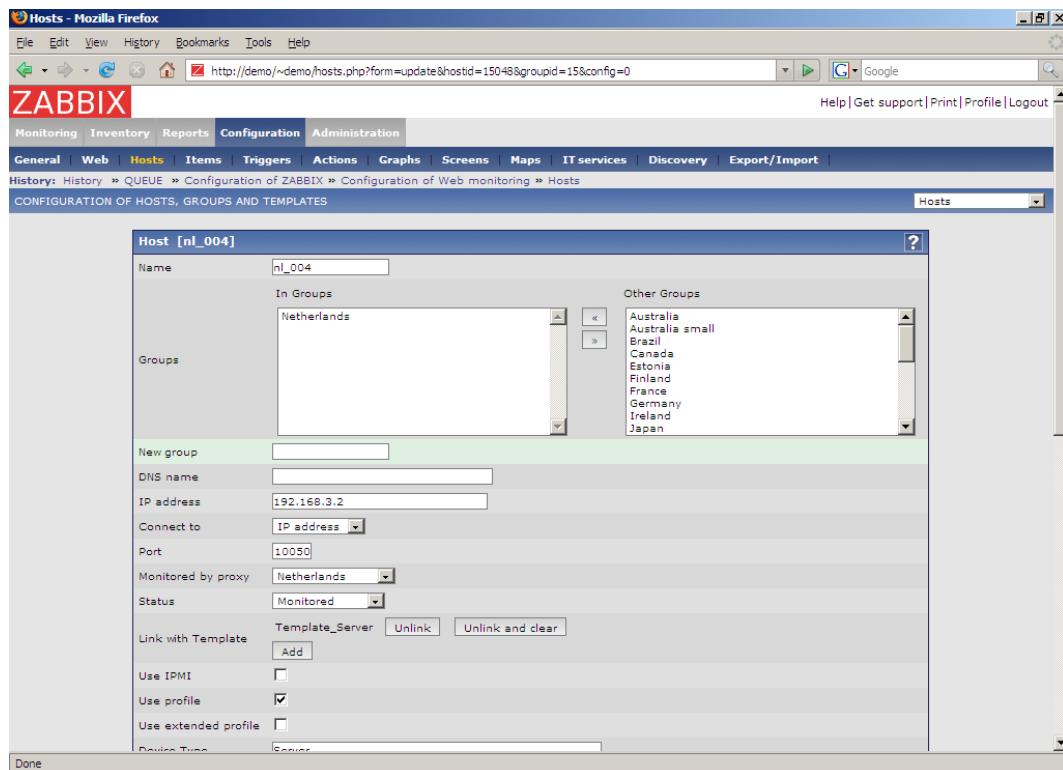
Host mass-update screen

The screen is accessible by selecting hosts and clicking on button “Mass update”. It is very effective way of changing attributes of a number of hosts.



Host configuration

The screen give access to host details.



Configuration parameters:

Parameter	Description
Name	Unique host name.
Groups	List of host groups the host belongs to.
New group	New group can be created and linked to the host. Ignored, if empty.
DNS name	Optional host DNS name.
IP address	Optional host IP address.
Connect to	ZABBIX server will use this setting to retrieve data from agents: DNS name – Connect to host DNS name IP address – Connect to host IP (recommended)
Port	ZABBIX agent TCP port number. Default value is 10050.
Monitored by proxy	The host can be monitored either by ZABBIX Server or one of Proxies: (no proxy) – host is monitored by ZABBIX Server Proxy name – host is monitored by Proxy “Proxy”

Parameter	Description
	name”
Status	Host status: Monitored – Host is active ,ready to be monitored Not monitored – Host is not active, thus not monitored
Link with template	Link host with one or more templates. Information about items, triggers and graphs will be inherited from the templates. Unlink – unlink from template, but reserve information about items, triggers and graphs Unlink and clear – unlink from template and remove all information inherited from the template
Use IPMI	Enable IMPI management functionality for this host.
IPMI IP address	IP address of IPMI management device.
IPMI port	Port number of the IPMI device.
IPMI privilege level	Keep default setting here, User .
IPMI username	User name for authentication.
IPMI password	Password for authentication.
Use profile	Enable or disable use of Host profile.
Use extended profile	Enable or disable use of extended Host profile.

19.2.3.2.Templates

The screen is used to manage host templates.

List of Templates

The screen provides list of templates.

The screenshot shows the Zabbix configuration interface for hosts. The top navigation bar includes links for Monitoring, Inventory, Reports, Configuration, Administration, General, Web, Hosts, Items, Triggers, Actions, Graphs, Screens, Maps, IT services, Discovery, Export/Import, Help, Get support, Print, Profile, and Logout. The main content area is titled 'CONFIGURATION OF HOSTS, GROUPS AND TEMPLATES'. A table lists 'TEMPLATES' with columns for 'Name', 'Templates', and 'Actions'. Each row contains a checkbox next to the template name, followed by the template name itself, a blank 'Templates' column, and an 'Actions' column with the word 'Select' repeated for each row. The 'Group' dropdown at the top right is set to 'all'.

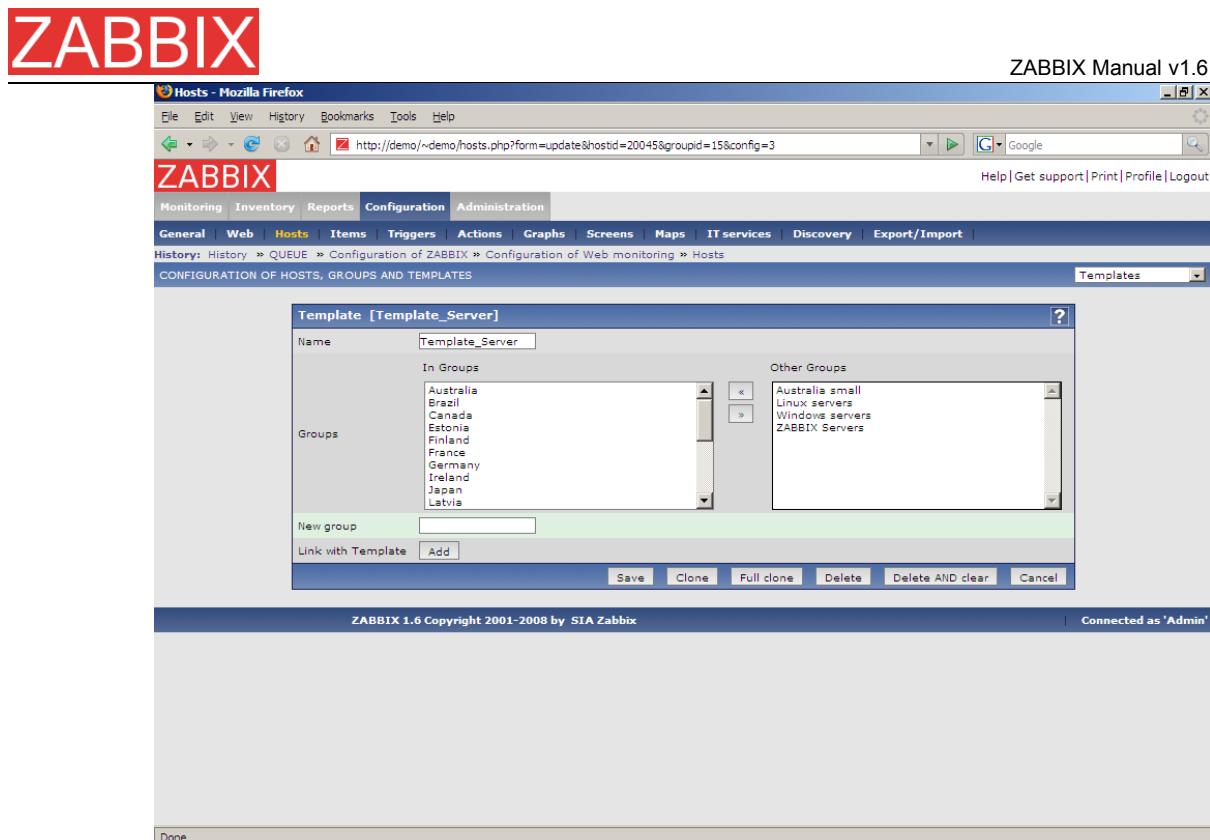
Name	Templates	Actions
Template_AIX	-	Select
Template_APc_Battery	-	Select
Template_App_SQL	-	Select
Template_Cisco_PIX	-	Select
Template_Cisco_PIX_525	-	Select
Template_Dell_OpenManage	-	Select
Template_Dell_PowerConnect_6248	-	Select
Template_Dell_PowerEdge	-	Select
Template_FreeBSD	-	Select
Template_HPUX	-	Select
Template_HP_InsightManager	-	Select
Template_Linux	-	Select
Template_MacOS_X	-	Select
Template_Netware	-	Select
Template_OpenBSD	-	Select
Template_SNMPv1_Device	-	Select
Template_SNMPv2_Device	-	Select
Template_Server	-	Select
Template_Solaris	-	Select

Displayed data:

Parameter	Description
Name	Template name.
Templates	List of hosts linked to this template.

Template configuration

The screen give access to template details.



Configuration parameters:

Parameter	Description
Name	Unique template name.
Groups	List of host groups the template belongs to.
New group	New group can be created and linked to the template. Ignored, if empty.
Link with template	Link template with one or more templates. Information about items, triggers and graphs will be inherited from the templates.

19.2.3.3.Proxies

The screen is used to manage proxies.

List of Proxies

The screen provides list of proxies.

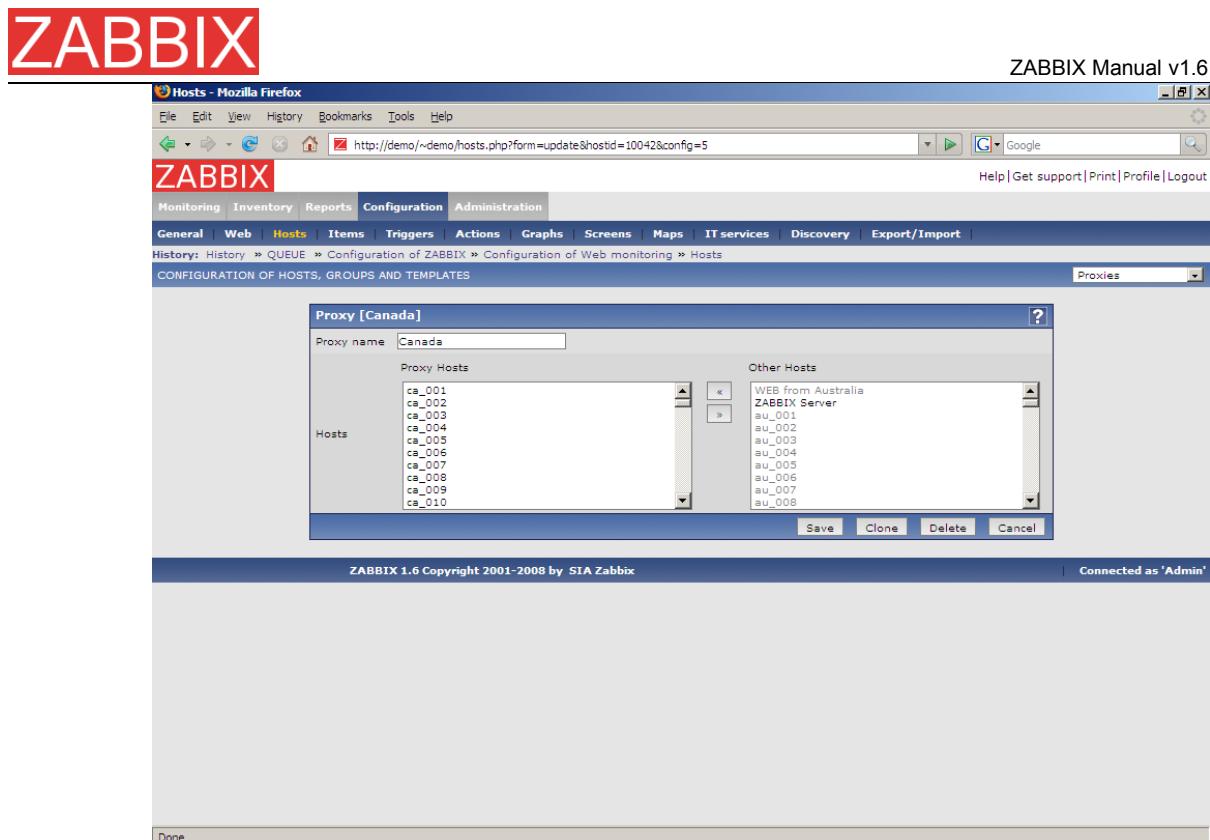
The screenshot shows the Zabbix web interface with the title "ZABBIX" at the top. The navigation bar includes "Monitoring", "Inventory", "Reports", "Configuration", and "Administration". The "Configuration" tab is active. Below it, the "Hosts" tab is selected in the main menu. The page title is "CONFIGURATION OF HOSTS, GROUPS AND TEMPLATES". A sub-menu "Hosts" is open, showing "General", "Web", "Hosts", "Items", "Triggers", "Actions", "Graphs", "Screens", "Maps", "IT services", "Discovery", "Export/Import", "Proxies", and "Create Proxy". The "Proxies" tab is also active. A search bar at the top right contains "Google". The main content area is titled "PROXIES" and shows a table with one row. The row contains a checkbox, the name "Australia", the last seen time "5s", and the member count "501". The "Members" column is a large scrollable list of host names, all starting with "WEB from Australia" followed by various host identifiers.

Displayed data:

Parameter	Description
Name	Unique Proxy name.
Last seen (age)	Last time we received a heart beat message or data from the Proxy.
Members	List of hosts monitored by this Proxy.

Proxy configuration

The screen give access to proxy details.



Configuration parameters:

Parameter	Description
Proxy name	Unique Proxy name.
Hosts	List of hosts monitored by this Proxy.

19.2.3.4. Host groups

The screen is used to manage host groups.

List of Host Groups.

The screen provides list of host groups..

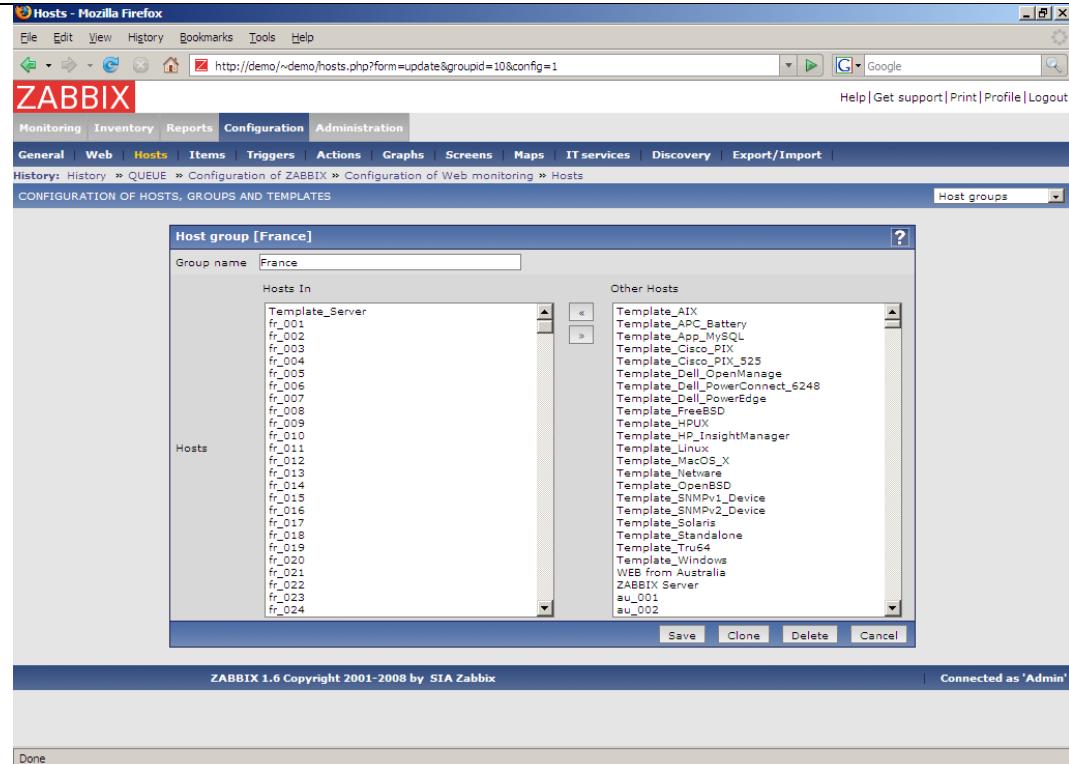
The screenshot shows the Zabbix web interface with the URL <http://demo/~demo/hosts.php?config=1>. The page title is "ZABBIX". The navigation menu includes Monitoring, Inventory, Reports, Configuration, Administration, General, Web, Hosts, Items, Triggers, Actions, Graphs, Screens, Maps, IT services, Discovery, and Export/Import. The current section is Configuration > Hosts. The sub-section is Configuration of hosts, groups and templates. The main content area is titled "HOST GROUPS" and lists one group named "Australia". The table columns are Name, #, and Members. The "Name" column contains "Australia", the "# column contains "502", and the "Members" column contains a very long list of host names, mostly starting with "au_". A scroll bar is visible on the right side of the list.

Displayed data:

Parameter	Description
Name	Host Group name.
#	Number of group members (hosts).
Members	List of host group members.

Host group configuration

The screen give access to host group details.



Configuration parameters:

Parameter	Description
Group name	Unique host group name.
Hosts	List of hosts, members of the group.

19.2.3.5.Template linkage

The screen is used to manage host template linkage.

List of Templates

The screen provides list of template and linked hosts.

Templates	Hosts
Template_AIX	-
Template_APP_Battery	-
Template_App_MySQL	-
Template_Cisco_PIX	-
Template_Cisco_PIX_525	-
Template_Dell_OpenManage	-
Template_Dell_PowerConnect_6248	-
Template_Dell_PowerEdge	-
Template_FreeBSD	-
Template_HPUX	-
Template_HP_InsightManager	-
Template_Linux	ZABBIX Server
Template_MacOS_X	-
Template_Netware	-
Template_OpenBSD	-
Template_SNMPv1_Device	-
Template_SNMPv2_Device	-
	au_001, au_002, au_003, au_004, au_005, au_006, au_007, au_008, au_009, au_010, au_011, au_012, au_013, au_014, au_015, au_016, au_017, au_018, au_019, au_020, au_021, au_022, au_023, au_024, au_025, au_026, au_027, au_028, au_029, au_030, au_031, au_032, au_033, au_034, au_035, au_036, au_037, au_038, au_039, au_040, au_041, au_042, au_043, au_044, au_045, au_046, au_047, au_048, au_049, au_050, au_051, au_052, au_053, au_054, au_055, au_056, au_057, au_058, au_059, au_060, au_061, au_062, au_063, au_064, au_065, au_066, au_067, au_068, au_069, au_070, au_071, au_072, au_073, au_074, au_075, au_076, au_077, au_078, au_079, au_080, au_081, au_082, au_083, au_084, au_085, au_086, au_087, au_088, au_089, au_090,

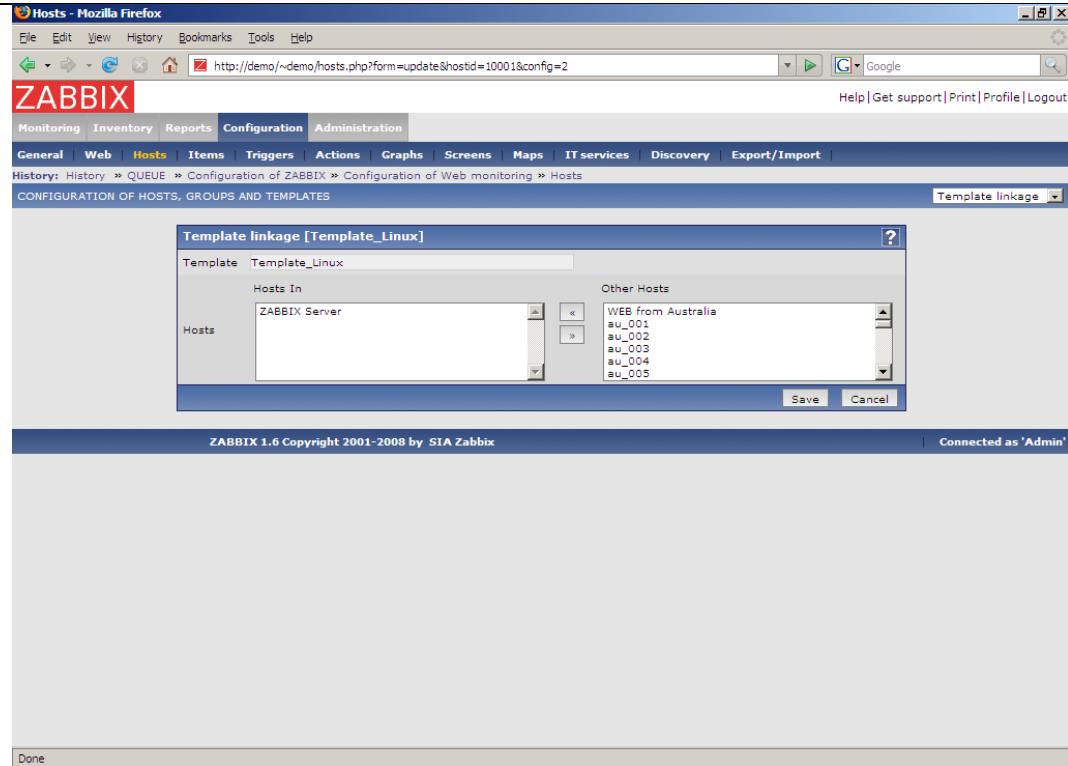
Done

Displayed data:

Parameter	Description
Templates	Host template name.
Hosts	List of hosts linked to the template.

Template linkage

The screen give access to management of host template linkage.



Configuration parameters:

Parameter	Description
Template	Template name.
Hosts	List of hosts linked to the template.

19.2.3.6. Applications

The screen is used to manage applications.

List of Applications

The screen provides list of applications.

The screenshot shows the Zabbix web interface in Mozilla Firefox. The title bar says 'Hosts - Mozilla Firefox'. The address bar shows the URL 'http://demo/~demo/hosts.php?groupid=0&hostid=10549'. The page header includes links for Help, Get support, Print, Profile, and Logout. The main navigation menu has tabs for Monitoring, Inventory, Reports, Configuration, and Administration, with Configuration selected. Sub-navigation tabs include General, Web, Hosts, Items, Triggers, Actions, Graphs, Screens, Maps, IT services, Discovery, and Export/Import. The current view is under the Hosts tab, specifically the 'CONFIGURATION OF HOSTS, GROUPS AND TEMPLATES' section. A dropdown menu shows 'Applications' selected. A table lists applications for host 'au_005':

Application	Show
Template_Server:Availability	Items (1)
Template_Server:CPU	Items (4)
Template_Server:General	Items (3)
Template_Server:Network	Items (0)
Template_Server:OS	Items (3)

At the bottom of the table are buttons for Activate Items, Disable Items, and Delete selected.

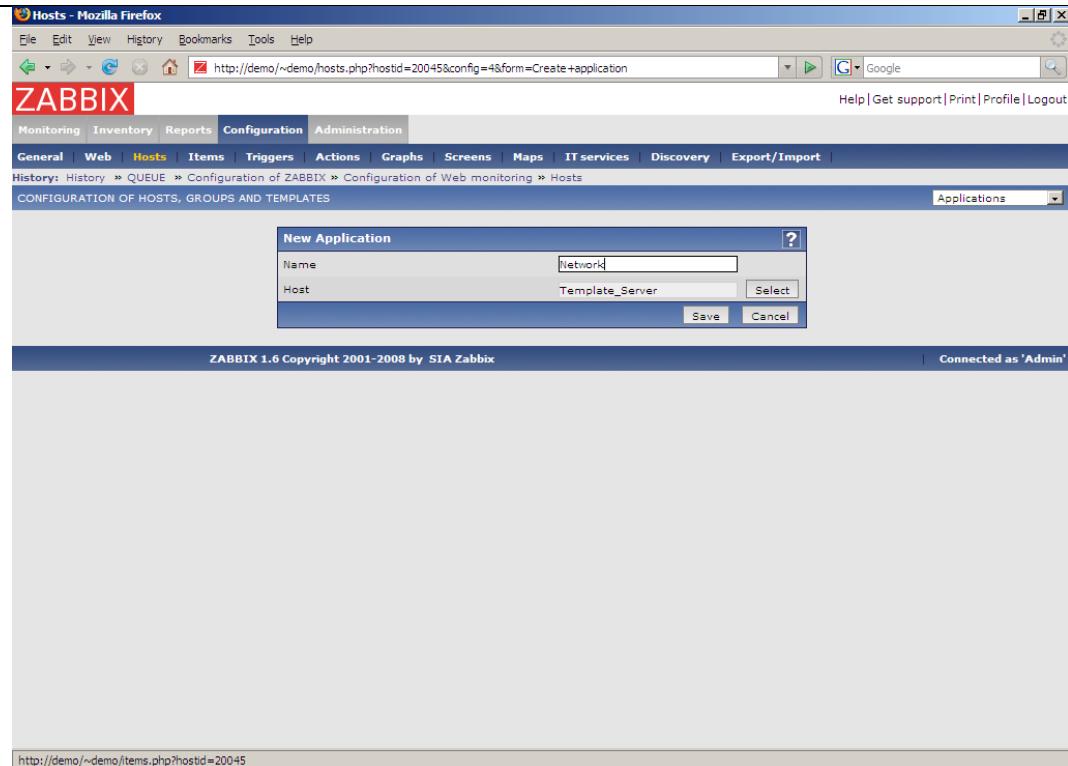
At the bottom of the page, it says 'ZABBIX 1.6 Copyright 2001-2008 by SIA Zabbix' and 'Connected as 'Admin''. A 'Done' button is at the very bottom.

Displayed data:

Parameter	Description
Application	Application name.
Show	Link to host items, also displays number of items (members of the application).

Configuration of application

The screen give access to management of applications.



Configuration parameters:

Parameter	Description
Name	Application name. Must be unique within one host.
Hosts	Host name the application is linked to.

19.2.4.Items

19.2.4.1.Items

The screen is used to manage item related information.

List of Items

The screen provides list of items linked to a host.

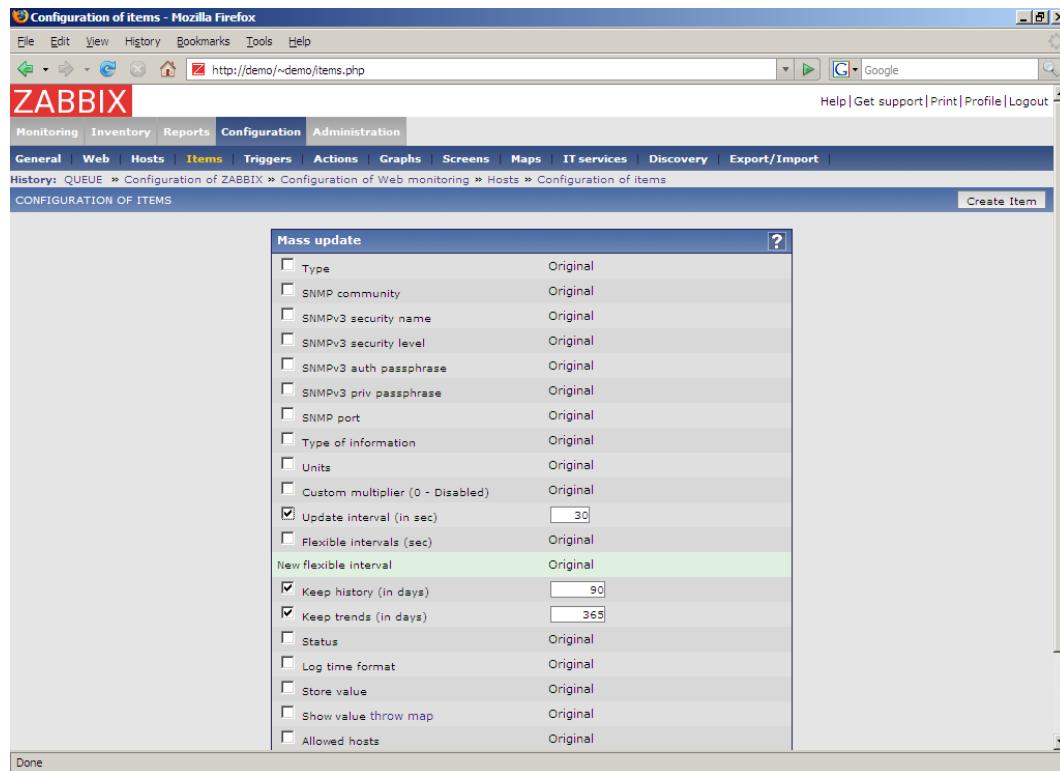
The screenshot shows the ZABBIX web interface for managing items. The top navigation bar includes links for Configuration, Administration, General, Web, Hosts, Items, Triggers, Actions, Graphs, Screens, Maps, IT services, Discovery, Export/Import, Help, Get support, Print, Profile, and Logout. The main content area is titled 'CONFIGURATION OF ITEMS' and displays a table of items. The table has columns for Description, Key, Update interval, History, Trends, Type, Status, Applications, and Error. Each item row contains a checkbox in the first column. At the bottom of the table, there are buttons for 'Activate selected', 'Disable selected', 'Clean history selected items', 'Delete selected', 'Copy selected to ...', and 'Mass update'. The status bar at the bottom indicates 'ZABBIX 1.6 Copyright 2001-2008 by SIA Zabbix' and 'Connected as 'Admin''. A 'Done' button is visible at the bottom left.

Displayed data:

Parameter	Description
Description	Item description (name).
Key	Unique item key.
Update interval	Frequency of the check.
History	Number of days ZABBIX keeps detailed historical data.
Trends	Number of days ZABBIX keeps trends data.
Type	Item type.
Status	Item status.
Applications	List of applications the item belongs to.
Error	Any errors related to this item.

Item mass-update screen

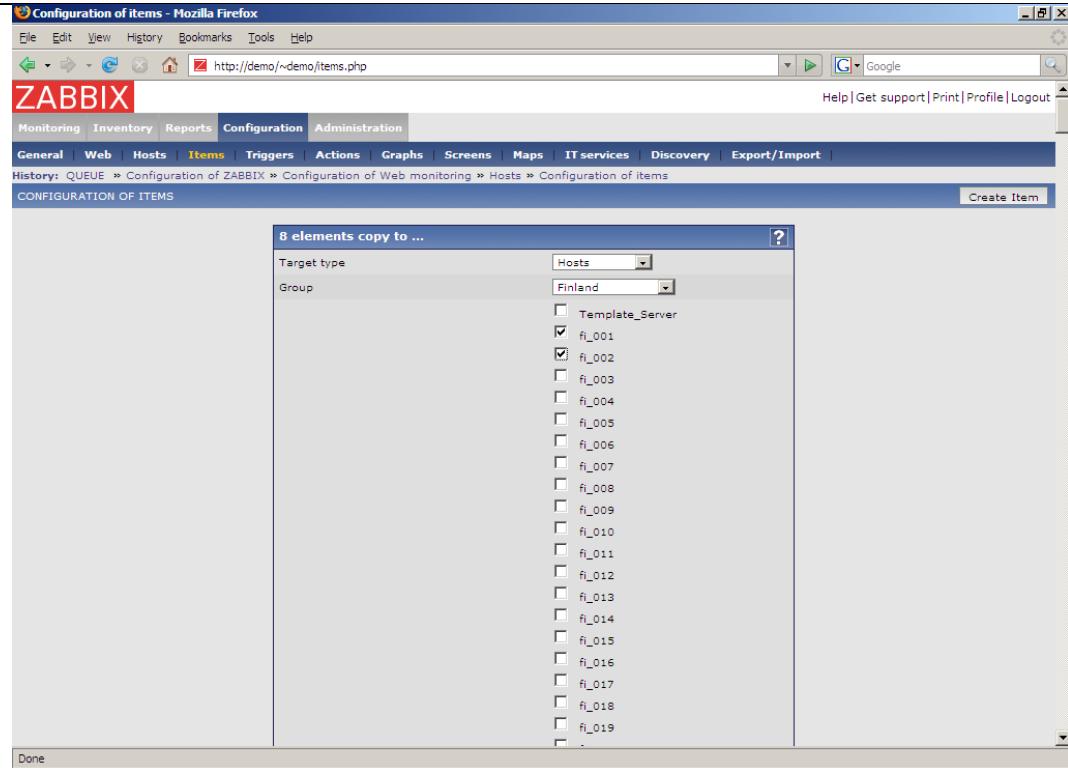
The screen is accessible by selecting items and clicking on button "Mass update". It is very effective way of changing attributes of a number of items.



Click on a parameter you would like to change, enter new value and press "Save".

Copy selected to...

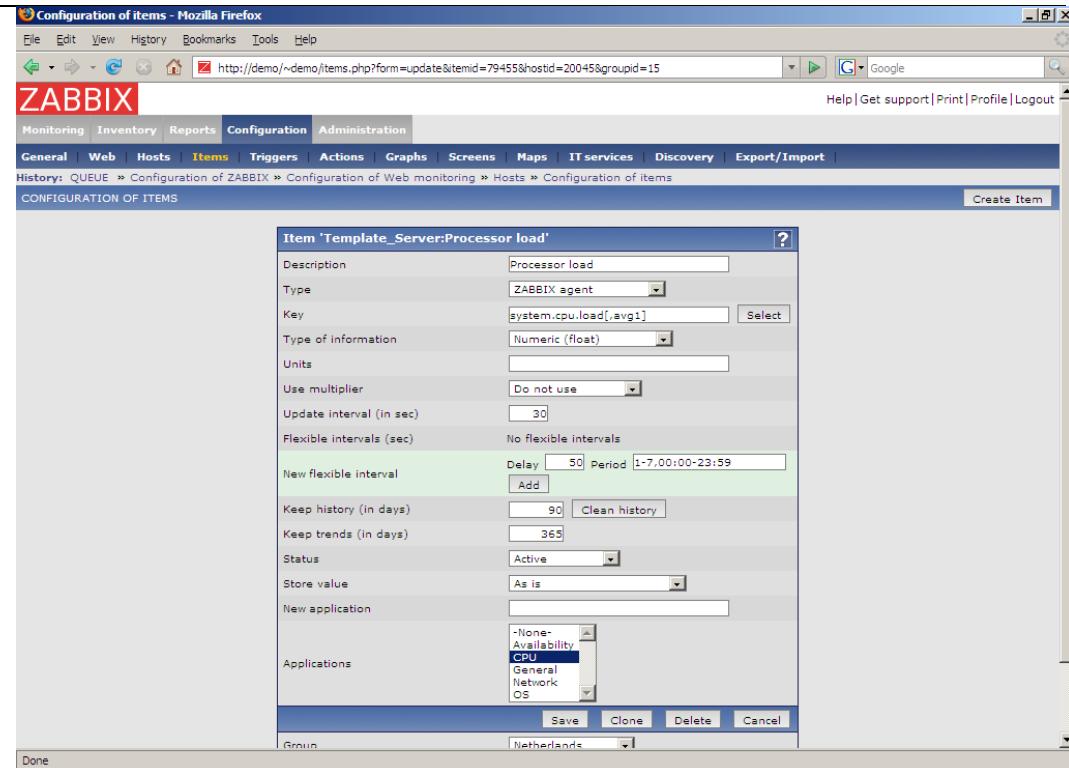
The screen makes possible copy of a selected item to a number of hosts.



Select hosts you would like to copy items and press “Copy”.

Item configuration

The screen provides access to configuration of a single item.



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

Parameter	Description
	<p>Log – log file. Must be set for keys <code>log[]</code>.</p> <p>Text – text of unlimited size</p>
Units	<p>If set, ZABBIX will add prefix K,M or G if required and the unit postfix to all received values (1024 is 1K).</p> <p>For example, if units set to 'B', ZABBIX will display:</p> <p>1 as 1B 1024 as 1KB 1536 as 1.5KB</p> <p>Some units have special processing:</p> <p>b, bps - 1000 is 1K, special processing for bits.</p> <p>unixtime – translated to "yyyy.mm.dd hh:mm:ss"</p> <p>uptime – translated to "hh:mm:ss" or "N days, hh:mm:dd", parameter is treated as number of seconds since 01/01/1970.</p> <p>s – translated to "yyymmddhhmm", parameter is treated as number of seconds since 01/01/1970. For example, 2y10m14d3h54m1s</p>
Use multiplier	<p>Pre-process received values.</p> <p>Do not use - do not pre-process received values</p> <p>Custom multiplier – multiply received values by value defined in Custom multiplier</p> <p>Use this option to convert values received in KB, MBps, etc into B, Bps. Otherwise ZABBIX cannot correctly set prefixes (K, M and G).</p>
Custom multiplier	Multiply all received value by this integer or floating-point value.
Update interval (in sec)	Refresh this item every N seconds.
Flexible intervals	<p>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.</p> <p>Period format: <code>dd-dd,hh:mm-hh:mm;dd-dd,hh:mm-hh-mm</code></p> <p>For example, 1-5,09:00-18:00;6-7,10:00-12:00 1- Monday, ...,7 - Sunday</p>
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) detailed

Parameter	Description
	history N days in the database. Older data will be removed by Housekeeper.
Status	<p>Active - active (normal) status. ZABBIX will process this item.</p> <p>Disabled – item is disabled. This item will not be processed.</p> <p>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.</p>
Store value	<p>As is – no pre-processing</p> <p>Delta (speed per second) – evaluate value as $(\text{value} - \text{prev_value}) / (\text{time} - \text{prev_time})$, where</p> <ul style="list-style-type: none"> value – current value value_prev – previously received value time – current timestamp prev_time – timestamp of previous value <p>This setting is extremely useful to get speed per second based on constantly growing value.</p> <p>Delta (simple change) – evaluate as $(\text{value} - \text{prev_value})$, where</p> <ul style="list-style-type: none"> value – current value value_prev – previously received value
Show value	<p>Apply value mapping to this item. Value mapping does not change received values, it is for displaying data only.</p> <p>It works with integer items only.</p> <p>For example, “Windows service states”.</p>
Applications	Link item to one or more applications.

See more details about items in other sections of the Manual.

19.2.5. Triggers

19.2.5.1. Triggers

The screen is used to manage triggers.

List of Triggers

The screen provides list of triggers linked to a host.

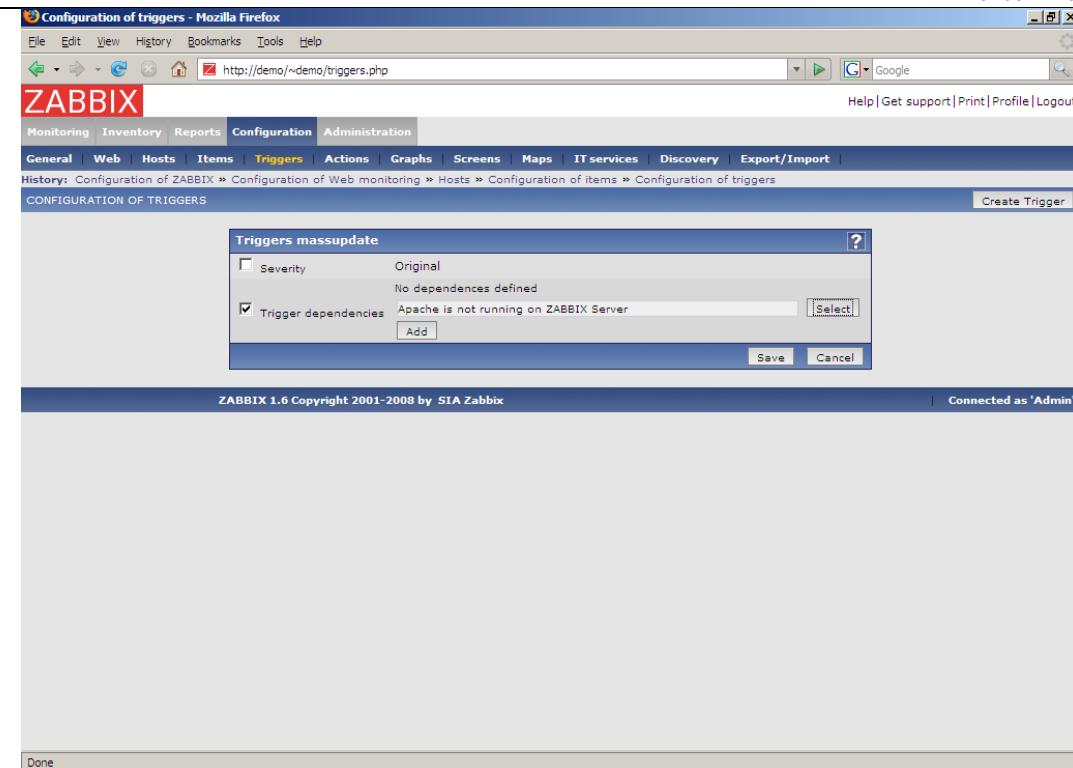
Severity	Status	Name	Expression
Warning	Enabled	Template_Linux:/etc/inetd.conf has been changed on server ZABBIX Server	{ZABBIX Server:vfs.file_cksum[/etc/inetd.conf], diff(0)}>0
Average	Enabled	Template_Linux:/etc/passwd has been changed on server ZABBIX Server	{ZABBIX Server:vfs.file_cksum[/etc/passwd], diff(0)}>0
Average	Enabled	Template_Linux:/etc/services has been changed on server ZABBIX Server	{ZABBIX Server:vfs.file_cksum[/etc/services], diff(0)}>0
Average	Enabled	Template_Linux:/usr/bin/ssh has been changed on server ZABBIX Server	{ZABBIX Server:vfs.file_cksum[/usr/bin/ssh], diff(0)}>0
Average	Enabled	Template_Linux:/usr/sbin/sshd has been changed on server ZABBIX Server	{ZABBIX Server:vfs.file_cksum[/usr/sbin/sshd], diff(0)}>0
Warning	Enabled	Template_Linux:/vmlinuz has been changed on server ZABBIX Server	{ZABBIX Server:vfs.file_cksum[/vmlinuz], diff(0)}>0
Information	Enabled	Template_Linux:Configured max number of opened files is too low on ZABBIX Server	{ZABBIX Server:kernel.maxfiles, last(0)}<=12
Information	Enabled	Template_Linux:Configured max number of processes is too low on ZABBIX Server	{ZABBIX Server:kernel.maxproc, last(0)}<255
Average	Enabled	Template_Linux:Email (SMTP) server is down on ZABBIX Server	{ZABBIX Server:net.tcp.service[smtp].last(0)}=0
Information	Enabled	Template_Linux:Host information was changed on ZABBIX Server	{ZABBIX Server:system.uname, diff(0)}>0
Information	Enabled	Template_Linux:Hostname was changed on ZABBIX Server	{ZABBIX Server:system.hostname, diff(0)}>0
Average	Enabled	Template_Linux:Lack of free memory on server ZABBIX Server	{ZABBIX Server:vm.memory.size[free], last(0)}<10000
High	Enabled	Template_Linux:Lack of free swap space on ZABBIX Server	{ZABBIX Server:system.swap.size[free], last(0)}<1000
High	Enabled	Template_Linux:Low free disk space on ZABBIX Server volume /	{ZABBIX Server:vfs.fs.size[/,pfree], last(0)}<10
High	Enabled	Template_Linux:Low free disk space on ZABBIX Server volume /home	{ZABBIX Server:vfs.fs.size[/home,pfree], last(0)}<10
High	Enabled	Template_Linux:Low free disk space on ZABBIX Server volume /opt	{ZABBIX Server:vfs.fs.size[/opt,pfree], last(0)}<10
High	Enabled	Template_Linux:Low free disk space on ZABBIX Server volume /tmp	{ZABBIX Server:vfs.fs.size[/tmp,pfree], last(0)}<10
High	Enabled	Template_Linux:Low free disk space on ZABBIX Server volume /usr	{ZABBIX Server:vfs.fs.size[/usr,pfree], last(0)}<10

Displayed data:

Parameter	Description
Severity	Colored trigger severity.
Status	Trigger status. Note that Disable status are hidden by default.
Name	Trigger name.
Expression	Trigger expression.

Trigger mass-update screen

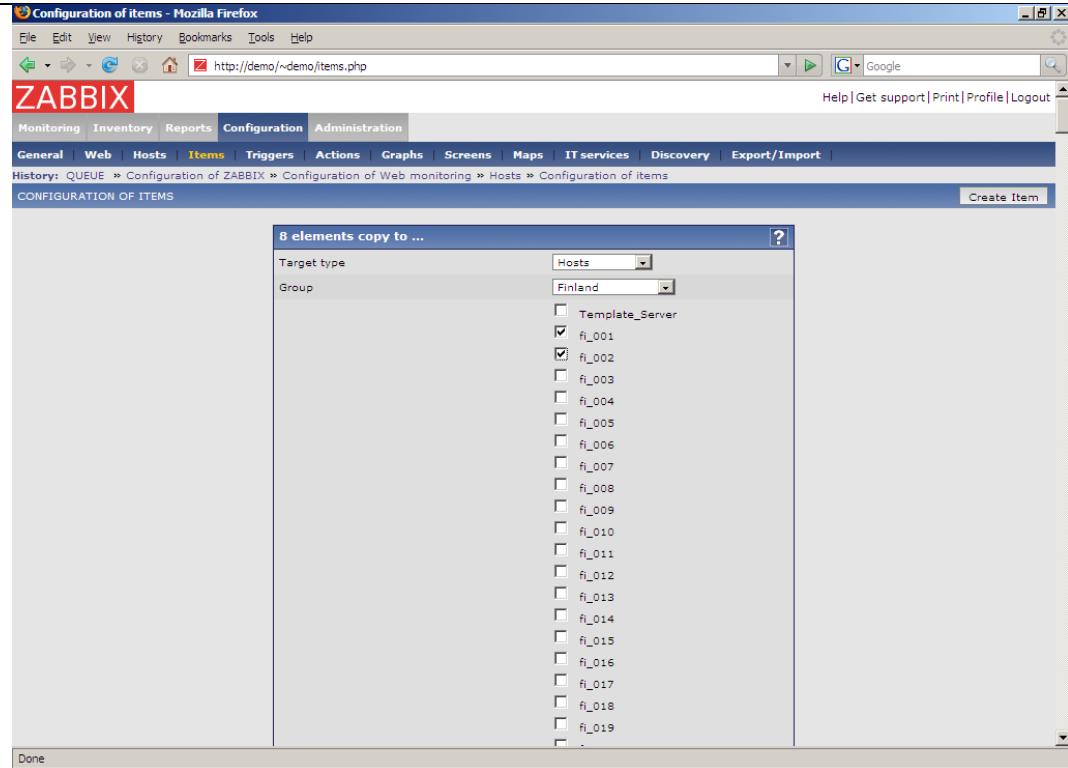
The screen is accessible by selecting triggers and clicking on button "Mass update". It is very effective way of changing attributes of a number of triggers.



Click on a parameter you would like to change, enter new value and press "Save".

Copy selected to...

The screen makes possible copy of a selected trigger to a number of hosts.



Select hosts you would like to copy items and press “Copy”.

Trigger configuration

The screen provides access to configuration of a single trigger.

The screenshot shows the Zabbix web interface with the title 'Configuration of triggers - Mozilla Firefox'. The main menu includes 'Monitoring', 'Inventory', 'Reports', 'Configuration', and 'Administration'. The 'Configuration' tab is selected. Below it, the 'Triggers' section is active. The URL in the browser is <http://demo/~demo/triggers.php?form=update&triggerid=12788&hostid=10017>. The page displays a configuration dialog for a trigger named 'Processor load is too high on {HOSTNAME}'. The dialog fields include:

- Name:** Processor load is too high on {HOSTNAME}
- Expression:** {ZABBIX Server:system.cpu.load[.avg1].last(0)}>5
- The trigger depends on:** No dependences defined
- New dependency:** Add (button)
- Event generation:** Normal
- Severity:** Average
- Comments:** (empty text area)
- URL:** (empty text field)
- Disabled:**

At the bottom of the dialog are 'Save', 'Clone', and 'Cancel' buttons.

Below the dialog, the footer reads 'ZABBIX 1.6 Copyright 2001-2008 by SIA Zabbix' and 'Connected as 'Admin''. A 'Done' button is visible at the bottom left of the main content area.

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.
Event generation	Normal – events are generated normally, on TRIGGER status change Normal + Multiple TRUE events – events are also generated on every TRUE evaluation of the trigger
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 disabled if required.

See more details about triggers in other sections of the Manual.

19.2.6.Actions

19.2.6.1.Actions

The screen is used to manage actions.

List of Actions

The screen provides list of actions.

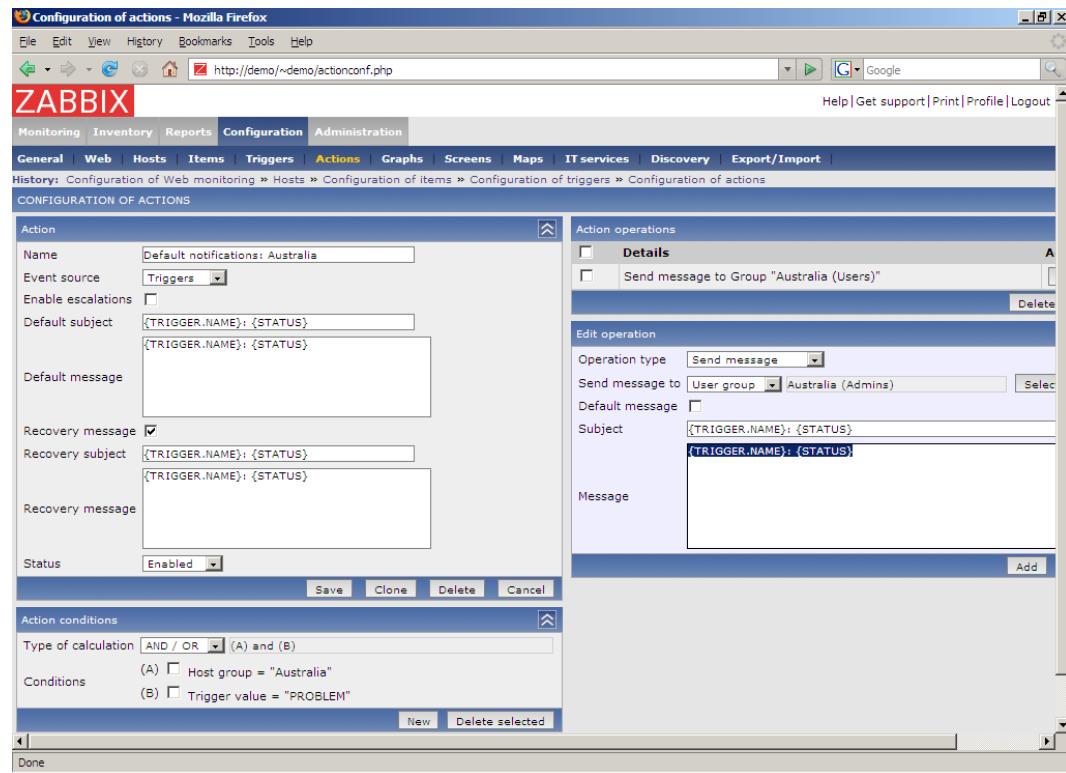
Name	Conditions	Operations	Status
Default notifications: Australia	Host group = "Australia" Trigger value = "PROBLEM"	Send message to Group "Australia (Users)"	Enabled

Displayed data:

Parameter	Description
Name	Action name.
Conditions	List of conditions for this action.
Operations	List of operations for execution.
Status	Status of the action.

Action configuration

The screen provides access to configuration of a single action.



More configuration options are available if escalation is enabled:

The screenshot shows the Zabbix configuration interface for actions. On the left, under 'Action', you can see settings for an action named 'Default notifications: Australia'. It's triggered by 'Triggers', has a period of 3600 seconds, and uses templates for default subject and message. On the right, the 'Action operations' section lists two steps: sending a message to the 'Australia (Users)' group and another to the 'Australia (Admins)' group. An 'Edit operation' dialog is open, showing the configuration for the second step, which sends a message to the 'Australia (Admins)' group from step 2 to 10. The conditions for this step include 'Event acknowledged = "Not Ack"'. The bottom of the interface shows a 'Done' button.

See more details about configuration of actions, conditions and operations in other sections of the Manual.

19.2.7. Graphs

19.2.7.1. Graphs

The screen is used to manage custom graphs.

List of Graphs

The screen provides list of graphs.

The screenshot shows the Zabbix web interface under the 'Administration' tab, specifically the 'Configuration' section for 'Graphs'. The page title is 'Configuration of graphs - Mozilla Firefox'. The URL in the address bar is 'http://demo/~demo/graphs.php'. The main content area displays a table titled 'CONFIGURATION OF GRAPHS' with five entries:

Name	Width	Height	Graph type
CPU Loads	900	200	Normal
CPU Utilization	900	200	Stacked
Disk usage	900	200	Stacked
Network utilization	900	200	Normal

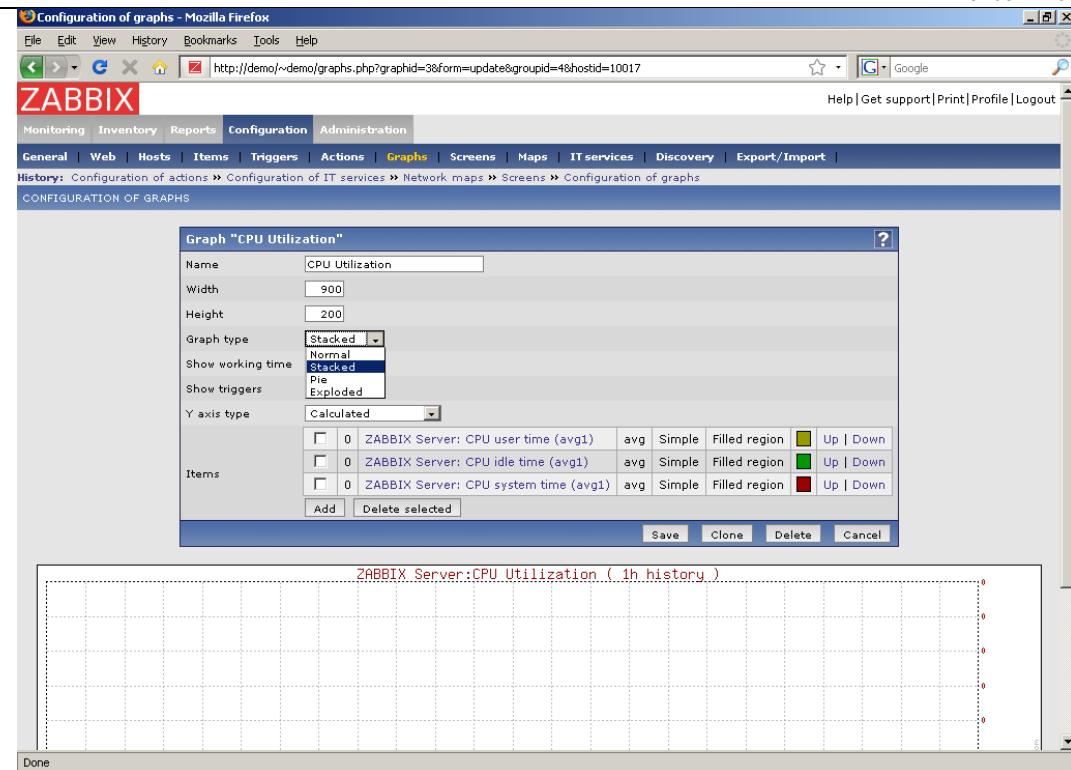
Below the table are two buttons: 'Delete selected' and 'Copy selected to ...'. At the bottom right of the page, it says 'Connected as 'Admin''. A 'Done' button is visible at the bottom left.

Displayed data:

Parameter	Description
Name	Graph name.
Width	Graph width in pixels.
Height	Graph height in pixels.
Graph type	Graph type: Normal Stacked Pie Pie exploded

Graph configuration

The screen provides access to configuration of a single custom graph.

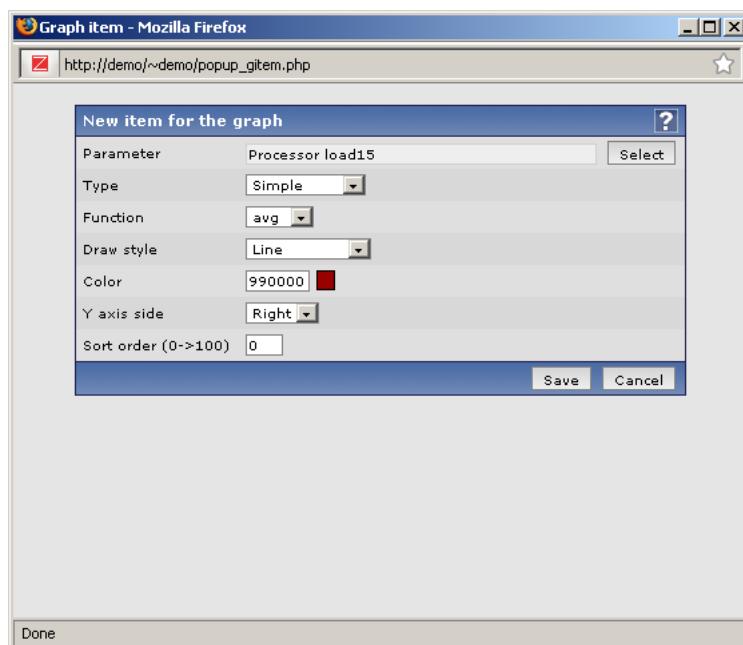


Graph attributes:

Parameter	Description
Name	Unique graph name.
Width	Graph width in pixels.
Height	Graph height in pixels.
Graph type	Graph type: Normal – normal graph, values displayed as lines. Stacked – stacked graph. Pie – pie graphs. Exploded – exploded pie graph.
Show working time	If selected, non-working hours will be shown with gray background.
Show triggers	If selected, simple triggers will be displayed as red lines.
Percentile line (Left)	Display percentile for left Y axis. Normally used for displaying 95% percentile.
Percentile line (Right)	Display percentile for right Y axis. Normally used for displaying 95% percentile.
Comments	Text field used to provide more information about this trigger. May contain instructions for fixing specific

Parameter	Description
	problem, contact detail of responsible staff, etc.
Y axis type	Type of Y axis: Calculated – Y axis value will be automatically calculated Calculated [min=0] – Y min value is set to 0, maximum value will be automatically calculated. Fixed – fixed min and max value for Y axis.
3D view	Enable 3D style. For Pie graphs only.
Legend	Display legend. For Pie graphs only.
Items	List of graph elements (items) to be displayed for this graph.

Graph element:



Attributes of a graph element:

Parameter	Description
Parameter	Selection if host item, which will be displayed.
Type	Type: Simple

Parameter	Description
	Aggregated
Function	What values will be displayed, used when more than one value exists for a single pixel (X-coordinate): All – all (minimum, average and maximum) Min – minimum only Avg – average only Max – maximum only
Draw style	Draw style: Line – draw lines Filled region – draw filled region Bold line – draw bold lines Dot – draw dots Dashed line – draw dashed line
Color	RGB color in HEX notation.
Aggregated periods count	
Y axis side	What Y axis side the element is assigned to.
Sort order (0->100)	Draw order, 0 will be processed first.

19.2.8.Screens

19.2.8.1.Screens

The screen is used to manage screens.

List of Screens

The screen provides list of screens.

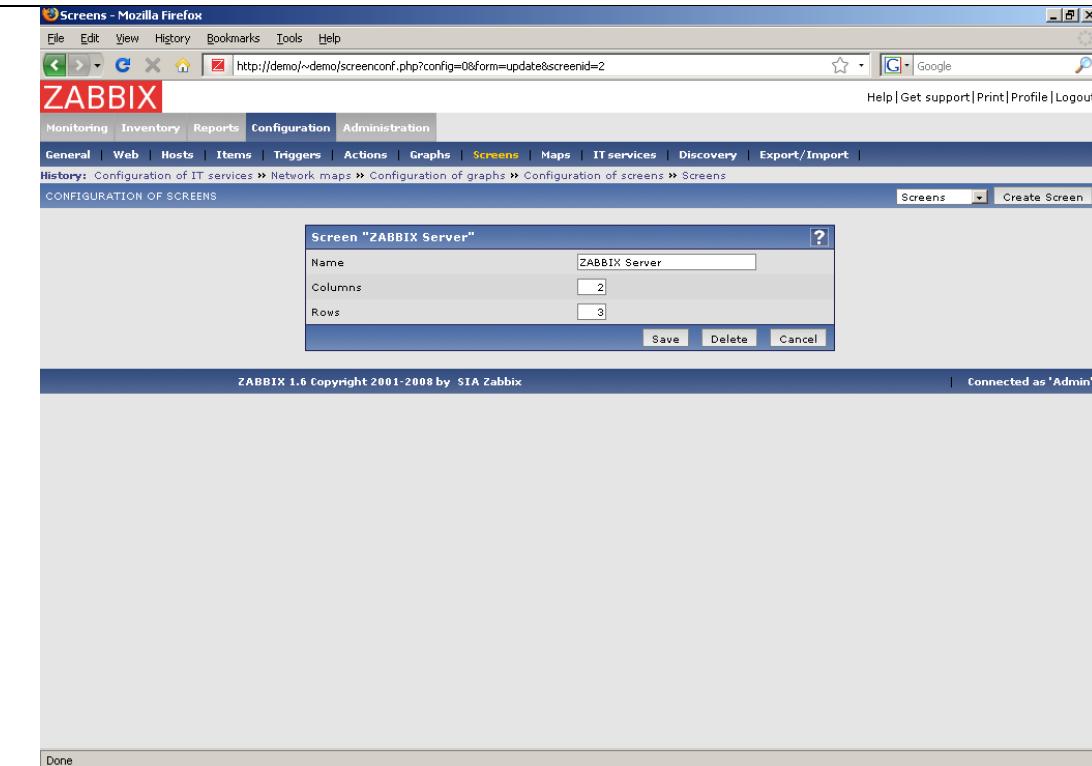
The screenshot shows the Zabbix web interface in Mozilla Firefox. The title bar says 'Screens - Mozilla Firefox'. The address bar shows the URL 'http://demo/~demo/screenconf.php'. The main content area has a header 'ZABBIX' and a navigation menu with tabs: Monitoring, Inventory, Reports, Configuration (which is selected), Administration, General, Web, Hosts, Items, Triggers, Actions, Graphs, Screens (highlighted in yellow), Maps, IT services, Discovery, Export/Import. Below the menu is a breadcrumb trail: History: Configuration of IT services > Network maps > Configuration of graphs > Screens > Configuration of screens. A sub-header 'CONFIGURATION OF SCREENS' is followed by a table titled 'SCREENS'. The table has columns: Name, Dimension (cols x rows), and Screen. One row is listed: 'ZABBIX Server' under 'Name', '2 x 3' under 'Dimension (cols x rows)', and 'Edit' under 'Screen'. At the bottom of the page, it says 'ZABBIX 1.6 Copyright 2001-2008 by SIA Zabbix' and 'Connected as "Admin"'. A 'Done' button is at the bottom left.

Displayed data:

Parameter	Description
Name	Screen name.
Dimension (cols x rows)	Screen size, number of columns and rows.

Screen configuration (high-level)

The screen provides access to configuration of a single screen.



Screen high-level attributes:

Parameter	Description
Name	Unique screen name.
Columns	Number of columns in the screen.
Rows	Number of rows in the screen.

Screen configuration (screen elements)

The screen provides access to configuration of a single screen giving access to configuration of all elements.

Configuration of screens - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://demo/~demo/screenedit.php?screenid=2

ZABBIX

Monitoring Inventory Reports Configuration Administration

General Web Hosts Items Triggers Actions Graphs Screens Maps IT services Discovery Export/Import

History: Configuration of IT services > Network maps > Configuration of graphs > Configuration of screens > Screens

CONFIGURATION OF SCREEN

Status of Proxies

11.03.2008 14:30:58

ZABBIX Server:CPU Loads (1h history)

ZABBIX Server:CPU Utilization (1h history)

http://demo/~demo/screenedit.php?form=update&screenid=2&screenitemid=2#form

Click on a screen element (cell) to change what information should be displayed in the screen cell.

Configuration of screens - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://demo/~demo/screenedit.php?form=update&screenid=2&screenitemid=2#form

ZABBIX

Monitoring Inventory Reports Configuration Administration

General Web Hosts Items Triggers Actions Graphs Screens Maps IT services Discovery Export/Import

History: Configuration of IT services > Network maps > Configuration of graphs > Screens > Configuration of screens

CONFIGURATION OF SCREEN

Screen cell configuration

Resource	Map
Parameter	Status of Proxies
Horizontal align	Center
Vertical align	Middle
Column span	2
Row span	0

Save Delete Cancel

ZABBIX Server:CPU Loads (1h history)

ZABBIX Server:CPU Utilization (1h history)

ZABBIX Server:Network utilization (1h history)

ZABBIX Server:Disk usage (1h history)

Done

Screen high-level attributes:

Parameter	Description
Resource	Information displayed in the cell: Clock – digital or analog clock displaying current server or local time Data overview – latest data for a group of hosts Graph – single custom graph History of actions – history of recent actions History of events – latest events Hosts info – high level host related information Map – single map Plain text – plain text data Screen – screen (one screen may contain other screens inside) Server info – server high-level information Simple graph – single simple graph Triggers info – high level trigger related information Triggers overview - status of triggers for a host group URL – include content from an external resource
Horizontal align	Possible values: Center Left Right
Vertical align	Possible values: Middle Top Bottom
Column span	Extend cell to a number of columns, same way as HTML column spanning works.
Row span	Extend cell to a number of rows, same way as HTML row spanning works.

19.2.9. Maps

19.2.9.1.Maps

The screen is used to manage user-defined maps.

List of Maps

The screen provides list of maps.

The screenshot shows a Mozilla Firefox browser window with the title 'Network maps - Mozilla Firefox'. The address bar contains 'http://demo/~demo/sysmaps.php'. The page header includes the ZABBIX logo and navigation links: Monitoring, Inventory, Reports, Configuration (which is selected), Administration, General, Web, Hosts, Items, Triggers, Actions, Graphs, Screens, Maps (highlighted in yellow), IT services, Discovery, Export/Import, Help, Get support, Print, Profile, and Logout. Below the header, a breadcrumb trail shows: History: Configuration of IT services > Configuration of graphs > Screens > Network maps > Configuration of screens. A 'Create Map' button is visible. The main content area is titled 'MAPS' and displays a table with two rows:

Name	Width	Height	Map
Local network	980	200	Edit
Status of Proxies	830	400	Edit

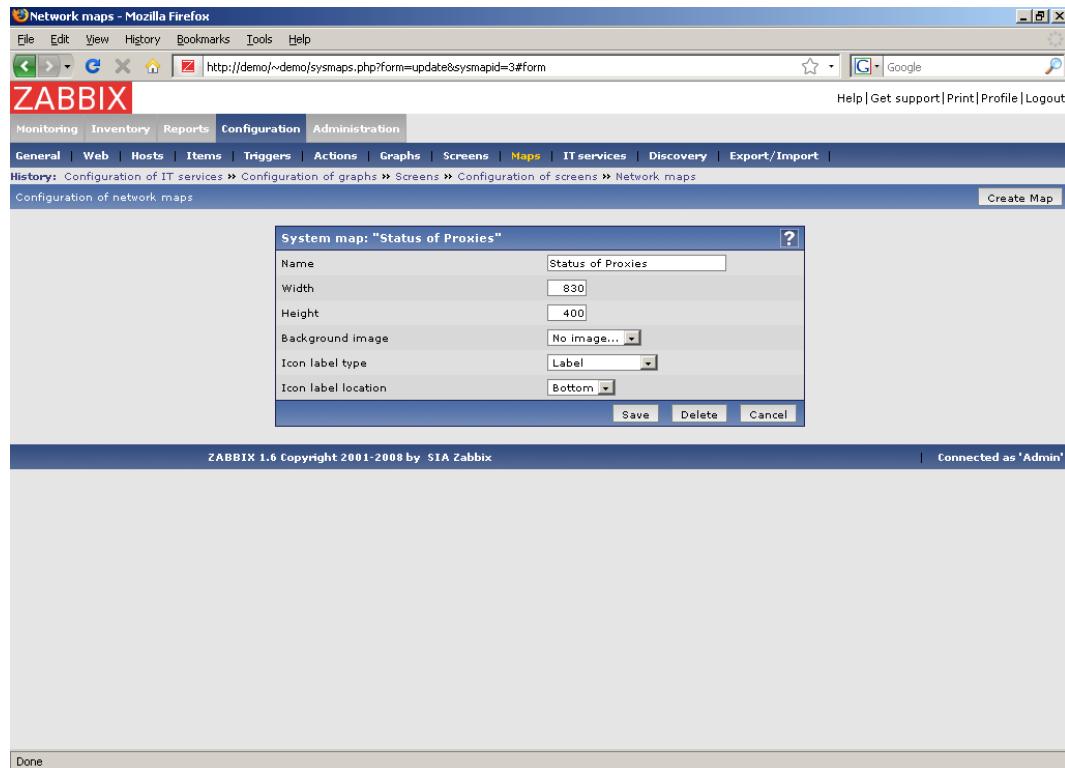
At the bottom of the page, there is a footer with 'ZABBIX 1.6 Copyright 2001-2008 by SIA Zabbix' and 'Connected as Admin'.

Displayed data:

Parameter	Description
Name	Map name
Width	Map width in pixels.
Height	Map height in pixels.

Map configuration (high-level)

The screen provides access to configuration of a user-defined screen.



Map high-level attributes:

Parameter	Description
Name	Unique map name.
Width	Map width in pixels.
Height	Map height in pixels.
Background image	Use background image: No image – no background image (white background) Image – selected image to be used as a background image. No scaling is performed.
Icon label type	Label type used for all map icons: Label – icon label only IP address – IP address only Element name – element name (for example, host name) Status only – status only (OK or PROBLEM) Nothing - no icon labels are displayed
Icon label location	Display icon label on: Bottom – bottom (under the icon)

Parameter	Description
	Left – left side
	Right – right side
	Top – top of the icon

Map configuration (configuration of map elements)

The screen provides access to configuration of map icons and links.

List of map elements (icons):

DISPLAYED ELEMENTS							
Label	Type	X	Y	Icon (ok)	Icon (problem)	Icon (unknown)	Icon (disabled)
Australia	Host	50	50				
Brazil	Host	150	50				
Canada	Host	250	50				
Estonia	Host	350	50				
Finland	Host	450	50				
France	Host	550	50				
Germany	Host	650	50				
Ireland	Host	50	200				
Japan	Host	750	200				
Latvia	Host	550	300				
Lithuania	Host	450	300				
Netherlands	Host	350	300				
New Zealand	Host	250	300				
Poland	Host	150	300				
Russia	Host	50	300				
United Kingdom	Host	750	100				
USA	Host	650	300				

List of links:

Configuration of network maps - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://demo/~demo/sysmap.php?sysmapid=3

ZABBIX Server Host 400 200

CONNECTORS				Create connection
Link	Element 1	Element 2	Link status indicator	
link 1	ZABBIX Server	Australia	-	
link 2	ZABBIX Server	Brazil	-	
link 3	ZABBIX Server	Canada	-	
link 4	ZABBIX Server	Estonia	-	
link 5	ZABBIX Server	Finland	-	
link 6	ZABBIX Server	France	-	
link 7	ZABBIX Server	Germany	-	
link 8	ZABBIX Server	Ireland	-	
link 9	ZABBIX Server	Japan	-	
link 10	ZABBIX Server	Latvia	-	
link 11	ZABBIX Server	Lithuania	-	
link 12	ZABBIX Server	Netherlands	-	
link 13	ZABBIX Server	New Zealand	-	
link 14	ZABBIX Server	Poland	-	
link 15	ZABBIX Server	Russia	-	
link 16	ZABBIX Server	United Kingdom	-	
link 17	ZABBIX Server	USA	-	

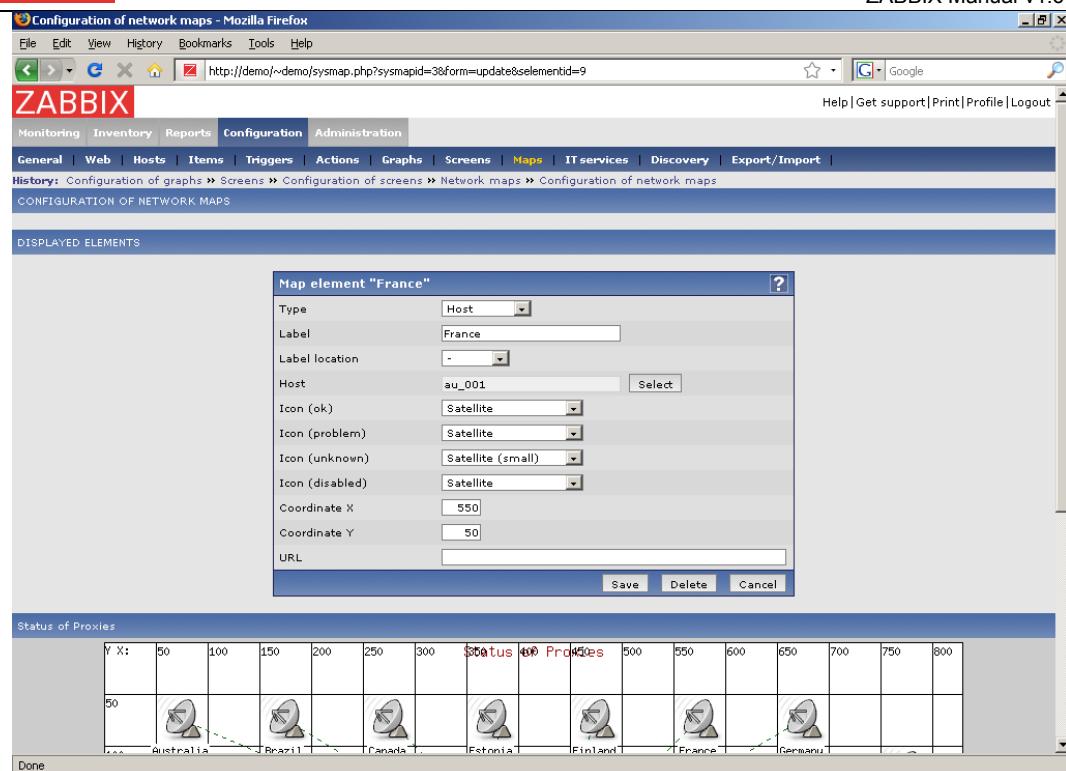
Status of Proxies

Y X:	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800
50																
100	Australia OK	Brazil OK	Canada OK	Estonia OK	Finland OK	France OK	Germany OK	United Kingdom								

Done

Configuration of map element

The screen provides access to configuration of a single map element.



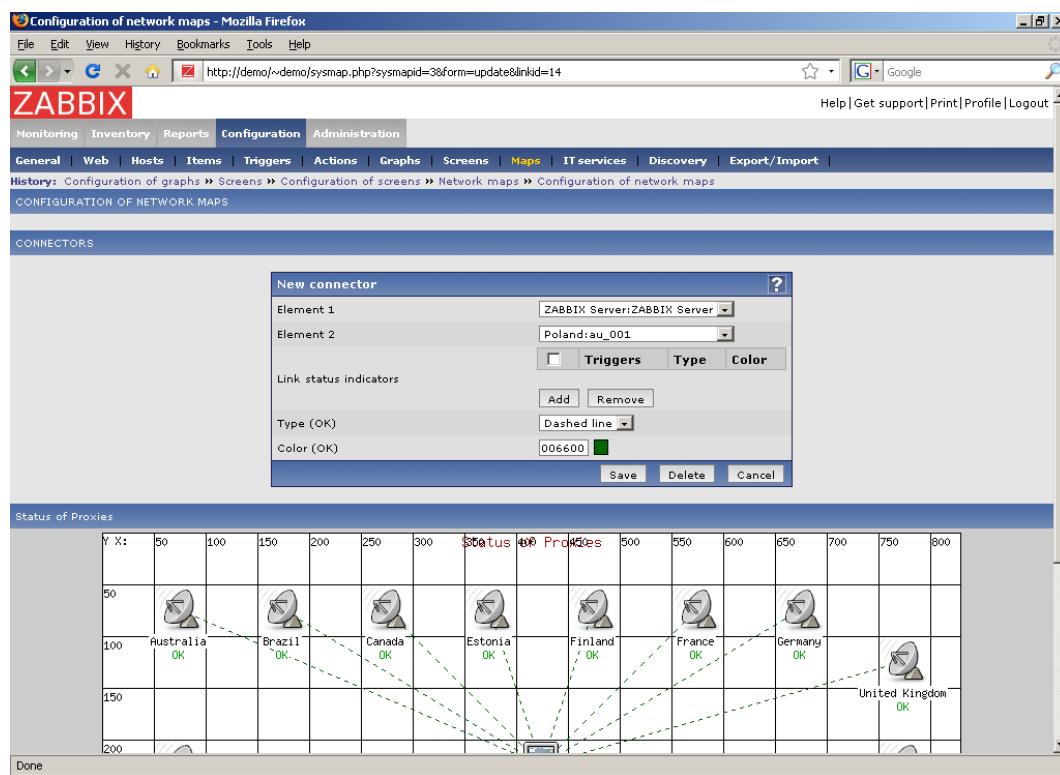
Map element attributes:

Parameter	Description
Type	Type of the element: Host – icon representing status of all triggers of the selected host Map – icon representing status of all elements of a map Trigger – icon representing status of a single trigger Host group – icon representing status of all triggers of all hosts belonging to
Label	Icon label, any string.
Label location	Label location: Default – Map's default label location Bottom – bottom (under the icon) Left – left side Right – right side Top – top of the icon
Host	Status of triggers of this hosts will be used.
Map	Status of all elements of this map will be used.

Parameter	Description
Trigger	Status of this triggers will be used.
Host group	Status of all triggers of this host group will be used.
Icon (ok)	Icon to be used when no problem exists.
Icon (problem)	Icon to be used in case of problems (one or more).
Icon (unknown)	Icon to be used in case of problems (one or more).
Icon (disabled)	Icon to be used if the selected host is disabled.
Coordinate X	X coordinate for the map element.
Coordinate Y	Y coordinate for the map element.
URL	If set, the URL will be used when an user clicks on the screen element.

Configuration of a link

The screen provides access to configuration of a link.



Map link attributes:

Parameter	Description
Element 1	Unique screen name.
Element 2	Number of columns in the screen.
Link status indicators	List of triggers linked to the link. In case if a trigger has status PROBLEM, its style is applied to the link.
Type (OK)	Default link style: Line – single line Bold line – bold line Dot - dots Dashed line – dashed line
Color (OK)	Default link color.

19.2.10.IT Services

19.2.10.1.IT Services

The screen is used to manage IT Services.

List of IT Services

The screen provides list of IT Services.

The screenshot shows the Zabbix Administration interface. The top navigation bar includes links for Monitoring, Inventory, Reports, Configuration, Administration, General, Web, Hosts, Items, Triggers, Actions, Graphs, Screens, Maps, IT services, Discovery, Export/Import, Help, Get support, Print, Profile, and Logout. The main content area is titled "IT SERVICES" and displays a table with columns: Service, Status calculation, and Trigger. The table lists various geographical locations under the "root" service, each with a status calculation of "Problem, if at least one child has a problem" and a trigger set to "None". A legend at the bottom right indicates that a blue square represents a host and a red square represents a service.

Service	Status calculation	Trigger
root		
SLA by Location		
Australia	Problem, if at least one child has a problem	None
Brazil	Problem, if at least one child has a problem	None
Canada	Problem, if at least one child has a problem	None
Estonia	Problem, if at least one child has a problem	None
Finland	Problem, if at least one child has a problem	None
France	Problem, if at least one child has a problem	None
Germany	Problem, if at least one child has a problem	None
Ireland	Problem, if at least one child has a problem	None
Japan	Problem, if at least one child has a problem	None
Latvia	Problem, if at least one child has a problem	None
Lithuania	Problem, if at least one child has a problem	None
Netherlands	Problem, if at least one child has a problem	None
New Zealand	Problem, if at least one child has a problem	None
Poland	Problem, if at least one child has a problem	None
Russia	Problem, if at least one child has a problem	None
South Africa	Problem, if at least one child has a problem	None
Spain	Problem, if at least one child has a problem	None
Sweden	Problem, if at least one child has a problem	None
United Kingdom	Problem, if at least one child has a problem	None
USA	Problem, if at least one child has a problem	None
SLA by Service		

Displayed data:

Parameter	Description
Service	Service name.
Status calculation	How the service updates its status.
Trigger	Linked to a trigger: none – no linkage trigger name – linked to the trigger, thus depends on the trigger status

IT Service configuration

The screen provides access to configuration of a user-defined screen.

The screenshot shows a Mozilla Firefox browser window with the URL http://demo/~demo/services_form.php?sform=1. The page title is "Service 'Australia'". The form fields include:

- Name:** Australia
- Parent Service:** SLA by Location
- Depends on:** (checkbox) Services (selected), Soft, Trigger
- Status calculation algorithm:** Problem, if at least one child has a problem
- Calculate SLA:** checked
- Acceptable SLA (in %):** 99.05
- Service times:** No times defined
- New service time:** From Sunday H:i, Till Sunday H:i, add button
- Link to trigger?**: checked
- Trigger:** Mysql is not running on ZABBIX Server, Select button
- Sort order (0->999):** 1

At the bottom are Save, Delete, and Cancel buttons.

IT Service attributes:

Parameter	Description
Name	Service name.
Parent service	Parent service. For reference only, it cannot be changed.
Depends on	List of child services the service depends on.
Status calculation algorithm	<p>How to calculate status of the service:</p> <p>Do not calculate – do not calculate service status</p> <p>Problem, if at least one child has a problem – consider problem if at least one child service has a problem</p> <p>Problem, if all children have problems – consider problem if all children have problems</p>
Calculate SLA	Select to display SLA data.
Acceptable SLA (in %)	SLA percentage for this service. It is used for reporting.
Service times	By default, all service operates 24x7x365. Add new service times to make exceptions.
New service time	Service times:

Parameter	Description
	One-time downtime – a single downtime. Service state within this period does not affect SLA. Uptime – service uptime Downtime – Service state within this period does not affect SLA.
Link to trigger	Services of the lowest level must be linked to triggers.
Sort order	Display sort order, lowest comes first.

19.2.11. Discovery

19.2.11.1. Discovery

The screen is used to manage discovery rules.

List of discovery rules

The screen provides list of discovery rules.

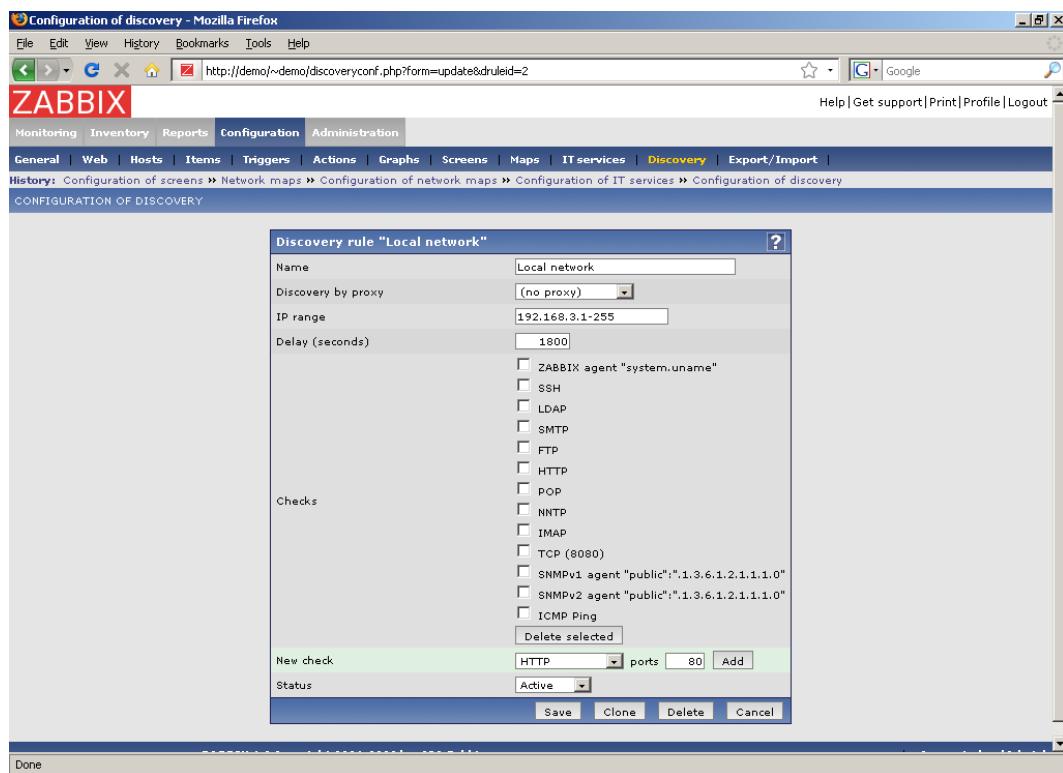
Name	IP range	Delay	Checks	Status
Local network	192.168.3.1-255	1800	SSH,LDAP,SMTP,FTP,HTTP,POP,NNTP,IMAP,TCP,ZABBIX agent,SNMPv1 agent,SNMPv2 agent,ICMP Ping	Active

Displayed data:

Parameter	Description
Name	Name of discovery rule.
IP range	Range of IP addresses affected by the discovery rule.
Delay	Frequency in seconds.
Checks	List of checks executed by the discovery rule.
Status	Status of the discovery rule: Active – the rule is active Disabled – the rule is disabled

Discovery rule configuration

The screen provides access to configuration of a discovery rule.



Discovery rule attributes:

Parameter	Description
Name	Unique name of the discovery rule.
Discovery by proxy	Who performs discovery: (no proxy) – ZABBIX Server is doing discovery proxy name – This proxy performs discovery
IP range	Range of IP addresses for discovery. Format: Single IP: 192.168.1.33 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 (seconds)	This parameter defines how often ZABBIX should execute this rule in seconds.
Checks	List of supported checks: SSH, LDAP, SMTP, FTP, HTTP, POP, NNTP, IMAP, TCP, ZABBIX Agent, SNMPv1 Agent, SNMPv2 Agent
New check	SLA percentage for this service. It is used for reporting.
Port	This parameter may be one of following: Single port: 22 Range of ports: 22-45 List: 22-45,55,60-70
Status	Status of the discovery rule: Active – the rule is active Disabled – the rule is disabled
New service time	Service times: One-time downtime – a single downtime. Service state within this period does not affect SLA. Uptime – service uptime Downtime – Service state within this period does not affect SLA.
Link to trigger	Services of the lowest level must be linked to triggers.
Sort order	Display sort order, lowest comes first.

19.2.12.Export/Import

19.2.12.1.Export

The screen is used to export hosts, items, triggers and graphs.

Export

The screen provides list of hosts and their elements for export.

Name	DNS	IP	Port	Status	Templates	Items	Triggers	Graphs
Template_APP_Battery	-	-	-	Template	-	7	6	-
Template_App_SQL	-	-	-	Template	-	6	-	-
Template_Cisco_PIX_525	-	-	-	Template	-	35	-	-
Template_Dell_OpenManage	-	-	-	Template	-	15	15	-
Template_Dell_PowerConnect_6248	-	-	-	Template	-	832	-	52
Template_Dell_PowerEdge	-	-	-	Template	-	2	2	1
Template_HP_InsightManager	-	-	-	Template	-	12	10	-
Template_Linux	-	-	-	Template	-	102	44	-
Template_Server	-	-	-	Template	-	10	1	3
Template_SNMPv2_Device	-	-	-	Template	-	207	207	-
Template_Standalone	-	-	-	Template	-	8	7	-
Template_Windows	-	-	-	Template	-	29	13	-

Buttons at the bottom: Preview, Export.

Select elements you would like to export, then press “Preview” or “Export”.

Displayed data:

Parameter	Description
Name	Host name.
DNS	Host DNS name.
IP	IP address of ZABBIX agent.
Port	ZABBIX agent port number.
Status	Host status.
Templates	Select to export template related information.
Items	Select to export host items.
Triggers	Select to export host triggers.

Parameter	Description
Graphs	Select to export host graphs.

Preview page:

The screenshot shows a Mozilla Firefox browser window displaying the Zabbix configuration interface. The title bar reads "Export/Import - Mozilla Firefox". The address bar shows the URL "http://demo/~demo/exp_imp.php". The main content area displays a table titled "Host Elements" for a host named "Template_Server". The table has two columns: "Host" and "Elements". The "Host" column contains "Template_Server" and the "Elements" column lists various monitoring items and triggers. At the bottom of the table are buttons for "Back", "Refresh", and "Export". Below the table, a footer bar includes "ZABBIX 1.6 Copyright 2001-2008 by SIA Zabbix" and "Connected as 'Admin'". A "Done" button is visible at the bottom left.

Host	Elements
Template_Server	Item Agent ping Item Incoming traffic on interface \$1 Item Outgoing traffic on interface \$1 Item Host boot time Item Processor load Item CPU \$2 time (\$3) Item CPU \$2 time (\$3) Item CPU \$2 time (\$3) Item Hostname Item Host uptime Trigger Processor load is too high on {HOSTNAME} Graph Network stats Graph CPU times Graph Processor load

19.2.12.2.Import

The screen is used to perform XML import of host related data.

The screenshot shows the Zabbix web interface with the title bar "Export/Import - Mozilla Firefox". The main menu includes File, Edit, View, History, Bookmarks, Tools, and Help. The URL in the address bar is "http://demo/~demo/exp_imp.php?config=1". The page header "ZABBIX" is displayed. The navigation menu includes Monitoring, Inventory, Reports, Configuration, Administration, General, Web, Hosts, Items, Triggers, Actions, Graphs, Screens, Maps, IT services, Discovery, Export/Import, and a History section. A sub-menu under Discovery is "Configuration of network maps > Configuration of IT services > Configuration of discovery > Export/Import". A toolbar at the top right includes Help, Get support, Print, Profile, and Logout. A dropdown menu "Import" is open. The main content area displays the "Import" dialog box with sections for "Import file" (Browse...), "Rules", and "Element" (Existing, Missing) settings for Host, Template, Item, Trigger, and Graph. An "Import" button is at the bottom right of the dialog.

Discovery rule attributes:

Parameter	Description
Import file	XML file to import.
Rules	<p>Set of rules for each type of element:</p> <p>Existing – what to do if element already exists</p> <p>Missing – what do to if element is missing</p> <p>Possible actions:</p> <p>Update – update existing element</p> <p>Add – add element</p> <p>Skip – do not process new data</p>

Press "Import" to import selected file.

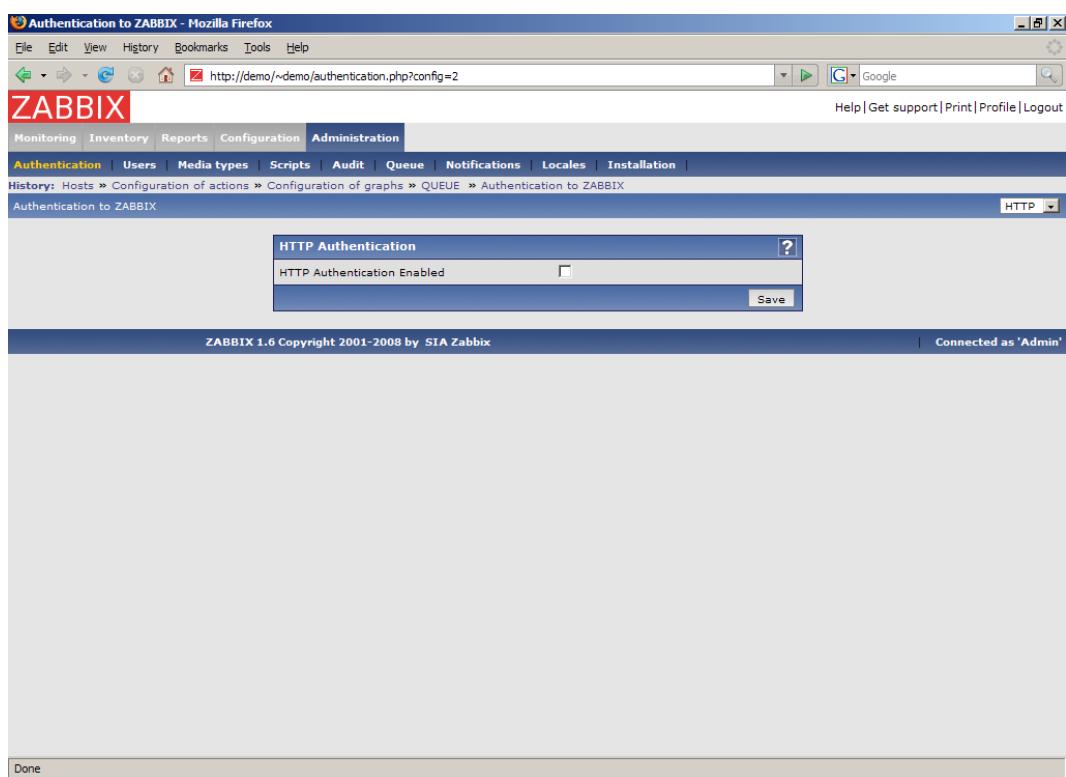
19.3. Administration

The Administration Tab is available to users Super Administrators only.

19.3.1. Authentication

19.3.1.1. HTTP

The screen can be used to enable Apache based (HTTP) authentication. The authentication will be used to check user names and passwords. Note that an user must exist in ZABBIX as well, however his ZABBIX password will not be used.



Configuration parameters:

Parameter	Description
HTTP Authentication Enabled	This parameter defines if Apache based authentication is enabled.

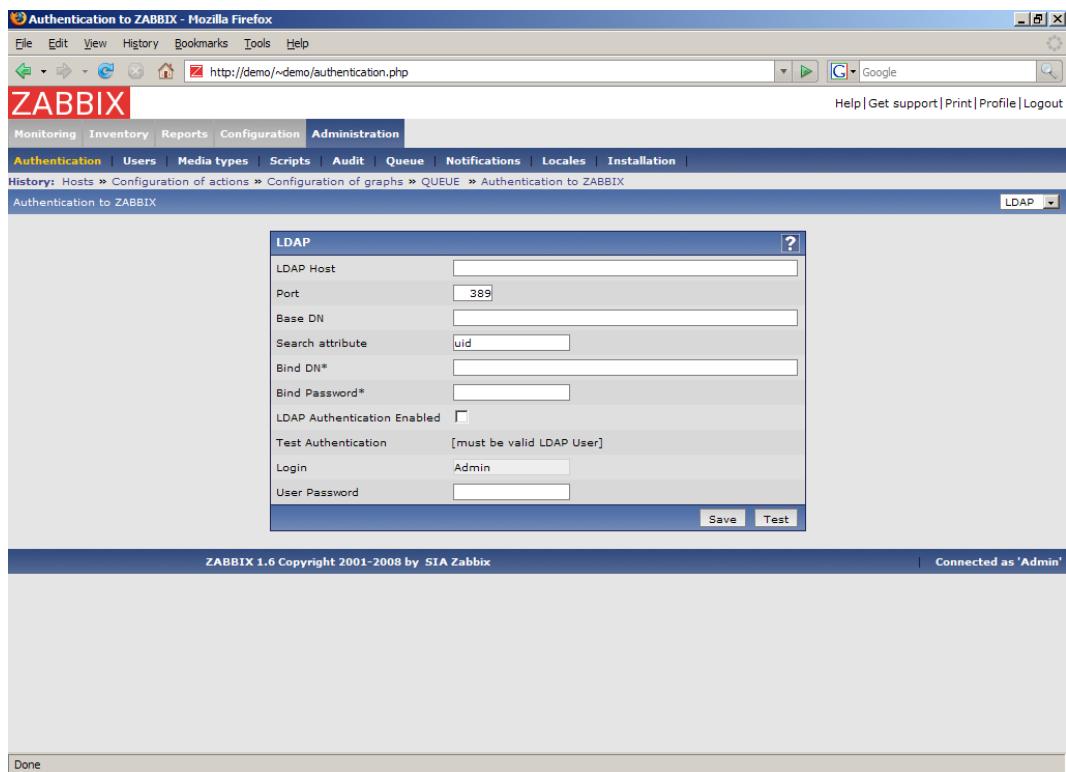
Note: Be carefull! Make sure that Apache authentication is configured and works properly before switching it on.

Note: In case of Apache authentication all users (even with GUI Access set to Internal) will be authorised by Apache, not by ZABBIX!

19.3.1.2.LDAP

The screen can be used to enable external LDAP authentication. The authentication will be used to check user names and passwords. Note that an user must exist in ZABBIX as well, however his ZABBIX password will not be used.

ZABBIX LDAP authentication works at least with Microsoft Active Directory and OpenLDAP.



Configuration parameters:

Parameter	Description
LDAP Host	Name of LDAP server. For example: ldap://ldap.zabbix.com
Port	Port of LDAP server. Default is 389.
Base DN	ou=Users,ou=system
Search Attribute	uid
Bind DN	uid=Admin,ou=system
Bind Password	Password for binding to the LDAP server.
LDAP Authentication	Enable LDAP authentication.

Parameter	Description
Enabled	
Test Authentication	-
Login	Name of a test user. The user must exist in LDAP.
User Password	LDAP password of the test user. ZABBIX will not activate LDAP authentication if it is unable to authenticate the test user.

Note: Some user group can still be authorised by ZABBIX. These group must have GUI Access set to Internal.

19.3.2. Users

19.3.2.1. Users

The screen can be used to manage ZABBIX users.

List of users

It provides list of users.

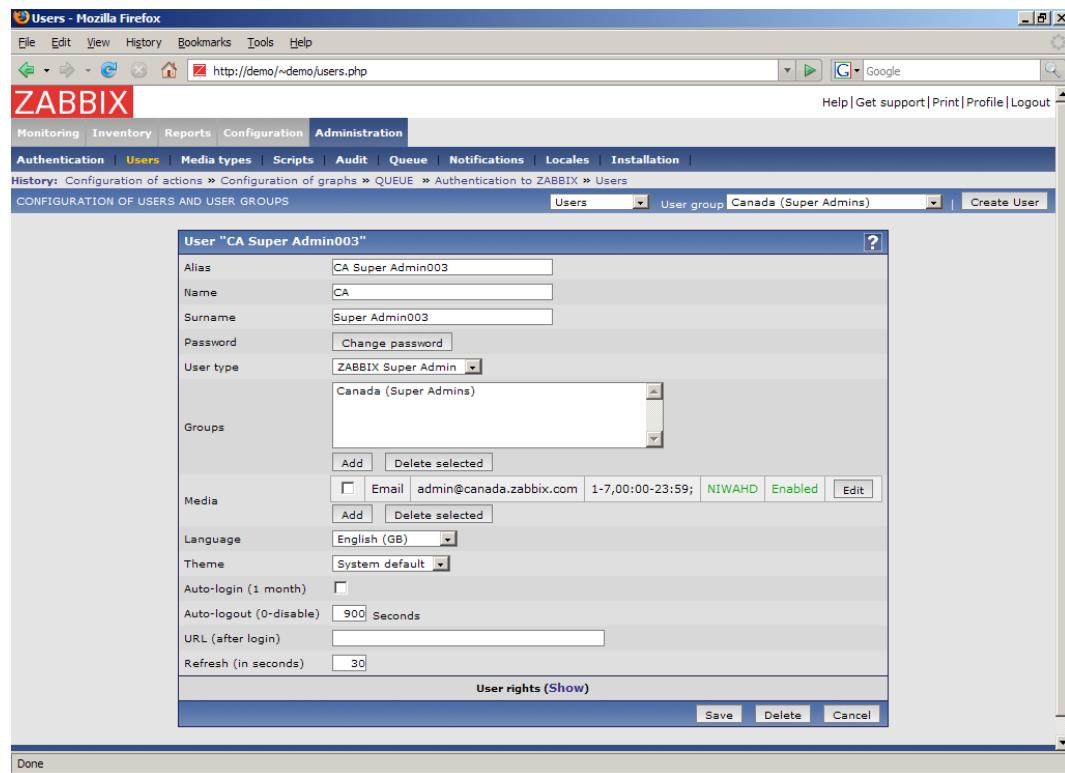
Alias	Name	Surname	User type	Groups	Is online?	GUI access	Status	Actions
<input checked="" type="checkbox"/> CA Super Admin001	CA	Super Admin001	ZABBIX Super Admin	Canada (Super Admins)	No	System default	Enabled	Select
<input type="checkbox"/> CA Super Admin002	CA	Super Admin002	ZABBIX Super Admin	Canada (Super Admins)	No	System default	Enabled	Select
<input type="checkbox"/> CA Super Admin003	CA	Super Admin003	ZABBIX Super Admin	Canada (Super Admins)	No	System default	Enabled	Select
<input type="checkbox"/> CA Super Admin004	CA	Super Admin004	ZABBIX Super Admin	Canada (Super Admins)	No	System default	Enabled	Select
<input type="checkbox"/> CA Super Admin005	CA	Super Admin005	ZABBIX Super Admin	Canada (Super Admins)	No	System default	Enabled	Select
<input type="checkbox"/> CA Super Admin006	CA	Super Admin006	ZABBIX Super Admin	Canada (Super Admins)	No	System default	Enabled	Select
<input type="checkbox"/> CA Super Admin007	CA	Super Admin007	ZABBIX Super Admin	Canada (Super Admins)	No	System default	Enabled	Select
<input type="checkbox"/> CA Super Admin008	CA	Super Admin008	ZABBIX Super Admin	Canada (Super Admins)	No	System default	Enabled	Select
<input type="checkbox"/> CA Super Admin009	CA	Super Admin009	ZABBIX Super Admin	Canada (Super Admins)	No	System default	Enabled	Select
<input type="checkbox"/> CA Super Admin010	CA	Super Admin010	ZABBIX Super Admin	Canada (Super Admins)	No	System default	Enabled	Select

Displayed data:

Parameter	Description
Alias	User short-name, i.e. login name.
Name	User name.
Surname	User surname.
User type	User type, one of following: ZABBIX User ZABBIX Admin ZABBIX Super Admin
Groups	List of all group the user belong to.
Is online?	Is user online.
GUI Access	Access to GUI, depends on settings of user groups: System default – ZABBIX, HTTP Authentication, LDAP Authentication Internal – the user is authenticated by ZABBIX regardless of system settings Disabled – GUI access is restricted to this user
Status	User status, depends on settings of user groups: Enabled – the user is active Disabled – the user is disabled. The user is ignored by ZABBIX.
Actions	

User configuration

The screen provides user details and gives control to change user attributes.



Configuration parameters:

Parameter	Description
Alias	User short-name, i.e. login name. Must be unique!
Name	User name.
Surname	User surname.
User type	User type, one of following: ZABBIX User – access to Monitoring tab only. ZABBIX Admin – access to Monitoring and Configuration tabs. ZABBIX Super Admin – access to everything, including Administration tabs.
Groups	List of all group the user belong to.
Media	List of all medias. The medias are used by ZABBIX for sending notifications.
Language	Language of ZABBIX GUI.
Theme	Defines how the GUI looks like:

Parameter	Description
	System Default - use system settings Original Blue – standard blue theme Black & Blue – alternative theme
Auto-login (1 month)	Enable if you want ZABBIX to remember you. Browser cookies are used for this.
Auto-logout (0 - disable)	User will be logged out after N seconds if inactive. Set it to 0 to disable auto-logout.
URL (after login)	Make ZABBIX to transfer you to the URL after successful login.
Refresh (in seconds)	Refresh used for graphs, screens, plain text data, etc. Can be set to 0 to disable.

Click on User Right **Show** to display user rights. It is impossible to change user rights here, the rights depend on user group membership!

The information is available read-only.

19.3.2.2. User Groups

The screen can be used to manage ZABBIX user groups.

List of user groups

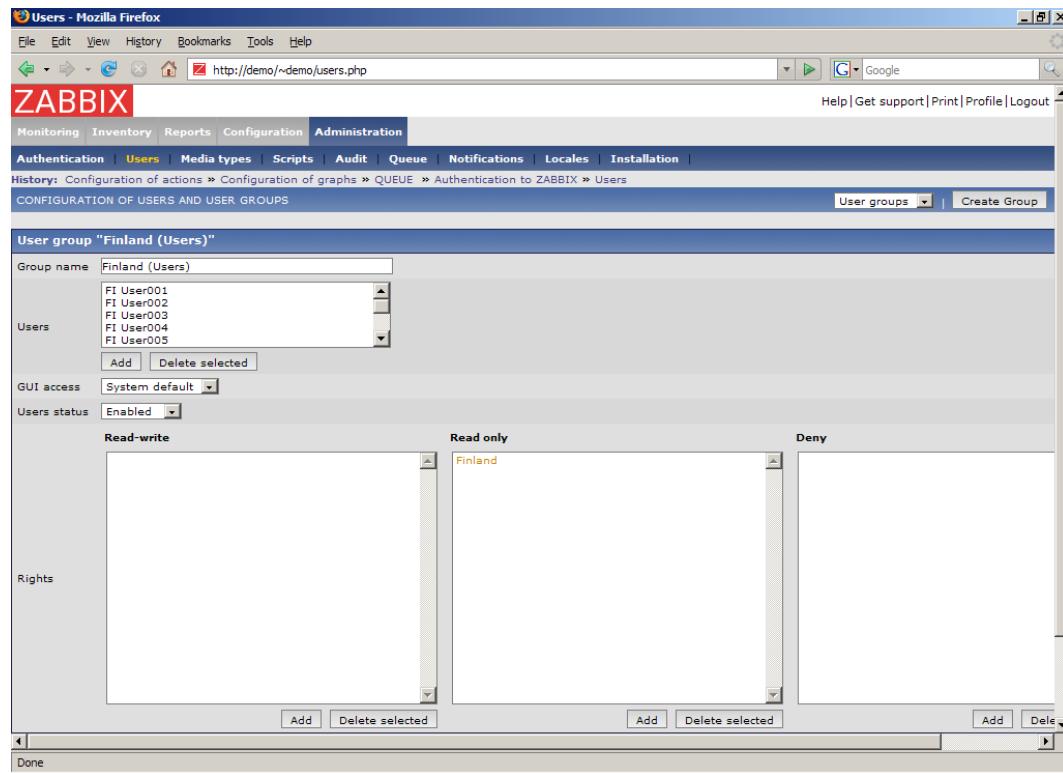
It provides list of user groups.

USER GROUPS			
Users status	GUI access	Name	Members
Enabled	System default	<input type="checkbox"/> Australia (Admins)	AU Admin001, AU Admin002, AU Admin003, AU Admin004, AU Admin005, AU Admin006, AU Admin007, AU Admin008, AU Admin009, AU Admin010
Enabled	System default	<input type="checkbox"/> Australia (Super Admins)	AU Super Admin001, AU Super Admin002, AU Super Admin003, AU Super Admin004, AU Super Admin005, AU Super Admin006, AU Super Admin007, AU Super Admin008, AU Super Admin009, AU Super Admin010
Enabled	System default	<input type="checkbox"/> Australia (Users)	AU User001, AU User002, AU User003, AU User004, AU User005, AU User006, AU User007, AU User008, AU User009, AU User010
Enabled	System default	<input type="checkbox"/> Brazil (Admins)	BR Admin001, BR Admin002, BR Admin003, BR Admin004, BR Admin005, BR Admin006, BR Admin007, BR Admin008, BR Admin009, BR Admin010
Enabled	System default	<input type="checkbox"/> Brazil (Super Admins)	BR Super Admin001, BR Super Admin002, BR Super Admin003, BR Super Admin004, BR Super Admin005, BR Super Admin006, BR Super Admin007, BR Super Admin008, BR Super Admin009, BR Super Admin010
Enabled	System default	<input type="checkbox"/> Brazil (Users)	BR User001, BR User002, BR User003, BR User004, BR User005, BR User006, BR User007, BR User008, BR User009, BR User010
Enabled	System default	<input type="checkbox"/> Canada (Admins)	CA Admin001, CA Admin002, CA Admin003, CA Admin004, CA Admin005, CA Admin006, CA Admin007, CA Admin008, CA Admin009, CA Admin010
Enabled	System default	<input type="checkbox"/> Canada (Super Admins)	CA Super Admin001, CA Super Admin002, CA Super Admin003, CA Super Admin004, CA Super Admin005, CA Super Admin006, CA Super Admin007, CA Super Admin008, CA Super Admin009, CA Super Admin010
Enabled	System default	<input type="checkbox"/> Canada (Users)	CA User001, CA User002, CA User003, CA User004, CA User005, CA User006, CA User007, CA User008, CA User009, CA User010
Enabled	System default	<input type="checkbox"/> Estonia (Admins)	EE Admin001, EE Admin002, EE Admin003, EE Admin004, EE Admin005, EE Admin006, EE Admin007, EE Admin008, EE Admin009, EE Admin010
Enabled	System default	<input type="checkbox"/> Estonia (Super Admins)	EE Super Admin001, EE Super Admin002, EE Super Admin003, EE Super Admin004, EE Super Admin005, EE Super Admin006, EE Super Admin007, EE Super Admin008, EE Super Admin009, EE Super Admin010

Displayed data:

Parameter	Description
Name	Host group name. Must be unique.
User status	Enabled – users are active Disabled – all users of the group are disabled
GUI Access	Displays how the users are authenticated. System default – use default authentication Internal – use ZABBIX authentication Disabled – access to ZABBIX GUI is forbidden
Members	List of group members

User group configuration



Configuration parameters:

Parameter	Description
Group name	Unique group name.
Users	List of members of this group.
GUI Access	How the users of the group are authenticated. System default – use default authentication Internal – use ZABBIX authentication Disabled – access to ZABBIX GUI is forbidden
Users Status	Status of group members: Enabled – users are active Disabled – users are disabled
Rights	Three lists for different host permissions: Read-write – host groups with read-write access Read-only – host groups with read-only access Deny – host groups with deny access

Click on User rights (**Show**) to see what permissions the user group have:

The screenshot shows the 'User rights' configuration page in Mozilla Firefox. The URL is <http://demo/~demo/users.php>. The page has three main sections: 'Read-write', 'Read only', and 'Deny'. The 'Host groups' section under 'Host groups' contains the entry ':Finland'. The 'Hosts' section under 'Hosts' contains entries for hosts from :fi_010 to :fi_024. The 'Deny' section contains a large list of host names, including :Latvia, :Linux servers, :Lithuania, :Netherlands, :New Zealand, :Poland, :Russia, :South Africa, :Spain, :Sweden, :Templates, :United Kingdom, :USA, :Windows servers, and :ZABBIX Servers. At the bottom right are 'Save' and 'Delete' buttons. The footer of the browser window displays 'ZABBIX 1.6 Copyright 2001-2008 by SIA Zabbix' and 'Connected as 'Admin''. A 'Done' button is visible at the bottom left.

19.3.3.Media types

19.3.3.1.Media types

The screen can be used to manage ZABBIX users.

List of media types

It provides list of media types. Media type is a delivery method for user notifications.

The screenshot shows a Mozilla Firefox browser window displaying the ZABBIX Administration interface. The title bar reads "Media types - Mozilla Firefox". The address bar shows the URL "http://demo/~demo/media_types.php". The main header has tabs for Monitoring, Inventory, Reports, Configuration, and Administration, with "Administration" being the active tab. Below the header, there are more navigation links: Authentication, Users, Media types (which is highlighted), Scripts, Audit, Queue, Notifications, Locales, and Installation. A breadcrumb trail indicates the current location: History: Configuration of graphs > QUEUE > Authentication to ZABBIX > Users > Media types. A "Create Media Type" button is visible on the right. The main content area is titled "CONFIGURATION OF MEDIA TYPES" and contains a table with three rows:

Type	Description	Details
Email	Email	SMTP server: 'smtp.zabbix.com', SMTP helo: 'zabbix.com', SMTP email: 'zabbix@zabbix.com'
Jabber	Jabber	Jabber Identifier: 'jabber@jabber.zabbix.com'
SMS	SMS	GSM modem: '/dev/ttyS0'

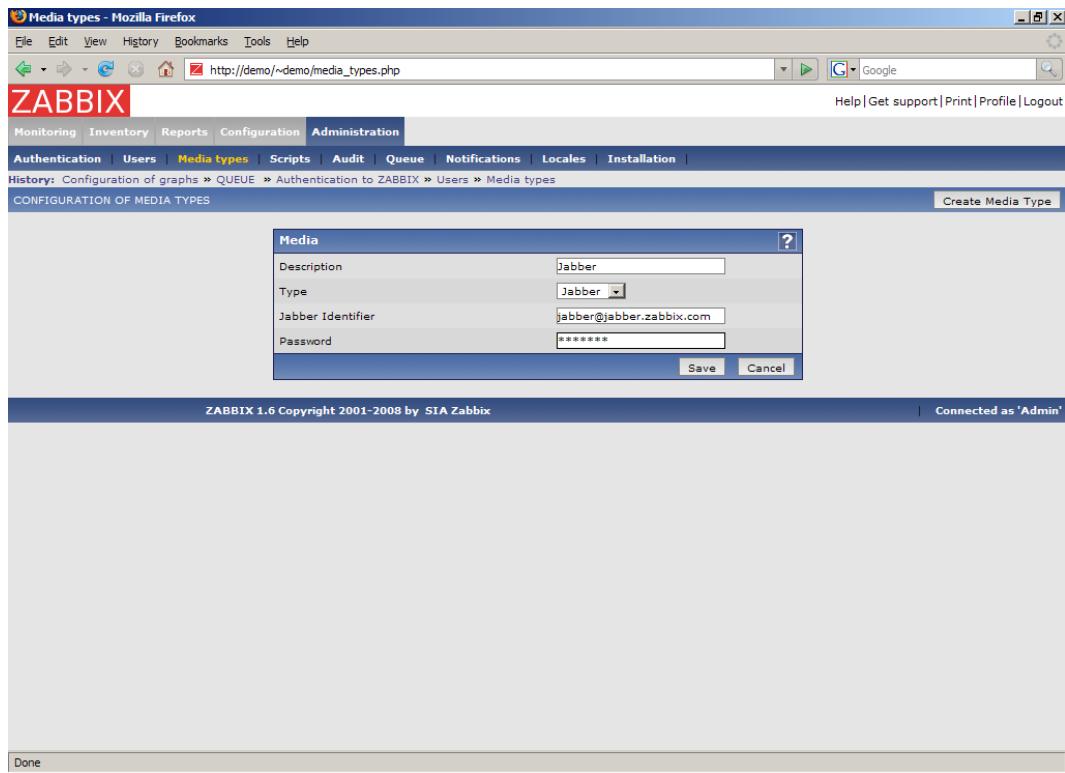
At the bottom of the page, it says "ZABBIX 1.6 Copyright 2001-2008 by SIA Zabbix" and "Connected as 'Admin'".

Displayed data:

Parameter	Description
Type	Media type: Email – email notification SMS – SMS notifications sent using serial GSM modem Jabber – Jabber notification Script – script based notification
Description	Name of the media.
Details	Configuration details, depends on media type.

Media configuration

The screen provides user details and gives control to change media attributes.



Configuration parameters:

Parameter	Description
Description	Unique media name.
Type	Media type: Email – email notification SMTP Server - server name SMTP Hello – Hello string, normally domain name SMTP Email – sender email address SMS – SMS notifications sent using serial GSM modem GSM Modem - serial device name of GSM modem Jabber – Jabber notification Jabber Identifier - Jabber ID Password – Password of the Jabber ID

Parameter	Description
	Script – script based notification
	Script name - name of the custom script

19.3.4. Scripts

The screen can be used to manage user-defined scripts.

List of scripts

It provides list of scripts known to ZABBIX. Depending on permission, ZABBIX user may execute a script from the front-end by clicking on host from certain screens.

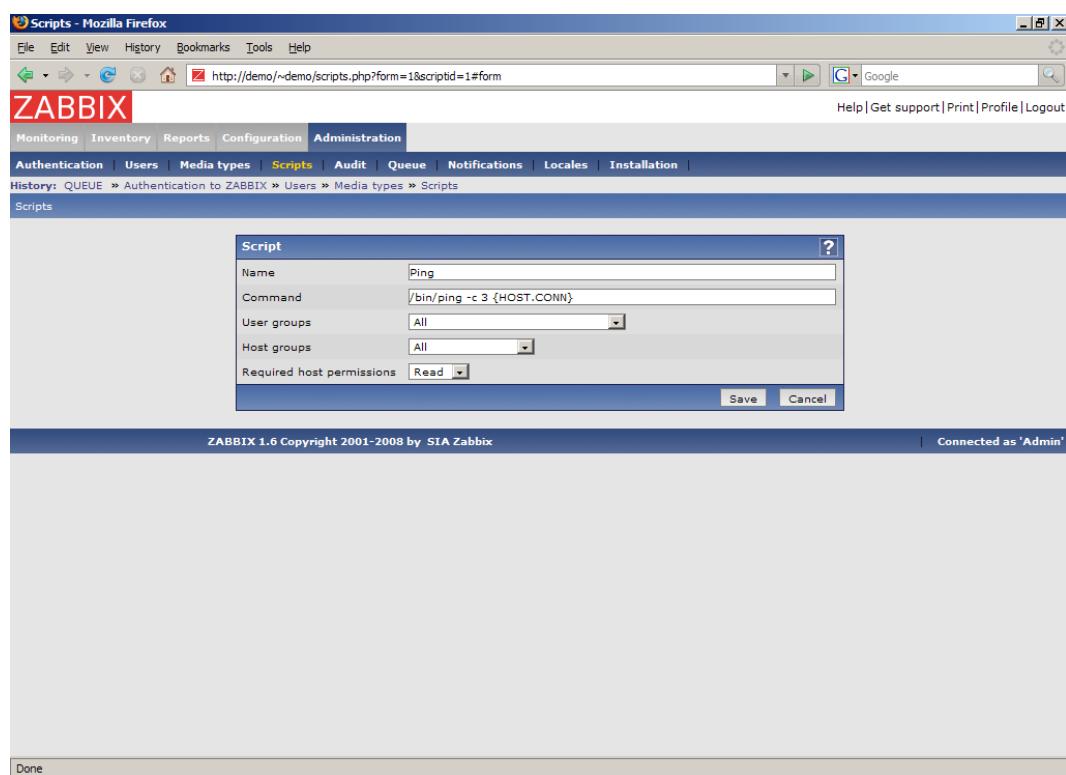
Displayed data:

Parameter	Description
Name	Unique script name.
Command	Command to be executed.
User group	The script is available to members of the user group only.
Host group	The script is available for hosts of the host group only.
Host access	Read - an user must have read permission for the host

Parameter	Description
	to execute the script Write - an user must have write permission for the host to execute the script.

Script configuration

The screen provides script details and gives control to change script attributes.



Configuration parameters:

Parameter	Description
Name	Unique script name.
Command	Full patch to a command, which will be executed on user request. The command will run on ZABBIX Server side. The following macros are supported here: {HOST.CONN} {HOST.DNS} {IPADDRESS}

Parameter	Description
	For example: <code>/bin/ping-c 3 {HOST.CONN}</code> A special syntax for IPMI commands must be used: <code>IPMI <ipmi control> [value]</code> For example: <code>IPMI power off</code>
User group	The script is available to members of the user group only.
Host group	The script is available for hosts of the host group only.
Host access	Read - an user must have read permission for the host to execute the script Write - an user must have write permission for the host to execute the script.

19.3.5.Audit

The screen can be used to see front-end audit records and list of notifications sent to users.

Audit logs

The screenshot shows the Zabbix Audit logs interface. At the top, there's a navigation bar with links like Monitoring, Inventory, Reports, Configuration, Administration, Authentication, Users, Media types, Scripts, Audit, Queue, Notifications, Locales, Installation, and Help. Below the navigation is a breadcrumb trail: History: QUEUE > Authentication to ZABBIX > Users > Media types > Scripts. A filter panel is open, showing a date range from 2008-08-11 to 2008-08-17. The main table lists audit logs with columns: Time, User, Resource, Action, and Details. The table contains numerous entries, mostly from Admin users performing actions like Added, Login, Logout, and Updated on various resources like Media type, Application, Graph, Host, and Item.

Displayed data:

Parameter	Description
Time	Time stamp when an action took place.
User	User name.
Resource	Object, which was affected: Application Graph Host Item User
Action	Performed action: Added Login Logout Removed Updated
Details	More detailed information about action.

Audit actions

The screen provides access to history of notifications and remote commands.

The screenshot shows the Zabbix Audit actions page. At the top, there's a navigation bar with links like Monitoring, Inventory, Reports, Configuration, Administration, Authentication, Users, Media types, Scripts, Audit, Queue, Notifications, Locales, Installation, and Help. Below the navigation is a breadcrumb trail: History: Authentication to ZABBIX » Users » Media types » Scripts » Audit. The main area is titled "Audit actions" and contains a "Filter" section with fields for "From" and "Till" dates, and a "Recipient" field. A "Select" button is next to the recipient field. Below the filter is a table header with columns: Time, Type, Status, Retries left, and Recipient(s). The table body displays a single row: "No actions found". To the right of the table is a calendar for August 2008, with the 17th highlighted in green. Navigation buttons "« Prev 100" and "Next 100 »" are also present. At the bottom of the page, a footer reads "ZABBIX 1.6 Copyright 2001-2008 by SIA Zabbix".

Displayed data:

Parameter	Description
Time	Time stamp when an action took place.
Type	Type of executed operation: Notifications Remote command
Status	Status: Not sent Sent
Retries left	Number of retries left.
Recipient(s)	List of recipients.
Message	Message used in notification.
Error	Error if the notification was not sent.

19.3.6.Queue

The Queue provides information about performance of ZABBIX.

Overview

The view gives information about overall performance of ZABBIX including ZABBIX Server and Proxies.

Items	5 seconds	10 seconds	30 seconds	1 minute	5 minutes	More than 10 minutes
ZABBIX agent	2025	5028	0	0	0	0
ZABBIX agent (active)	0	0	0	0	0	0
SNMPv1 agent	0	0	0	0	0	0
SNMPv2 agent	0	0	0	0	0	0
SNMPv3 agent	0	0	0	0	0	0
Simple check	0	0	0	0	0	0
ZABBIX internal	0	0	0	0	0	0
ZABBIX aggregate	0	0	0	0	0	0
External check	0	0	0	0	0	0

For each item type the following data is displayed:

Parameter	Description
Items	Item type
5 seconds	Data is delayed for 5-10 seconds.
10 seconds	Data is delayed for 10-30 seconds.
30 seconds	Data is delayed for 30-60 seconds.
1 minute	Data is delayed for 1-5 minutes.
5 minutes	Data is delayed for 5-10 minutes.
More than 10 minutes	Data is delayed for more than 10 minutes.

Overview by proxy

The view gives more detailed information about performance of ZABBIX Server and Proxies.

Proxy	5 seconds	10 seconds	30 seconds	1 minute	5 minutes	More than 10 minutes
Australia	101	273	0	0	0	0
Brazil	99	211	0	0	0	0
Canada	105	289	0	0	0	0
Estonia	99	271	0	0	0	0
Finland	101	294	0	0	0	0
France	104	264	0	0	0	0
Germany	96	280	0	0	0	0
Ireland	105	229	0	0	0	0
Japan	101	273	0	0	0	0
Latvia	100	256	0	0	0	0
Lithuania	104	222	0	0	0	0
Netherlands	101	252	0	0	0	0
New Zealand	99	231	0	0	0	0
Poland	105	289	0	0	0	0
Russia	101	231	0	0	0	0
South Africa	99	251	0	0	0	0
Spain	100	313	0	0	0	0
Sweden	109	233	0	0	0	0
United Kingdom	100	237	0	0	0	0
USA	96	320	0	0	0	0
Server	0	0	0	0	0	0

Total: 21

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Connected as Admin

For each Proxy and local ZABBIX Server the following data is displayed:

Parameter	Description
Proxy	Proxy name or Server . Server , displayed last, shows statistics about local server.

Details

The view gives very detailed information about delayed items.

The screenshot shows a Mozilla Firefox browser window displaying the Zabbix Administration interface. The title bar reads "QUEUE [refreshed every 30 sec] - Mozilla Firefox". The address bar shows the URL "http://demo/~demo/queue.php?show=2". The main content area has a blue header bar with tabs: Monitoring, Inventory, Reports, Configuration, Administration, Authentication, Users, Media types, Scripts, Audit, Queue, Notifications, Locales, Installation. Below the header, a breadcrumb trail shows: History: Users > Media types > Scripts > Audit > QUEUE. The main table is titled "QUEUE OF ITEMS TO BE UPDATED". It has three columns: "Next check", "Host", and "Description". The table lists numerous entries, mostly "Agent ping" items from various hosts like nl_017, nl_047, nl_054, etc., with some host boot time and uptime entries. A "Details" dropdown menu is visible at the top right of the table. At the bottom of the table, a message says "Transferring data from demo...".

Next check	Host	Description
08.17.2008 14:28:26	nl_017	Agent ping
08.17.2008 14:28:26	nl_047	Agent ping
08.17.2008 14:28:26	nl_054	Host boot time
08.17.2008 14:28:26	nl_077	Agent ping
08.17.2008 14:28:26	nl_107	Agent ping
08.17.2008 14:28:26	nl_137	Agent ping
08.17.2008 14:28:26	nl_155	Host uptime
08.17.2008 14:28:26	nl_167	Agent ping
08.17.2008 14:28:26	nl_197	Agent ping
08.17.2008 14:28:26	nl_227	Agent ping
08.17.2008 14:28:26	nl_257	Agent ping
08.17.2008 14:28:26	nl_287	Agent ping
08.17.2008 14:28:26	nl_317	Agent ping
08.17.2008 14:28:26	nl_347	Agent ping
08.17.2008 14:28:26	nl_354	Host boot time
08.17.2008 14:28:26	nl_377	Agent ping
08.17.2008 14:28:26	nl_407	Agent ping
08.17.2008 14:28:26	nl_437	Agent ping
08.17.2008 14:28:26	nl_455	Host uptime
08.17.2008 14:28:26	nl_467	Agent ping
08.17.2008 14:28:26	nl_497	Agent ping
08.17.2008 14:28:26	uk_007	Agent ping
08.17.2008 14:28:26	uk_037	Agent ping
08.17.2008 14:28:26	uk_067	Agent ping

List of items is displayed with the following details:

Parameter	Description
Next check	Expected time stamp of next data retrieval. The time stamps will always be in the past.
Host	Host name.
Description	Item name.

19.3.7. Notifications

This is report on number of notifications sent to each user grouped by media types.

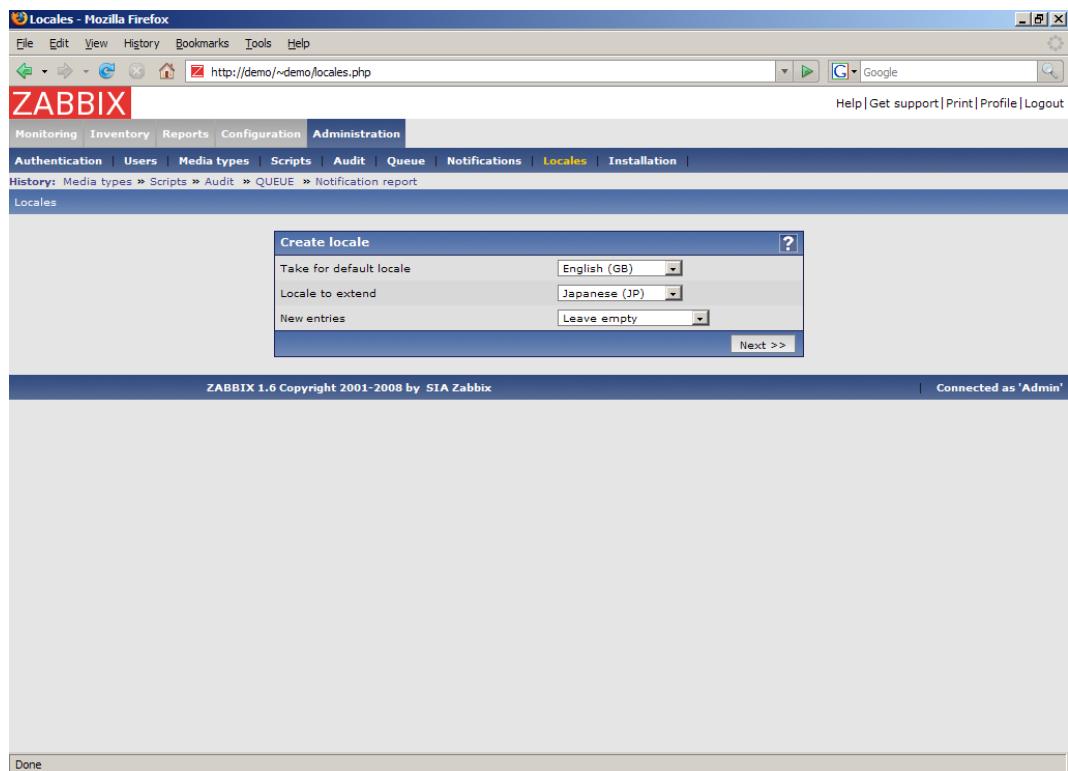
For each user number of notifications is displayed per each media type.

19.3.8.Locales

Locales provides functionality for easy editing of translations of ZABBIX front-end.

Locale selection

Select locale you'd like to select for further processing.



Parameters:

Parameter	Description
Take for default locale	The locale will be used as a base one.
Locale to extend	Select language you'd like to improve.
New entries	Do not add – if something is not translated, ignore it Leave empty – if something is not translated, leave translation empty Fill with default value – if something is not translated, fill translation with default value

Translation form

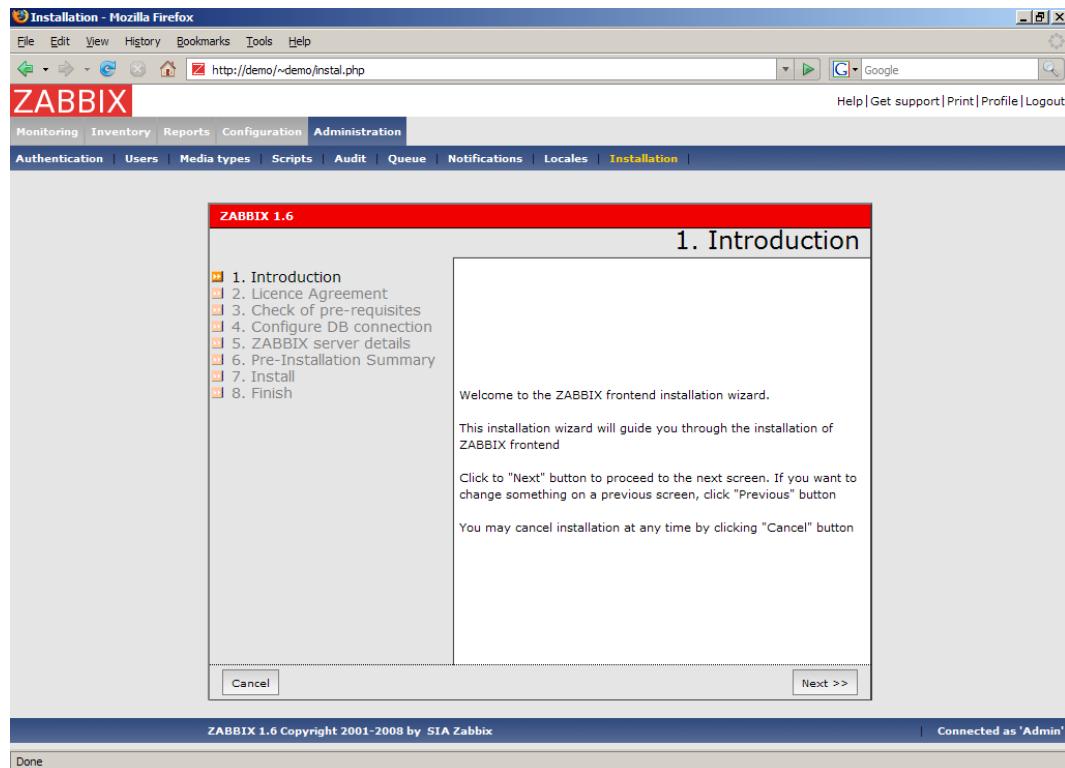
This form is used to translate phrases used in ZABBIX front-end. Left side is filled with default language, right side consists of translated phrases.

English	Japanese
d M H:i:s	m-d H:i:s
d M Y	Y-m-d
UTF-8	UTF-8
Activate selected	選択を有効
Disable selected	選択を無効
Delete selected	選択を削除
Copy selected to ...	選択をコピー...
Host ip	ホストのIPアドレス
Service type	サービスのタイプ
Service port	サービスのポート
Discovery status	ディスカバリーのステータス
Received value	受信した値
Uptime/Downtime	アップタイム/ダウンタイム
Discovery rule	ディスカバリールール
Discovery	ディスカバリー
DISCOVERY	ディスカバリー
Configuration of discovery	ディスカバリーの設定
CONFIGURATION OF DISCOVERY	ディスカバリーの設定
No discovery rules defined	ディスカバリーのルールが定義されていません
IP range	IPアドレスの範囲

Once translation is ready, press button “Download” to have translation file, which can be used to replace files under **include/locales**.

19.3.9. Installation

The screen makes possible creation of ZABBIX front-end configuration file.



20. Performance Tuning

20.1. 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 $600 \times 2 = 1200$ servers. These calculations made in assumption that all monitored values are retrieved as soon as required (latency is 0). If this is not a requirement, then number of monitored servers can be increased even up to 5x-10x times.

20.2. Performance tuning

It is very important to have ZABBIX system properly tuned for maximum performance.

20.2.1. Hardware

General advices on hardware:

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

20.2.2. 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.

20.2.3.Database Engine

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

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

20.2.4.General advices

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

Example: why use system[procload],system[procload5] and system[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).

21.Cookbook

21.1.GENERAL RECIPES

21.1.1.Monitoring of server's availability

At least three methods (or combination of all methods) may be used in order to monitor availability of a server.

- ICMP ping (Key "icmpping")
- Key "status"
- Trigger function nodata() for monitoring availability of hosts using only active checks

21.1.2.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.

21.2.MONITORING OF SPECIFIC APPLICATIONS

21.2.1.AS/400

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

21.2.2.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)

21.2.3.Mikrotik routers

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

21.2.4.WIN32

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

21.2.5.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.

21.2.6.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.

21.2.7.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.

21.2.8.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>:<jmlexport>
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 userparam.

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

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

21.3.INTEGRATION

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

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

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- Share your experience

We are extremely interested in your experience of using ZABBIX. It gives very useful information that allows us make the software better. It also helps justify priorities for the feature requests.

- Write review

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

- Report bugs

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

- Write code

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

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

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

My wish list at Amazon.com

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<http://www.amazon.com/exec/obidos/wishlist/2MXT84ZA4ZNNA>

Thanks to all who sent me something from Amazon!

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

Contributors

Please, see ZABBIX Manual for a complete list of contributors.

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24.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.

24.1.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.

24.2.Contributors to ZABBIX

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

In alphabetical order:

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

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

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

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Support for querying SNMP parameters by IP address.

- DANIEL ESTER

Support for SNMP values of type timetick.

- DANIEL HIGGINS

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- EUGENY BACULA

Many suggestions for improvements.

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

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RPMs and zabbix.spec.

- IGOR MICKO

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Start-up scripts for RedHat 8.0

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Help with testing

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Idea and implementation of check_service_perf[^{*}]

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Select criteria in for “Status of Triggers”

- LUKAS MACURA

Many ideas.

- MARC LEDENT

Original implementation of proc_cnt[*] for Solaris.

- MARIUSZ ...

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Improvements for system maps.

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- SEBASTIEN “SLIX” LIENARD

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- SHAWN MARRIOTT

Proofreading of the Manual.

- VICTOR KIRHENSTEIN



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