

Telenet Developing a custom **ZABBIX** Reporting Solution



Who am I



Nick Corné

- Linux DevOps Engineer with Telenet
- Zabbix Certified Expert
- Co-Founder of Triple-C



Who is Telenet

Leading **Belgian** telecom and entertainment player



2.8 million
mobile
customers



1.7 million
internet
customers



2 million
TV subscribers



How do **we** use Zabbix?

We offer monitoring as a service to our customers

- **multi-tenant** design using hostgroups^(*)
- **On-site** proxy nodes
- Daily, weekly, monthly, ... **reporting** for each customer

^(*) Deploying Zabbix as a multi-tenant multi-team monitoring tool (Zabbix Conference Benelux 2020) by Sven Putteneers



How we handled reporting in the past

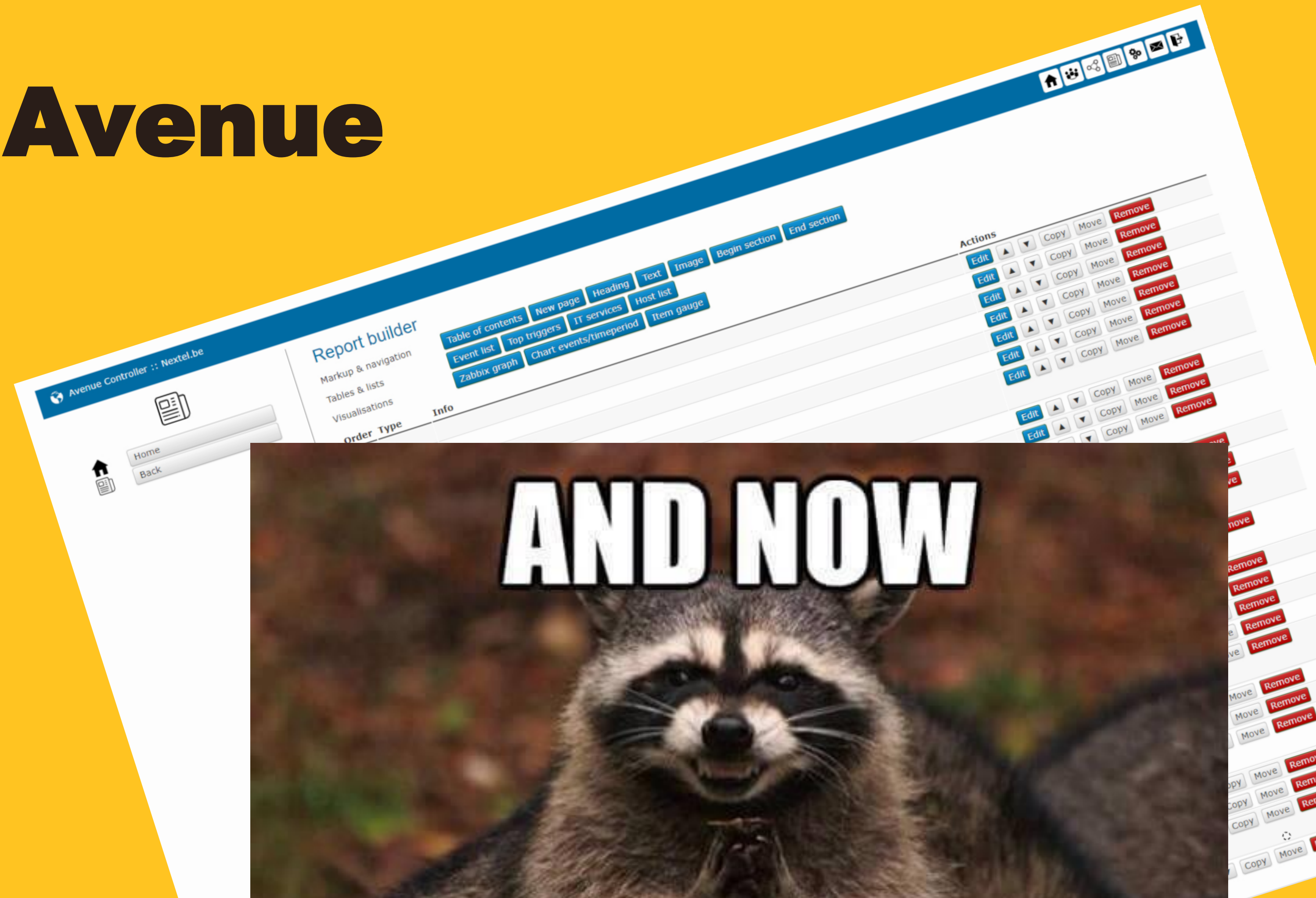
- In the dark corners of Zabbix Integration hub - **Avenue**

The screenshot shows the Zabbix website's integration hub search interface. At the top, the Zabbix logo is on the left, and navigation links for PRODUCT, SOLUTIONS, SUPPORT & SERVICES, TRAINING, PARTNERS, COMMUNITY, and ABOUT US are in the center. A green DOWNLOAD button is on the right. Below the navigation is a search bar with the text "Search in Zabbix Integrations". Underneath the search bar are tabs for Web, Blog, Presentations, Videos, Integrations (which is selected), Release Notes, Events, Press Releases, and Documentation. On the left side, there are filter sections for STATUS (with an "Unofficial" checkbox and a count of 1), TYPE, CATEGORIES (with a "Visualization" checkbox and a count of 1), and ZABBIX VERSIONS. The search bar contains the text "Avenue" and shows "1 result found in 3ms". The search result is a link titled "PDF reports" under the path "integrations/pdf", marked as "unofficial". The description of the result reads: "using Zabbix API. Fully configurable what to include and what not. github.com/martinm76/zabbix-pdf-report GitHub 48 module php 2018-10-17 1 y Popular Avenuenetworks Ggenerate PDF reports directly from your monitoring data. Embed graphs, events and many more elements and data into your periodi...". The word "visualization" is also visible below the result.



Shortcomings of Avenue

- **Not user friendly**
- **Not always accurate**
- **Not the fastest application**
- **Error handling**



And we wait...



Error... Try again



Until it became my problem

12/6/2021

 BUSINESS  BUSINESS  BUSINESS  BUSINESS  BUSINESS  BUSINESS  BUSINESS  BUSINESS  BUSI

Weekly report

Report generated on Mon 06 Dec 2021 00:15



12/6/2021

Table of contents

- [1 Events & Triggers](#)
- [2 CPU, memory, disk space & traffic](#)
- [3 server performance](#)
- [4 cache](#)
- [5 queue](#)
- [6 processes busy](#)

2 Alerts

Hostname	Description	Severity	Occurrences
RSNEXCH	Tracing Service for Search in Exchange Service is not running	High	0
RSNEXCH	Microsoft Exchange Unified Messaging Call Router Service is not running	High	0
RSNEXCH	World Wide Web Publishing Service Service is not running	High	0
RSNSBS01	DHCP Server Service is not running	High	0
RSNSBS01	Group Policy Client Service is not running	High	0
RSNEXCH	Microsoft Exchange Unified Messaging Service is not running	High	0
RSNEXCH	Microsoft Exchange Transport Log Search Service is not running	High	0
RSNEXCH	Microsoft Exchange Service Host Service is not running	High	0
RSNEXCH	Microsoft Exchange Mailbox Transport Submission Service is not running	High	0
RSNEXCH	Microsoft Exchange Throttling Service is not running	High	0
RSNEXCH	Microsoft Exchange Transport Service is not running	High	0
RSNVC	Disk space < 1% on volume F: [2TB <= vol]	High	0
RSNEXCH	Microsoft Exchange IMAP4 Service is not running	High	0
ESXIserver67	Host is unreachable by SNMP for 10m	High	0
RSNEXCH	Microsoft Exchange IMAP4 Backend Service is not running	High	0



Looking for a new **solution**

Consideration

- **Improve on Avenue**
- Zabbix native reporting feature
- Create custom solution



Improve on Avenue



- **Reverse engineering**
- **Time consuming**
- **Out dated technology**

- **Less user impact**
- **Known Evil**
- **Customer ready**
- **No extra infra requirements**



Improve on Avenue

— **Cons**

**REAL PROGRAMMERS
DON'T COMMENT THEIR CODE**

**IF IT WAS HARD TO WRITE
IT SHOULD BE HARD TO
UNDERSTAND**

Hapo Team



Looking for a new **solution**

Consideration

- ~~Improve on Avenue~~
- **Zabbix native reporting feature**
- Create custom solution



Zabbix native reporting



- **Requires dashboards**
- **Not customer ready for our use case**

- **No custom code**
- **Supported by Zabbix**
- **Dummy proof interface**



Zabbix native reporting

Cons



Looking for a new **solution**

Consideration

- ~~Improve on Avenue~~
- ~~Zabbix native reporting feature~~
- **Create custom solution**



Custom solution



- **Development time**

- **Self-managed**
- **Customer ready**
- **No extra dependencies**
- **Custom styling**
- **Build on top of our multi-tenant setup**
- **Dummy proof interface**



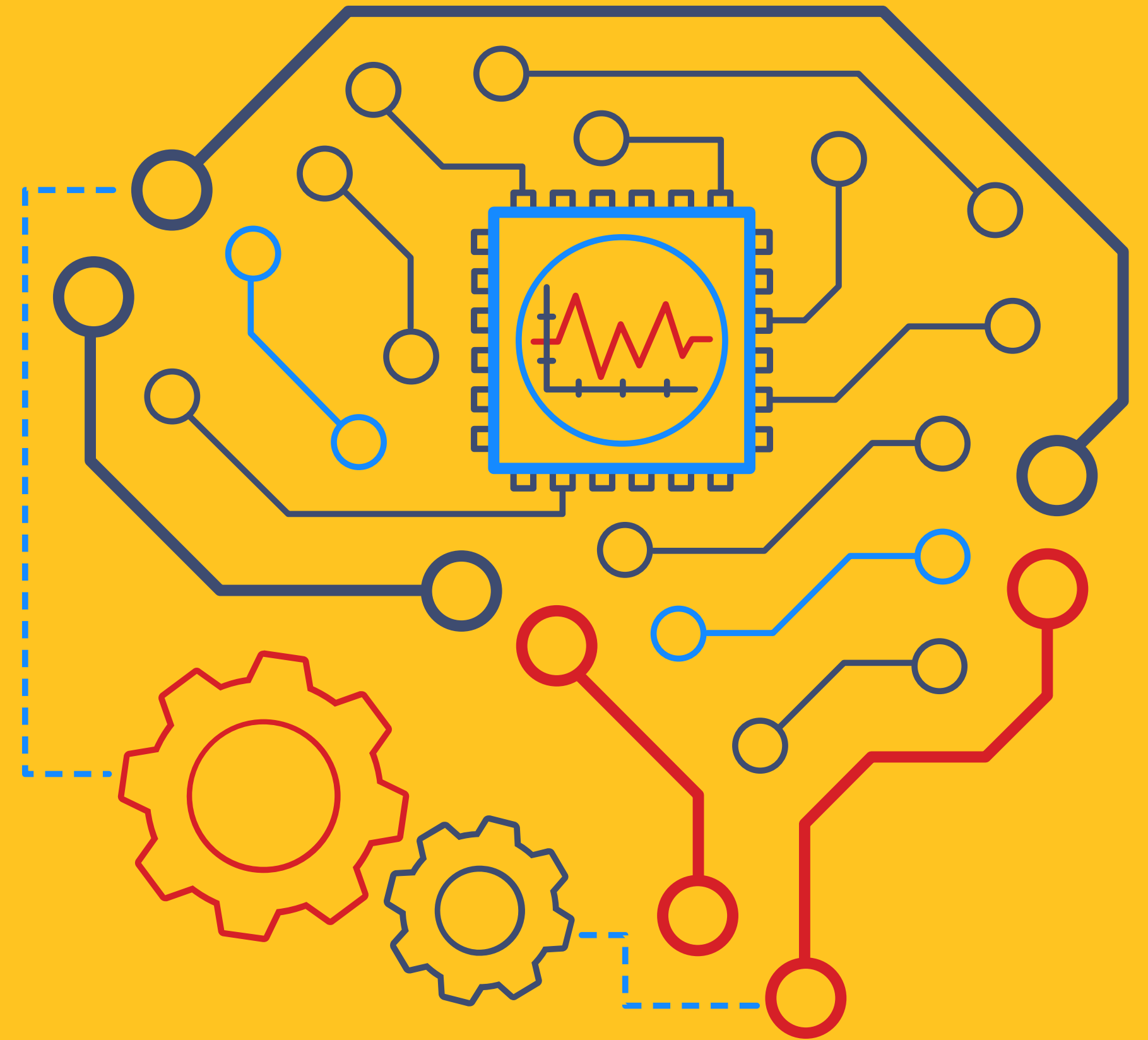
Custom solution



How did we implement this

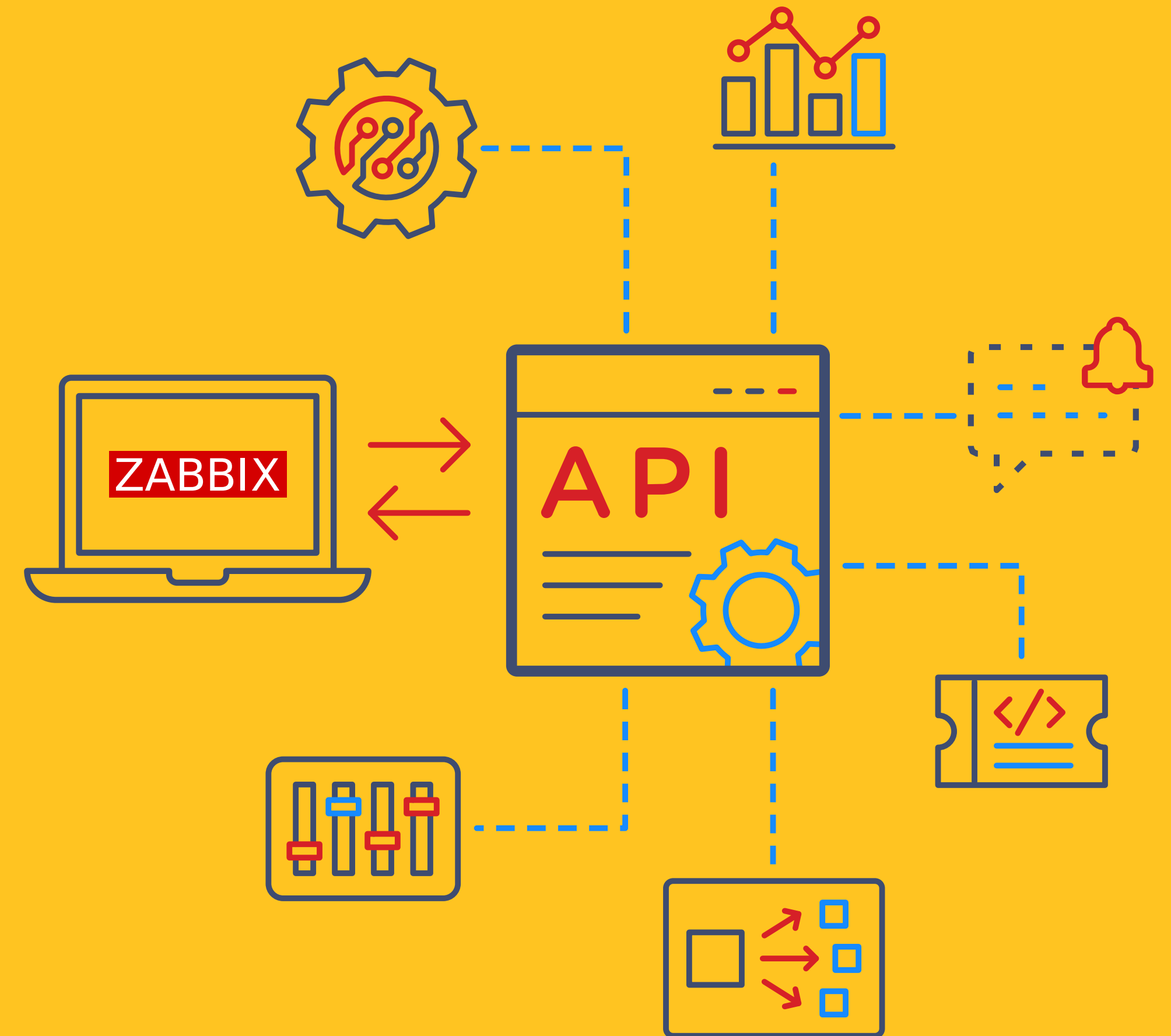
Key requirements

- 100% Zabbix API driven
- No headless-chrome
- Scalability
- Containerized



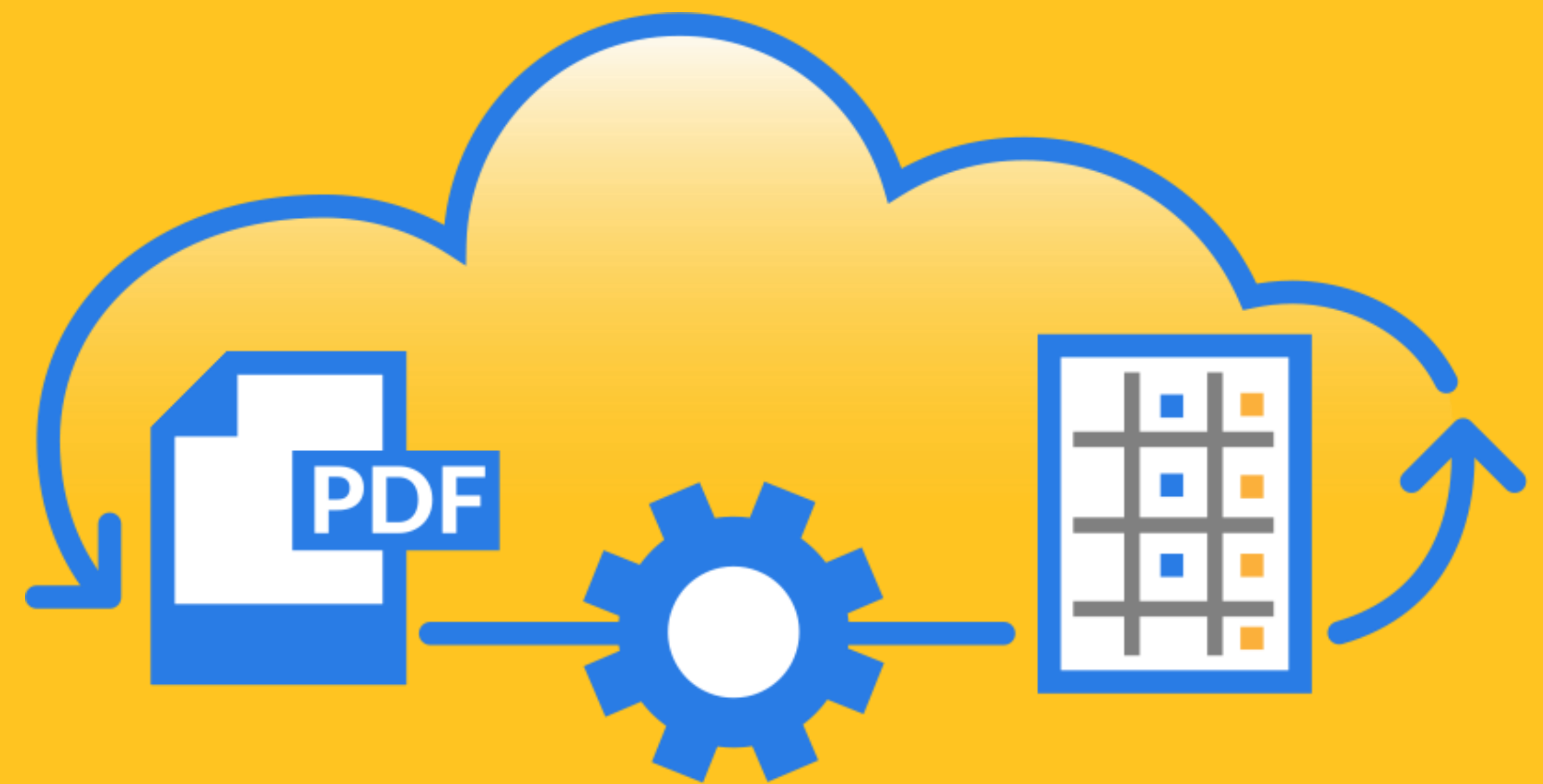
100% Zabbix API

- **No external dependencies**
- **All information fetched from Zabbix API**
- **Customized calls for multi-tenant setup**
- **Graph rendering**



PDF library - no headless-chrome

- **No external dependencies**
- **More flexibility**
- **Less prone to errors due to upgrades**
- **Customized styling**



Scalability

- **Easy scalable**
- **No limit on amount of reports and graphs**
- **Simultaneous report generation**
- **Scheduling**





Containerized

- **CI/CD integrations for build/deployment**
- **High availability**
- **Kubernetes ready**

Deployments

Name ▼ zabbix

Name zabbix ✕ [Clear all filters](#)

Name ↑	Status ↑
 queue-zabbix	3 of 3 pods
 queue-zabbix-graphs	10 of 10 pods



What does the **GUI** look like

Components

- Report overview
- General information
- Graphs
- Schedules



GUI – Report overview

- **Title + subtitle**
- **Time period**
- **Number of schedules**
- **Creation date**
- **Generate now**

Report Overview

[+ New Report](#)

Show entries Search:

Title	Time Period	Schedules	Creation Date	Action(s)
Global - Test Environment	last week	No	2024-08-08 14:10:58	
Triple-C - Yearly Report	current year	Yes (1)	2024-08-08 14:01:58	
Telenet - Weekly report	last week	Yes (1)	2024-08-08 14:01:21	
Telenet - Monthly Report	last month	Yes (2)	2024-08-08 14:00:37	
Zabbix Summit 2024 - Riga	last month	No	2024-08-08 13:59:54	

Showing 1 to 5 of 5 entries Previous **1** Next



GUI – General information

- **Title + subtitle**
- **Customers (hostgroups)**
- **Filter hosts**
- **Page selection**
- **Minimum trigger severity**
- **Sort triggers by**
- **Time period**

Report - New

General Graphs Schedules

Title

Subtitle

Customers
Please select customer(s)

Filter hosts by Tech groups
Please select tech group(s)

Pages

- Table of content
- Host inventory overview
- Active problems
- Triggers
- SLA

Triggers minimum severity
Please select the minimum trigger severity

Sort triggers by
Please select the trigger sorting options

Time period
Please select the time period

Create Report

Report - Zabbix Summit 2024

General Graphs Schedules

Title
Zabbix Summit 2024

Subtitle
Riga

Customers
Telenetbusiness

Pages

- Table of content
- Host inventory overview
- Active problems
- Triggers
- SLA

Triggers minimum severity
Warning

Sort triggers by
Severity (default)

Time period
Last month

Report created at 2024-08-08 13:16:37 by Nick Corne

Update Report Preview Report Open in new tab



GUI – Create/update graph elements

- **Host**
- **Predefined graph / single item**
- **Graph**
- **Description**
- **SLA information**
- **Paragraph + sub paragraph**
- **Time settings**

Update Graph ✕

Host

Please select a host ▼

Graph Type

Predefined graph Single item

Graph

Please select the required host first ▼

Graph Description

Services (SLA)

Optional: Select a SLA service ✕ ▼

Paragraph ?

Sub Paragraph ?



Time settings

Report default Custom

Cancel Add Graph



GUI – Graph overview

























- Paragraph + sub paragraph
- Host
- Graph title
- Indicator icons
description 
SLA 
- Drag & drop

Report - Zabbix Summit 2024

General **Graphs** Schedules

[+ Graph](#)

Show entries Search:

Paragraph	Subparagraph	Host	Graph title	Action(s)
Availability	SIP connectivity	GLOBAL-TEST-OSIP01	Network traffic on docker0 	  
		GLOBAL-TEST-SBCSOUTH-external	ICMP response time	  
	Call Handler functionality	GLOBAL-TEST-APP01	Release cause 101 (Message Not Compatible With Call State)	  
		GLOBAL-TEST-APP01	Process Wildfly %MEM	  
Capacity	Licenses	GLOBAL-TEST-XMS01	Basic Audio licenses - % used 	  
	Hardware/systems	GLOBAL-TEST-XMS01	CPU utilization 	  
		GLOBAL-TEST-SYSLOG01	Network traffic on eth0	  

Showing 1 to 7 of 7 entries Previous **1** Next



GUI – Create/update schedule

- **Recurrence**
- **Receiver(s)**
- **Start time**

Update Schedule ×

Recurrence

Monthly ▼

Receiver(s)

✉ nick.corne@telenetgroup.be + 🗑️

✉ nick.corne@triple-c.be + 🗑️

Start Time

Auto Custom

Cancel Add Schedule



GUI – Schedule overview



- **Recurrence**
- **Receiver(s)**
- **Next run**
- **Last run**
- **Status / duration**
- **Download copy**

Report - Zabbix Summit 2024

General Graphs Schedules




+ Schedule

Show 25 entries Search:

Recurrence	Receiver(s)	Next Run	Last Run	Last Run Duration	Action(s)
Monthly	nick.corne@telenetgroup.be nick.corne@triple-c.be	2024-08-08 13:25:00	never	Running	 

Showing 1 to 1 of 1 entries Previous 1 Next

Show 25 entries Search:

Recurrence	Receiver(s)	Next Run	Last Run	Last Run Duration	Action(s)
Monthly	nick.corne@telenetgroup.be nick.corne@triple-c.be	2024-09-08 13:25:00	2024-08-08 13:25:00	✓ 00:00:02	  

Showing 1 to 1 of 1 entries Previous 1 Next



What does a **report** look like

Available pages

- Front page
- Table of contents
- Host inventory
- (Active) alerts
- Graphs
- SLA



Report – Front page

- **Company logo**
- **Title / subtitle**
- **Reporting period**
- **Timestamp of generation**



Zabbix Summit 2024

Riga

(Reporting Period: 01 February 2024 - 31 July 2024)

Report generated on Fri 09 Aug 2024 08:43



Report – Front page

Old solution



New solution



Report – Table of Contents

- **Company font**
- **Company color scheme**
- **Selected pages**
- **Graphs with paragraph and sub paragraph**
- **Uniform table of contents**

Table of contents

1. Inventory Hosts	3
2. Currently Active Problems	5
3. Alerts	6
4. Graphs	7
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4.1.1 SIP connectify	7
4.1.3 Call Handler functionality	8
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4.2.2 Hardware/systems	9
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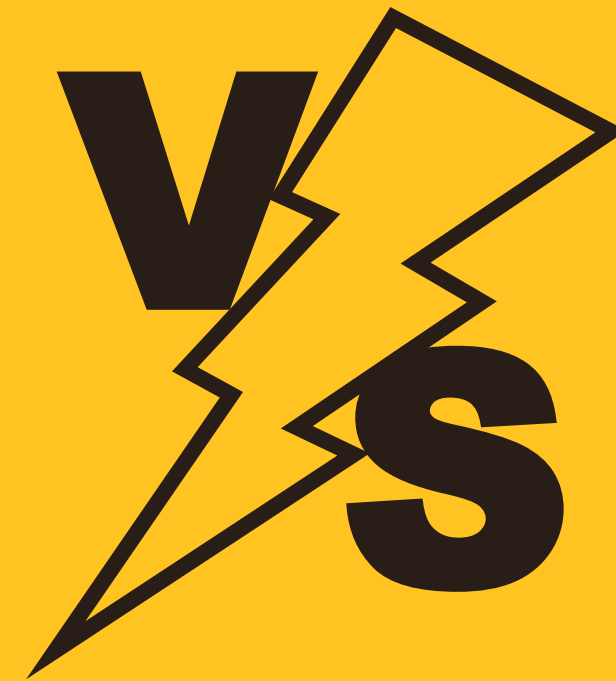
Report – Table of Contents

Old solution

12/6/2021

Table of contents

- [1 Events & Triggers](#)
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New solution

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4.2.2 Hardware/systems	9
5. SLA	11



Report – Host Inventory

- **Host name**
- **Interface(s)**
- **Status of interface**
- **Template(s)**



1. Inventory Hosts

Name	Interfaces	Templates
TEST-APP01	ZBX SNMP IPMI JMX 10.0.1.110:10050	TEMPL-NX Global APP server TEMPL-NX Global backed up hosts Zabbix Agent - Application - Linux - Process Monitoring
TEST-APP02	ZBX SNMP IPMI JMX 10.0.1.210:10050	TEMPL-NX Global APP server TEMPL-NX Global backed up hosts Zabbix Agent - Application - Linux - Process Monitoring
TEST-CORE INTERNALS	ZBX SNMP IPMI JMX 127.0.0.1:10050	TEMPL-CUST-VICTORIA Core Internals
TEST-DB01	ZBX SNMP IPMI JMX 10.0.1.111:10050	Template App MySQL TEMPL-NX Global DB server TEMPL-NX Global backed up hosts Zabbix Agent - Application - Linux - Process Monitoring
TEST-DB02	ZBX SNMP IPMI JMX 10.0.1.211:10050	Template App MySQL TEMPL-NX Global DB server TEMPL-NX Global backed up hosts Zabbix Agent - Application - Linux - Process Monitoring
TEST-FE01	ZBX SNMP IPMI JMX 10.0.2.100:10050	TEMPL-NX Global FE server TEMPL-NX Global backed up hosts Zabbix Agent - Application - Linux - Process Monitoring
TEST-FE02	ZBX SNMP IPMI JMX 10.0.2.200:10050	TEMPL-NX Global FE server TEMPL-NX Global backed up hosts Zabbix Agent - Application - Linux - Process Monitoring
TEST-GRAYLOG01	ZBX SNMP IPMI JMX 10.0.1.55:10050	TEMPL-NX Global Graylog server TEMPL-NX Global backed up hosts
TEST-OSIP	ZBX SNMP IPMI JMX 10.0.1.214:10050	External script - OpenSIPS - HA active server Zabbix Agent - Functionality - HA cluster with VIP
TEST-OSIP01	ZBX SNMP IPMI JMX 10.0.1.115:10050	TEMPL-NX Global OpenSIPS server TEMPL-NX Global backed up hosts
TEST-OSIP02	ZBX SNMP IPMI JMX 10.0.1.215:10050	TEMPL-NX Global OpenSIPS server TEMPL-NX Global backed up hosts
TEST-RO01	ZBX SNMP IPMI JMX 10.0.0.2:161	SNMP - Router - VyOS
TEST-RO02	ZBX SNMP IPMI JMX 10.0.0.3:161	SNMP - Router - VyOS
TEST-SBCSOUTH	ZBX SNMP IPMI JMX 10.0.1.200:10050 10.0.1.200:161	ICMP Ping Template OpenSSL validate certs Vendor - Sangoma - SBC - HA active server
TEST-SBCSOUTH01	ZBX SNMP IPMI JMX 10.0.1.200:10050 10.0.1.200:161	Vendor - Sangoma - SBC - Real server - Cluster
TEST-SBCSOUTH-EXTERNAL	ZBX SNMP IPMI JMX :10050	ICMP Ping
TEST-SRA01	ZBX SNMP IPMI JMX 10.0.1.10:161	SNMP - SRA - SonicWALL
TEST-SSL_CERTIFICATES	ZBX SNMP IPMI JMX 127.0.0.1:161	Template OpenSSL validate certs
TEST-SW01	ZBX SNMP IPMI JMX 10.0.1.252:161	ICMP Ping

Report – Active problems

- **Host name**
- **Problem**
- **Severity**
- **Duration**
- **Acknowledged**

2. Currently Active Problems

Host	Problem	Severity	Duration	Acknowledged
TEST-SBCSOUTH01	Zabbix agent is unreachable for 10 minutes	Average	1yr 6mos	No
TEST-SBCSOUTH	SSL certificate for [redacted] expires in less than 30 days	Warning	1yr 2mos	No
TEST-SBCSOUTH	SSL certificate for [redacted] expires in less than 14 days	Average	1yr 2mos	No
TEST-SBCSOUTH	SSL certificate for [redacted] expires in less than 7 days	High	1yr 1mo	No
TEST-SBCSOUTH	SSL certificate for [redacted] is expired	High	1yr 1mo	No
TEST-DB01	Wrongly formatted mobile numbers have been provisioned	Average	5mos 3w	No
TEST-DB02	Wrongly formatted mobile numbers have been provisioned	Average	5mos 3w	No
TEST-XMS02	Disk space < 20% on volume / [vol < 40GB]	Average	3mos 2w	No
TEST-XMS02	CDR Service is not running	High	2mos 1w	No
TEST-FE01	Tomcat endpoint VCC unreachable	High	3w 3d	No
TEST-FE01	Tomcat endpoint ServiceGateway unreachable	High	3w 3d	No
TEST-DB01	MySQL replication slave I/O is not running	High	3w 3d	No
TEST-DB01	Error in replication slave I/O thread	High	3w 3d	No
TEST-OSIP01	Process monit not running	High	3w 3d	No
TEST-DB02	Zabbix agent is unreachable for 10 minutes	High	3w 3d	No
TEST-SBCSOUTH01	Trunk "SRC01" (trunk_494) status is not UP	High	3w 3d	Yes
TEST-SBCSOUTH01	Trunk "" status is not UP	High	3w 3d	No
TEST-FE01	Most recent backup is older than 3 days	Average	2w 1d	No



Report – Alerts

- **Host name**
- **Description**
- **Severity**
- **Occurrences**

3. Alerts

Hostname	Description	Severity	Occurrences
TEST-SYSLOG01	CPU load is above 95%	High	7
TEST-FE02	Tomcat endpoint ServiceGateway unreachable	High	2
TEST-SRA01	Device has rebooted in the last 30 minutes	High	2
TEST-DB01	MySQL replication slave I/O is not running	High	1
TEST-DB01	Error in replication slave I/O thread	High	1
TEST-FE01	Tomcat endpoint ServiceGateway unreachable	High	1
TEST-FE01	Tomcat endpoint VCC unreachable	High	1
TEST-FE02	Tomcat endpoint VCC unreachable	High	1
TEST-OSIP01	Process monit not running	High	1
TEST-SBCSOUTH01	Free memory < 5%	High	1
TEST-SBCSOUTH01	Trunk "" status is not UP	High	1
TEST-SBCSOUTH01	Trunk "SRC01" (trunk_494) status is not UP	High	1
TEST-SYSLOG01	Free inodes is less than 5% on volume /	High	1
TEST-SYSLOG01	Disk space < 1.5% on volume / [vol < 40GB]	High	1
TEST-SBCSOUTH01	Load average is too high	Average	7
TEST-SYSLOG01	CPU usage is above 85%	Average	7
TEST-SYSLOG01	Load average is too high	Average	6
TEST-SYSLOG01	Free inodes is less than 10% on volume /	Average	2
TEST-FE01	Most recent backup is older than 3 days	Average	1
TEST-FE02	Free memory < 10%	Average	1
TEST-OSIP01	Host has just been restarted	Average	1
TEST-OSIP02	Host has just been restarted	Average	1
TEST-SBCSOUTH-EXTERNAL	ICMP ping response time is too high	Average	1
TEST-SBCSOUTH01	Host has just been restarted	Average	1
TEST-SYSLOG01	Free memory below 20% on GLOBAL-TEST-SYSLOG01	Average	1
TEST-SYSLOG01	Disk space < 10% on volume /mnt/backup [250GB <= vol < 1TB]	Average	1
TEST-SYSLOG01	Disk space < 20% on volume / [vol < 40GB]	Average	1
TEST-FE02	Disk I/O is overloaded	Warning	3
TEST-SYSLOG01	Disk I/O is overloaded	Warning	3
TEST-XMS02	Disk I/O is overloaded	Warning	2
TEST-FE01	Most recent backup is older than 2 days	Warning	1
TEST-SBCSOUTH	SSL certificate for could not be fetched	Warning	1
TEST-SBCSOUTH01	Too many processes are started	Warning	1
TEST-SBCSOUTH01	Disk I/O is overloaded	Warning	1
TEST-SYSLOG01	Too many processes are started	Warning	1
TEST-SYSLOG01	Free memory < 15%	Warning	1
TEST-SYSLOG01	Free inodes is less than 20% on volume /	Warning	1

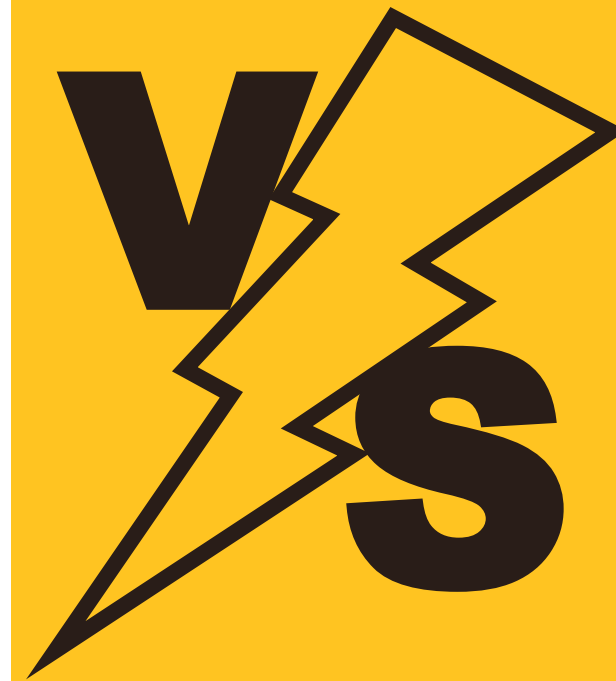


Report – Alerts

Old solution

2 Alerts

Hostname	Description	Severity	Occurrences
RSNEXCH	Tracing Service for Search in Exchange Service is not running	High	0
RSNEXCH	Microsoft Exchange Unified Messaging Call Router Service is not running	High	0
RSNEXCH	World Wide Web Publishing Service Service is not running	High	0
RSNSBS01	DHCP Server Service is not running	High	0
RSNSBS01	Group Policy Client Service is not running	High	0
RSNEXCH	Microsoft Exchange Unified Messaging Service is not running	High	0
RSNEXCH	Microsoft Exchange Transport Log Search Service is not running	High	0
RSNEXCH	Microsoft Exchange Service Host Service is not running	High	0
RSNEXCH	Microsoft Exchange Mailbox Transport Submission Service is not running	High	0
RSNEXCH	Microsoft Exchange Throttling Service is not running	High	0
RSNEXCH	Microsoft Exchange Transport Service is not running	High	0
RSNVC	Disk space < 1% on volume F: [2TB <= vol]	High	0
RSNEXCH	Microsoft Exchange IMAP4 Service is not running	High	0
ESXlserver67	Host is unreachable by SNMP for 10m	High	0
RSNEXCH	Microsoft Exchange IMAP4 Backend Service is not running	High	0



New solution

3. Alerts

Hostname	Description	Severity	Occurrences
TEST-SYSLOG01	CPU load is above 95%	High	7
TEST-FE02	Tomcat endpoint ServiceGateway unreachable	High	2
TEST-SRA01	Device has rebooted in the last 30 minutes	High	2
TEST-DB01	MySQL replication slave I/O is not running	High	1
TEST-DB01	Error in replication slave I/O thread	High	1
TEST-FE01	Tomcat endpoint ServiceGateway unreachable	High	1
TEST-FE01	Tomcat endpoint VCC unreachable	High	1
TEST-FE02	Tomcat endpoint VCC unreachable	High	1
TEST-OSIP01	Process monit not running	High	1
TEST-SBCSOUTH01	Free memory < 5%	High	1
TEST-SBCSOUTH01	Trunk "" status is not UP	High	1
TEST-SBCSOUTH01	Trunk "SRC01" (trunk_494) status is not UP	High	1
TEST-SYSLOG01	Free inodes is less than 5% on volume /	High	1
TEST-SYSLOG01	Disk space < 1.5% on volume / [vol < 40GB]	High	1
TEST-SBCSOUTH01	Load average is too high	Average	7
TEST-SYSLOG01	CPU usage is above 85%	Average	7
TEST-SYSLOG01	Load average is too high	Average	6
TEST-SYSLOG01	Free inodes is less than 10% on volume /	Average	2



Report – Graphs

- Paragraph + sub paragraph
- Description
- Graph
- SLA



4.2 Capacity

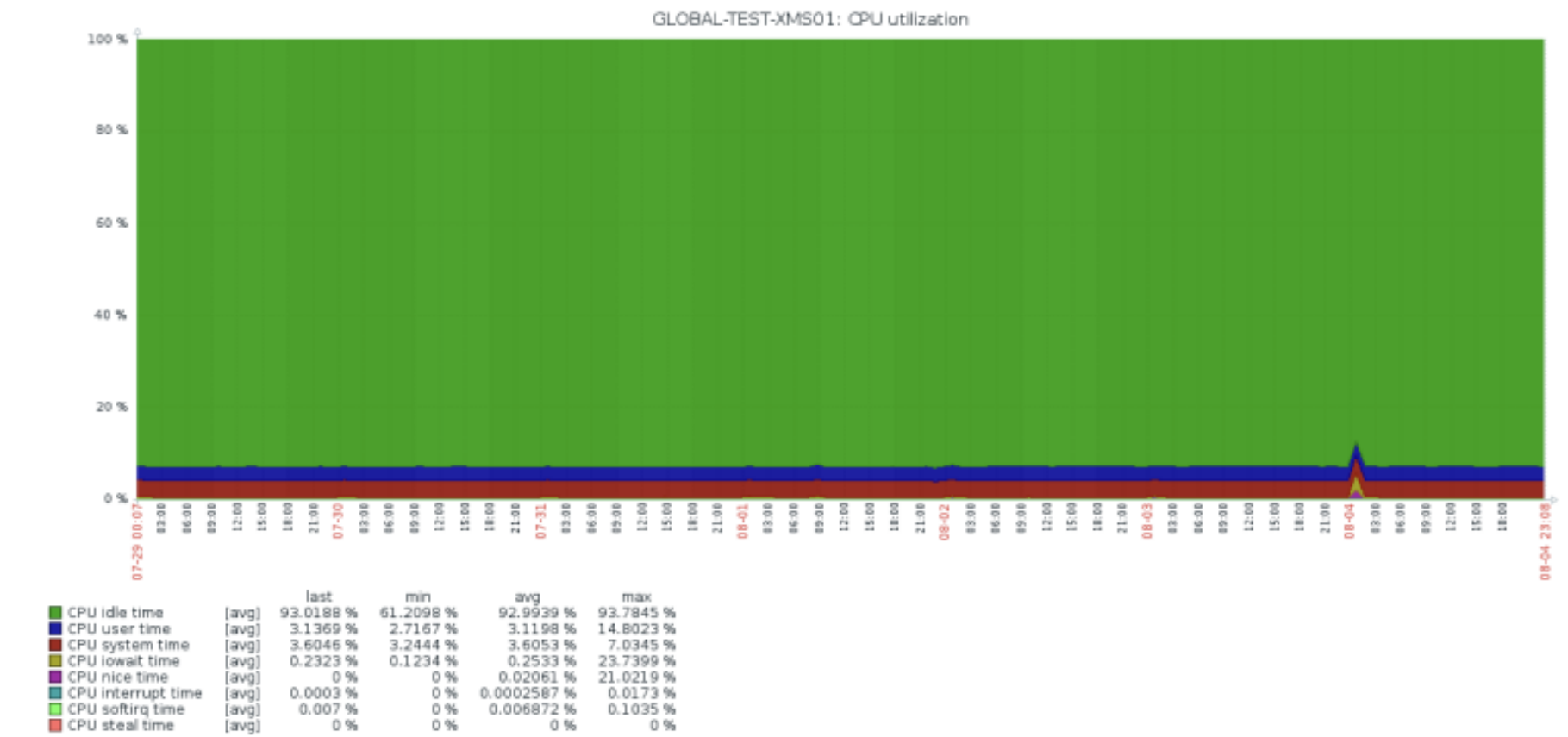
4.2.1 Licenses

The amount of mediaserver licenses in use is measured.
100% is the total amount of licenses available.



Name	Configured SLA	Calculated SLA	Status
Functional availability	99.9%	100%	Compliant

The amount of CPU power that is used.
100% is the total amount of CPU power available.



Report – SLA

- **SLA name**
- **Configured SLA**
- **Calculated SLA**
- **Status**

5. SLA

Name	Configured SLA	Calculated SLA	Status
Functional availability	99.9%	100%	Compliant
Internet availability	99.9%	100%	Compliant
Connectivity availability	99.9%	100%	Compliant



Questions?

Thank you for your time!



CONTACT ME

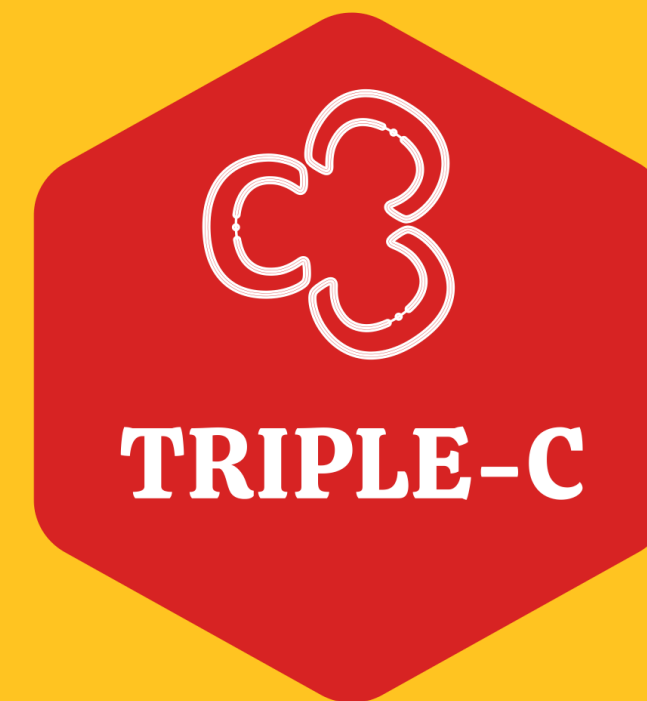


 telenet.be/business

 [company/telenet/](https://company.telenet/)



Nick Corné



 triple-c.be/zabbix-summit

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 github.com/triple-c-be

