



New in 2.3:

More developer APIs



Moritz Kiemer

Team Lead Development
Checkmk GmbH

Extensibility is a core pillar of Checkmk



Cloud



Data Center



IoT

Great user experience
for beginners
and experts



Monitor anything



Powerful configuration



Alerts & analytics

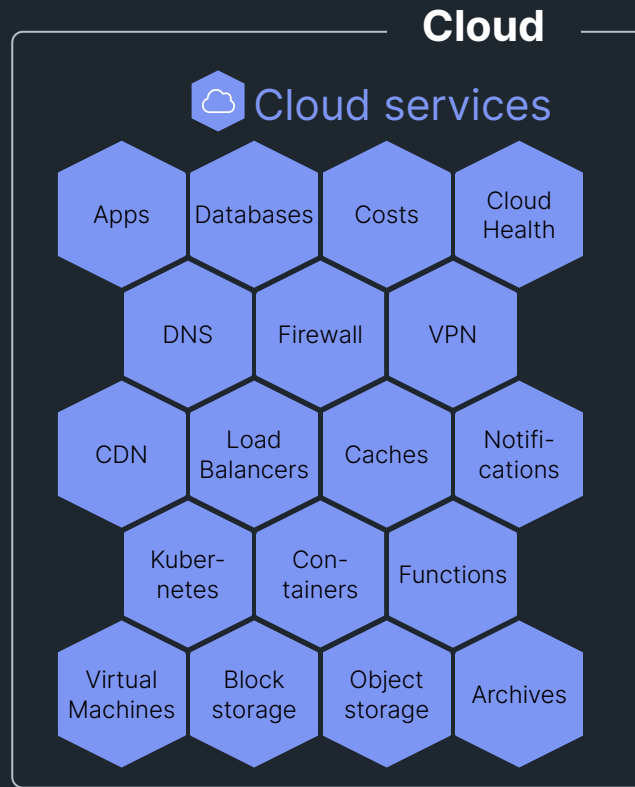
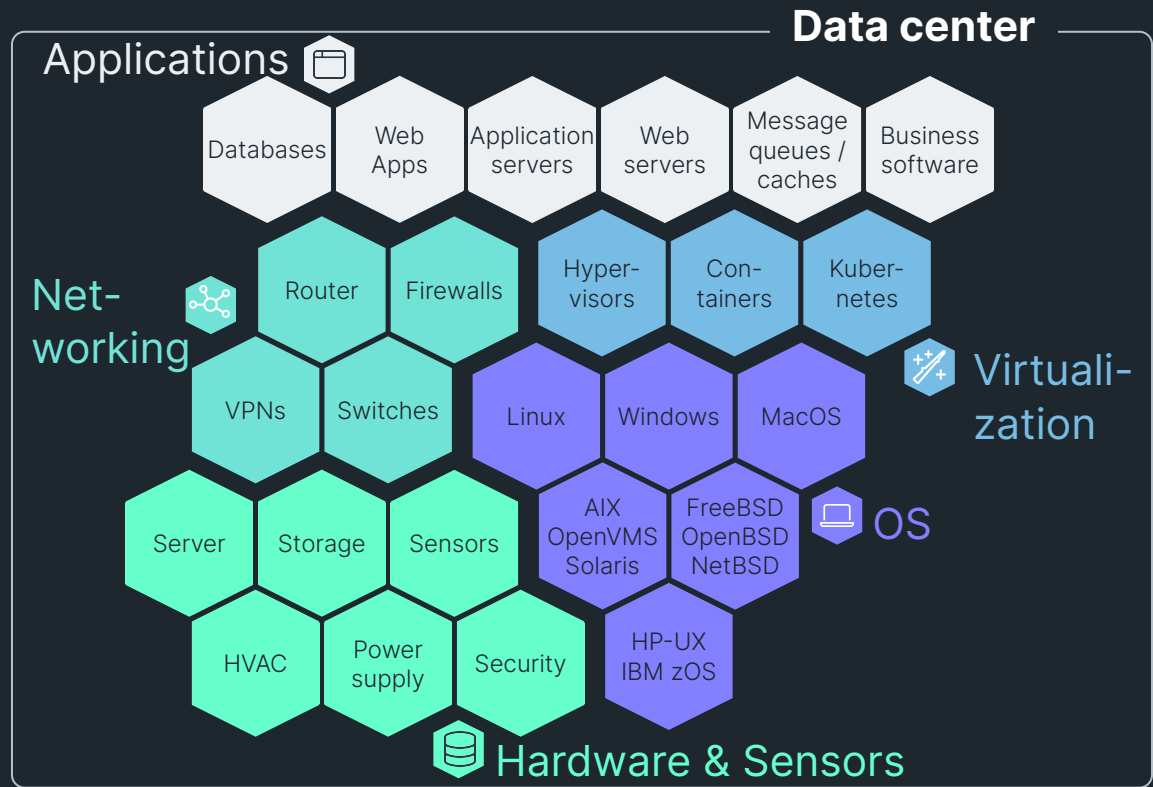


Monitoring platform
Secure & scalable

Extensible interfaces
for automation
& development



2,000+ plug-ins that can monitor anything



But anything is not everything



RavenDB Plugin

1

votes

Windows plugin to monitoring RavenDB databases, documents and raven.server process.

<https://ravendb.net/>

Users should be able to extend the monitoring of Checkmk themselves

Users should be able to create extensions equivalent to shipped ones

When extensions meet updates



Update to CMK 2.2 from CMK 2.1 - Exception while trying to load rulesets: module 'cmk.gui.plugins.wato.utils' has no attribute 'load_web_plugins'



TBC

1  3d

1 / 3

Oct 27

CMK version: from version 2.1.0p35.cce to 2.2.0p12.cce

OS version: CMA 1.6.6 on CMA 1.6.5 was similar.

- | Verifying Checkmk configuration...
- | 01/04 Rulesets...
- | **Exception while trying to load rulesets: module 'cmk.gui.plugins.wato.utils' has no attribute 'load_web_plugins'**
- |
- | You can abort the update process (A) and try to fix the incompatibilities or try to continue the update (c).
- | Abort update? [A/c]

Loading internal modules

✓ Solved by TBC in [post #2](#) 

Yeah. I got it! Its was caused by some custom rulesets py file for custom py checks we developed. After deleting update works! I will investigate deteail later. in folders:



There is a (simple) solution...

Root-cause of issues

- For some extensions:
only internal APIs available
- Constant improvements of
code base lead to changes
for internal APIs
- No problem for native
extensions



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**External
extensions**

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External
extensions



Internal
APIs



Update



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External
extensions



Internal
APIs



Update



**Documented & versioned
stable APIs for external use**

The first proper API

In 2020 with Checkmk 2.0: Introduced 'New Check-API'

- Focus: the most important area when writing monitoring extensions
- High stability for any extension using it
- No changes needed since then

```
check_levels(value, *, levels_upper=None, levels_lower=None, metric_name=None, render_func=None, label=None, boundaries=None, notice_only=False)
```

Generic function for checking a value against levels.

- Parameters:
- `value` (float) – The currently measured value
 - `levels_upper` (optional [tuple [float, float]]) – A pair of upper thresholds, ie. warn and crit. If value is larger than these, the service goes to **WARN** or **CRIT**, respectively.
 - `levels_lower` (optional [tuple [float, float]]) – A pair of lower thresholds, ie. warn and crit. If value is smaller than these, the service goes to **WARN** or **CRIT**, respectively.
 - `metric_name` (optional [str]) – The name of the datasource in the RRD that corresponds to this value or None in order not to generate a metric.
 - `render_func` (optional [callable [[float], str]]) – A single argument function to convert the value from float into a human readable string.
 - `label` (optional [str]) – The label to prepend to the output.
 - `boundaries` (optional [tuple [optional [float], optional [float]]]) – Minimum and maximum to add to the metric.
 - `notice_only` (bool) – Only show up in service output if not OK (otherwise in details). See `notice` keyword of `Result` class.

Return type: Generator [Result | Metric, None, None]

Example

```
>>> result, metric = check_levels(
...     23.0,
...     levels_upper=(12., 42.),
...     metric_name="temperature",
...     label="Fridge",
...     render_func=lambda v: "%.1f°" % v,
... )
>>> print(result.summary)
Fridge: 23.0° (warn/crit at 12.0°/42.0°)
>>> print(metric)
Metric('temperature', 23.0, levels=(12.0, 42.0))
```


What do you need for a monitoring plug-in?



▼ Kubernetes

Cluster name (required)

saas_dev_1

Token

From password store ▼ kubern

API server connection

Endpoint (required)

https://ABC.eu-central-1.eks.ama

SSL certificate verification

Verify the certificate

Checkmk
Conference

8

What do you need for a monitoring plug-in?

```
/omd/sites/monitoring/share/check_mk/agents/special/agent_kube --cluster saas_dev_1  
--token '****' --api-server-endpoint https://ABC.eu-central-1.eks.amazonaws.com
```

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SSL certificate verification

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WARN

Pod
resources

Running: 10, Pending: 0, Succeeded:
0, Failed: 0, Unknown: 0, Allocatable:
11, Free: 1 (warn/crit below 2/1) **WARN**

41.37 %



What do you need for a monitoring plug-in?



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▼ Value

☐ Define levels for pending pods

☒ Define lower levels for free pods

Absolute levels ▼

Warning below 10

What do you need for a monitoring plug-in?



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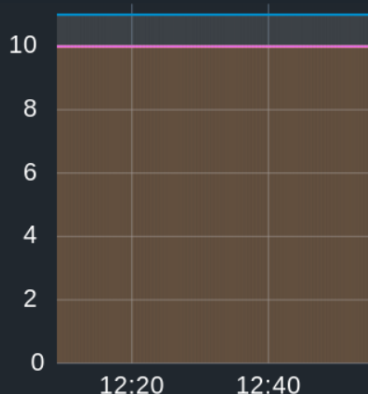
WARN

Pod
resources

Agent-based API (a.k.a check api)

Running: 10, Pending: 0, Succeeded:
0, Failed: 0, Unknown: 0, Allocatable:
11, Free: 1 (warn/crit below 2/1) **WARN**

41.37 %



▼ Value

☐ Define levels for pending pods

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Absolute levels ▼

Warning below 10

Key elements of monitoring plug-ins now covered



Special Agents / Active Checks

Server-side calls API v1



Rulesets

Rulesets API v1



Metrics, Graphs, Perf-O-Meters

Graphing API v1



Check plug-in & HW/SW inventory*

Agent-based API v2

No more hassle with extensions during upgrades



Plug-ins using the new APIs are much more future-proof

- Example:
 - Agent-based API v1 introduced in 2.0
 - Still supported in 2.3
- No unforeseen update incompatibilities
 - Transparency for extension developers and users
 - Proper handling / information, when we release new API versions
 - Appropriate time for migration
- Less effort for plug-in development due to documented API



Technical benefits of development APIs

✓ All elements of plug-ins are modules now

- ◆ Independent of Checkmk: Develop plug-ins without having to run a site
- ◆ No side effects with other modules (no global registry) → easier testing
- ◆ Leverage IDEs

✓ Any extension imports a well-defined, versioned API

✓ Principles

- ◆ Establish conventions & consistency
- ◆ Things doing the same thing should look the same
- ◆ Make implicit explicit
- ◆ Reduce unnecessary options
- ◆ Ensure “fail early” principle

What happens if you don't have standardization



✖ Levels for used/free space

Levels for used space ▾

Percentage ▲

Percentage

80.0 %

Absolute

90.0 %

Dynamic levels

levels in check

✖ Define lower levels for free pods

Percentual levels ▲

Absolute levels

%

Do not impose levels

%

Percentual levels

configured time period parameters

✖ Levels for RAM

Percentual levels for used RAM ▲

Absolute levels for free RAM

Absolute levels for used RAM

Do not impose levels

Percentual levels for free RAM

Percentual levels for used RAM

✖ Levels of Datafile used

Percentage used space ▲

Percentage used space

Absolute used space

Dynamic levels

d

d

oci

Brightness

Fixed Levels ▲

No Levels

Fixed Levels

Predictive Levels (only on CMC)

Levels

Warning at 70.0 %

Critical at 80.0 %

Better implementation of standardized levels



✖ Upper level for rate of memory reclaimed by GC

Fixed levels ▼

Warning at 0 Byte ▼

Critical at 0 Byte ▼

Better implementation of standardized levels

✖ Upper level for rate of memory reclaimed by GC

Fixed levels ▼

Warning at

0

Byte ▼

Critical at

0

Byte ▼

✖ Upper level for rate of memory reclaimed by GC

No levels ▼

Do not impose levels, always be OK

- Default method provided to render 'levels' rulesets
- Always includes a 'no levels' option available to disable default threshold (no more '101%' workarounds...)
- Option for standardized 'predictive levels' also available

No more secrets in command line

Requires appropriate implementation in plug-in

checkmk.com					
State	Service	Icons	Summary	Perf-O-Meter	
OK	Certificate checkmk.com	☰	OK - Certificate obtained in 94 ms, Verification: OK, Certificate expires in 41 day(s) (Jul 17 06:58:11 2024 +00:00)		
OK	HTTPS Downloads	☰ 📁	Version: HTTP/1.1, Status: 200 OK		1.35 s

Service
check
command

```
check_mk_active-httpv2!--url https://download.checkmk.com/checkmk --method  
GET --auth-user callme.maybe --auth-pw-pwstore  
uidd9c2342d-2659-4ec6-8400-4e389535c0f3:/omd/sites/stable/var/check_mk/  
core/helper_config/latest/stored_passwords
```



checkmk



Monitor



Customize



Setup



Help

Add rule: Check HTTP web service

Setup > Services > HTTP, TCP, Email, ... > Check HTTP web service > Add rule: Check HTTP web serv

Rule

Related

Display

Help



Value

HTTP web service endpoints to monitor (required)

Service name

Prefix

Use "HTTP(S)" as service name prefix

Name (required)

My service name



URL

https://subdomain.domain.tld:port/path/to/filename?parameter=value#anchor

☐ Individual settings to use for this endpoint

Add new endpoint

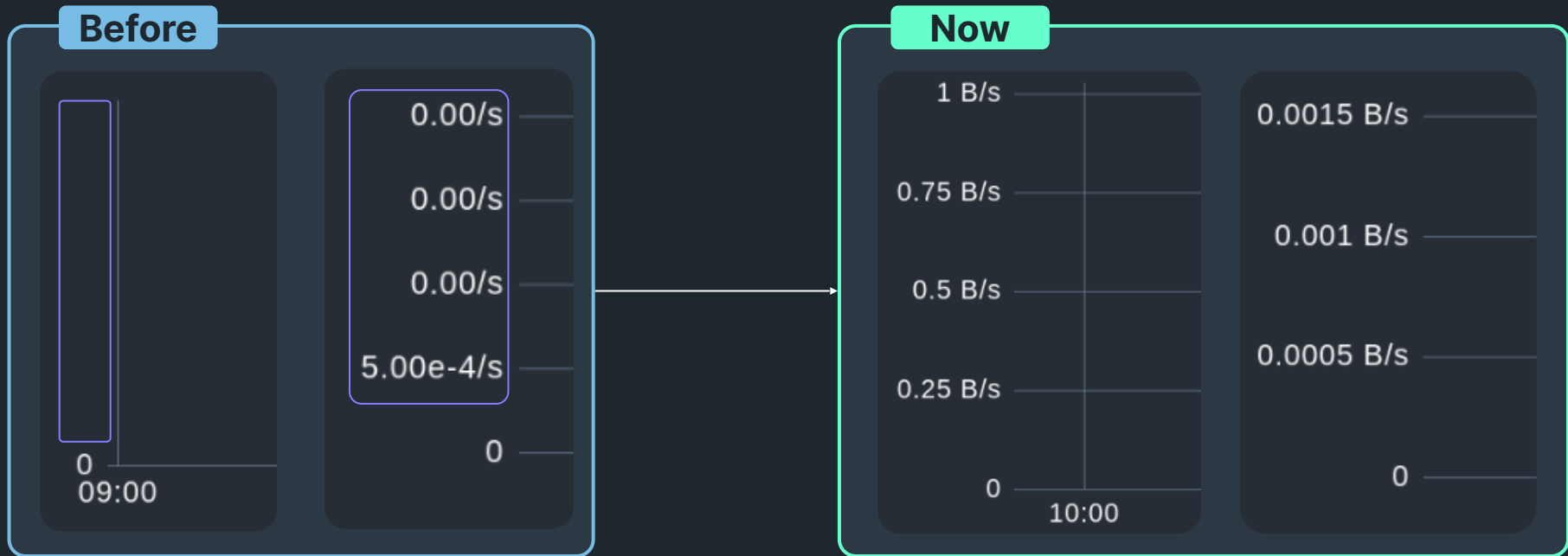
Multiple active checks in one rule

Check HTTP and Check ICMP



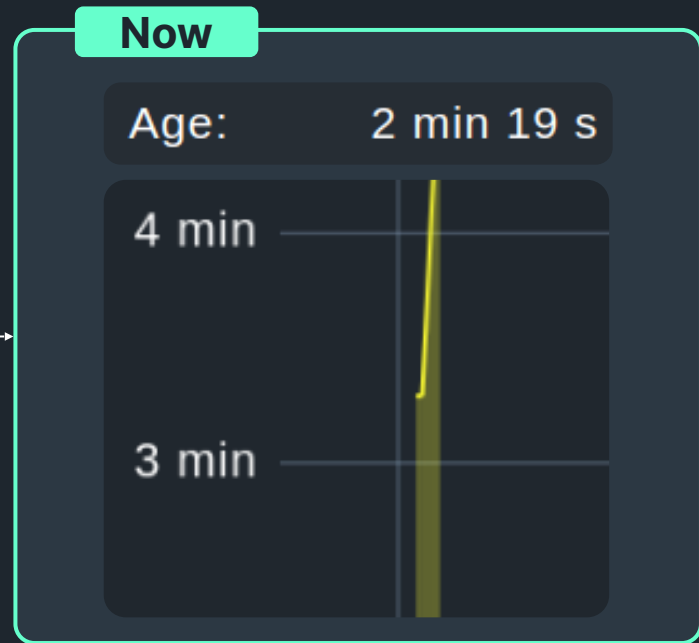
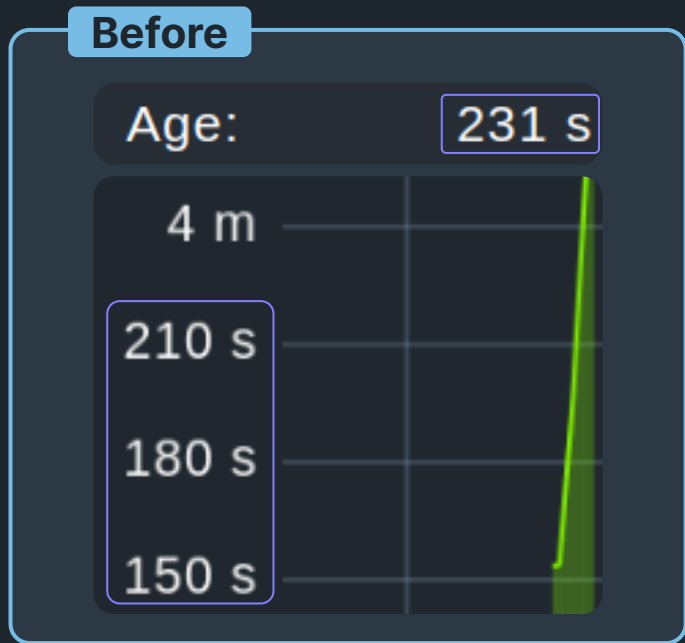
Better handling of very small values

Quality of Life improvements for metrics & graphs

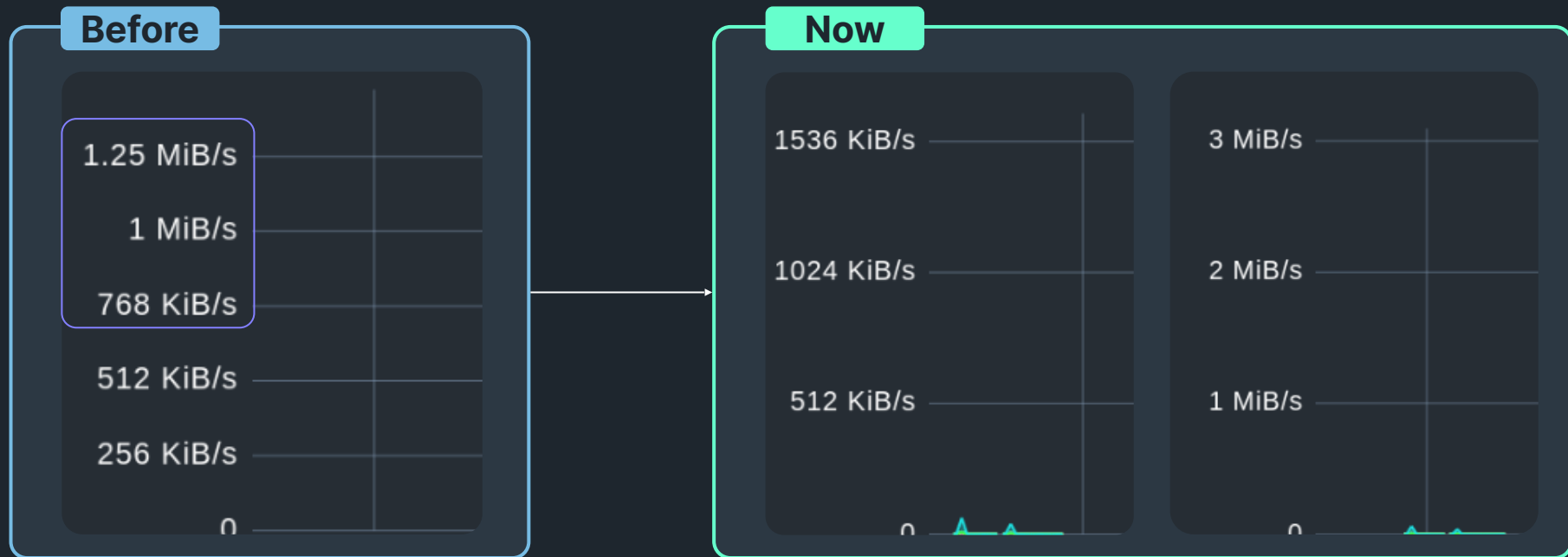


Better handling of times

Quality of Life improvements for metrics & graphs



Quality of Life improvements for metrics & graphs



Proper naming and units of metrics

Quality of Life improvements for metrics & graphs

Before

Bytesperreq:	50818
Direkt_lo:	27488
Gracefully finishing:	0
Idle clean up of worker:	0
Idle workers:	4
Keepalive:	0
Logging:	0
Open slots:	59
Reading request:	0

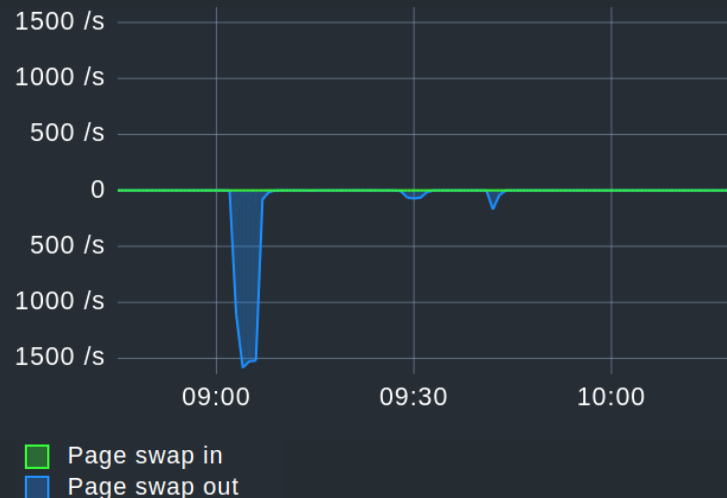
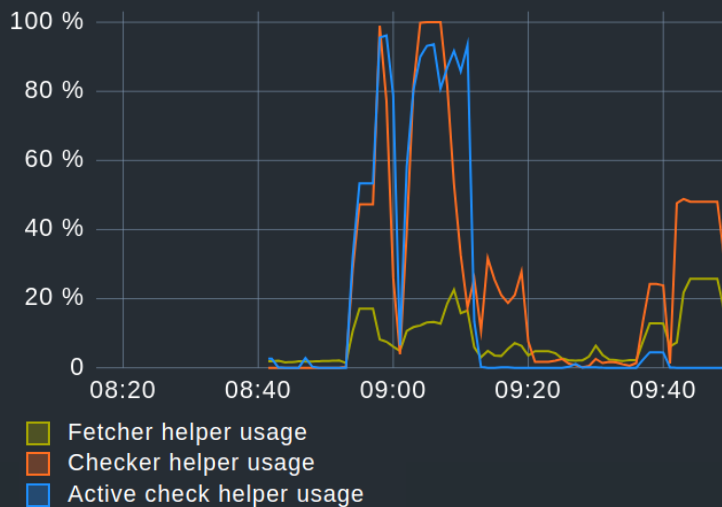
Now

Data transfer rate:	27.49 kB/s
Gracefully finishing:	0
Idle cleanup of worker:	0
Idle workers:	4
Keepalive:	0
Logging:	0
Open slots:	59
Reading request:	0
Request transfer rate:	50.81 kB/req

Combining of graphs

Quality of Life improvements for metrics & graphs

Previously individual graphs each



Quality of Life improvements for metrics & graphs



No more mixing
of units

No more
unnecessary
rendering of
decimals

Better handling
of very small
and large values

Better handling
of zero and
negative values

Better handling
of times

No more empty
graph legends

No more layered
areas in graphs

More and better
metrics &
graphs

Better structure of plug-in file locations



Shipped plug-ins in `lib/python3/cmk/plugins`.

User supplied plug-ins in `local/lib/python3/cmk_addons/plugins`



Big advantage

Old places will still work (at least for 2.3, depending on plug-in type for longer).

plug-ins are grouped by topic (“family”), allowing for shared code and easier packaging:

- ◆ Checks: `cmk/plugins/kube/agent_based/`
- ◆ Rulesets: `cmk/plugins/kube/rulesets/`
- ◆ Special agent: `cmk/plugins/kube/server_side_calls/`

Plugins using the new API have to be in the new folder location.

Timeline



Checkmk 2.3.0

- API implementations
 - Initial migration of own code
-
- The replaced internal APIs will not be supported anymore
 - Decommissioning: legacy check API

Checkmk 2.4.0

- Finish migration of all active checks, special agents, metrics, graphing
-
- The replaced internal APIs will be removed (see [werk 16259](#))
 - Agent-based API v1 will be deprecated

Use Checkmk 2.3 to migrate all extensions to the new APIs!

Sample commits with lengthy explanations

Supporting material for API developers

Commit

PRO TIP: migrate check_tcp (1/2)

Browse f

This change migrates the server side call (SSC) plugin of `check_tcp` to the new API.

Note that you should always migrate both plugins at the same time, to avoid incompatibilities (although sometimes you might not **have** to).

In this change we only migrate the SSC plugin, to provide a better overview.

Lets go through these changes one by one, starting at the top:

- * File location: SSC plugins live in the folder
`cmk/plugins/<family>/server_side_calls/`.
The family is used to group plugins together that are related to each other (for whatever reason).
- * Required objects are imported with an absolute import from the corresponding API. The API name is matching




Commits marked with 'PRO TIP'








- 🛡️ [Migrate check_tcp \(1/2\)](#)
- 🛡️ [Migrate check_tcp \(2/2\)](#)
- 🛡️ [Natively support password store in active check or special agent](#)

All migrated code in one location




Supporting material for API developers

[checkmk](#) / [cmk](#) / [plugins](#) / 

 **rseltmann** Re-add grouping in httpv2  



Name	Last commit message
 ..	
 alertmanager/special_agents	move agent_alertmanager
 arbor	Replace 'plugin(s)' with 'plug-in(s)' part 2
 aws	Fix broken mypy CI due to CCE specific code
 azure	Rename "if" ruleset to "interfaces"
 bazel	16022 bazel_cache: Monitor Bazel Remote C
 checkmk/graphing	Fix too high perfometer boundaries






cmk/plugins

- Many examples for migrated plug-ins
- Good examples:
 -  fritzbox
 -  jenkins
 -  pure_storage_fa

Supporting material for API developers

[checkmk](#) / [doc](#) / [treasures](#) / [migration_helpers](#) / 

 **mo-ki** legacy migration: improve type_defs handling  e74170f · yesterday

Name	Last commit message	Last co
 ..		
 agent_based_v1_v2.py	legacy migration: improve type_defs han...	
 graphing_v0_v1.py	Always take filtered metrics into account	la
 legacy_checks_to_v2.py	create legacy_vs_to_ruleset_v1.py	
 legacy_vs_to_ruleset_v1.py	Add some more features.	

doc/treasures/ migration_helpers

- Helper scripts to automate migration
- Works particularly well for agent based API v1 → v2
- Read the script intro
- **Finalize the generated code manually**

Properly documented APIs

Supporting material for API developers

Checkmk's Plugin APIs

Search docs

- Agent based ("Check API")
- Bakery
- Server-side calls
- Graphing

Rulesets

- Version 1
 - rulesets.v1
 - rulesets.v1.rule_specs
 - iskeyword()

Developer resources

- Check plug-in API introduction
- Plug-in API references
- REST API introduction
- REST API documentation
- REST API interactive GUI

Help

```
class SNMP(title, topic, parameter_form, eval_type, name, is_deprecated=False, help_text=None)
```

Specifies configurations for SNMP services

Instance of this class will only be picked up by Checkmk if their names start with `rule_spec_`.

Parameters:

- `title` (`title`) – Human readable title
- `topic` (`Topic` | `CustomTopic`) – Categorization of the rule
- `parameter_form` (`callable` [`[]`, `Dictionary`]) – Configuration specification
- `eval_type` (`EvalType`) – How the rules of this RuleSpec are meant to be evaluated in respect to each other
- `name` (`str`) – Identifier of the rule spec
- `is_deprecated` (`bool`) – Flag to indicate whether this rule is deprecated and should no longer be used
- `help_text` (`optional` [`Help`]) – Description to help the user with the configuration

In-product

- The hard facts: plug-in references
- Automatically generated – always up to date and correct
- Located in Help → Plug-in API references
 - Eventually also on docs.checkmk.com

User guide: Updated and new development guides

Supporting material for API developers

EN ▾

Latest (2.3.0) ▾

to checkmk.com

3. Writing a simple check plug-in

Preparing the agent is only half the fun. Now you need to teach Checkmk how to handle the information from the new agent section, which services it should generate, when they should go to **WARN** or **CRIT**, etc. You can do all this by programming a check plug-in using Python.

3.1. Preparing the file

You will find a directory prepared for your own check plug-ins in the `local` hierarchy in the [site directory](#). This is `~/local/lib/check_mk/base/plugins/agent_based/`. Here in the path, `base` means the part of Checkmk that is responsible for the actual monitoring and notifications. The `agent_based` folder contains all of the plug-ins associated with the Checkmk agent (i.e. not notification plug-ins, for example). It is best to switch to this folder to work with:

```
OMD[mysite]:~$ cd local/lib/check_mk/base/plugins/agent_based
```

The directory belongs to the site user and you can therefore edit it. You can edit your check plug-in with any text editor installed on the Linux system.

On this page

- 1. Introduction
 - 1.1. The Check API documentation
 - 1.2. Prerequisites
 - 1.3. Terms and definitions
- 2. Writing an agent plug-in
 - 2.1. Retrieving and filtering information
 - 2.2. Incorporate the command into the agent
 - 2.3. Testing the agent
- 3. Writing a simple check plug-in
 - 3.1. Preparing the file
 - 3.2. Writing the parse function
 - 3.3. Registering the agent section
 - 3.4. Registering the check plug-in
 - 3.5. Writing the discovery function
 - 3.6. Writing the check function

docs.checkmk.com

- Q2 2024:
Update of 'Development of check plug-ins' to agent-based API v2
- Q3 2024:
General update of development guides with new APIs

Livestream: Migrating & mainlining a plug-in

Supporting material for API developers



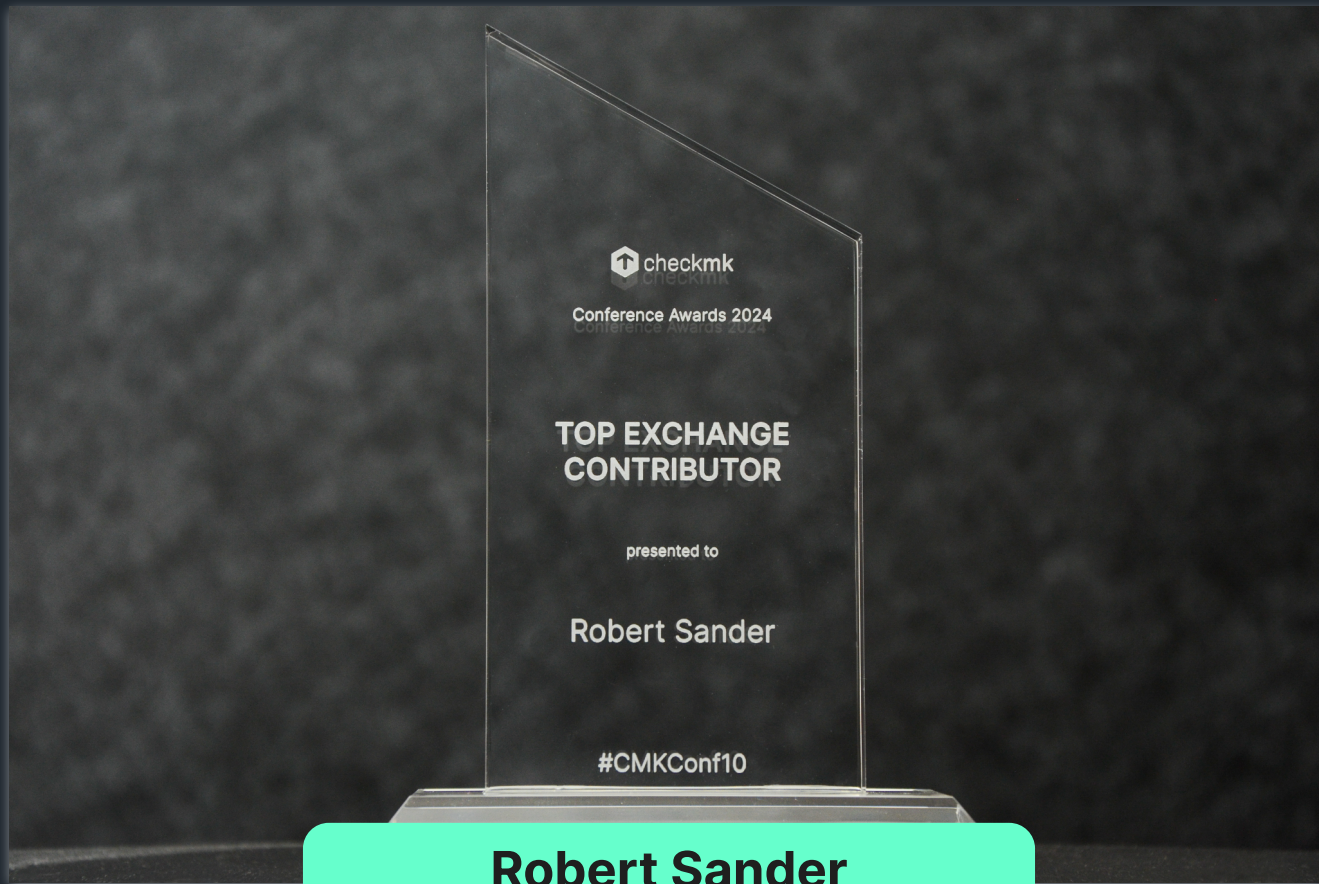
[check_mk_extensions](#) / [ceph](#) /

gurubert adds new MKP f8257d2 · 10 months ago

Name	Last commit message	Last com
..		
agents/plugins	adds config option to specify ceph.conf a...	10 mo
lib	adds config option to specify ceph.conf a...	10 mo
web/plugins	adds config option to specify ceph.conf a...	10 mo
README.md	uses Python 3 now for the agent plugin	3 y
ceph-11.20.0.mkp	adds new MKP	10 mo

Let's code!

- 🛡 Wednesday, June 26th
2:00 – 4:00 PM (CEST)
- 🛡 Live migration of Ceph
plug-in
- 🛡 Ask your questions and
more
- 🛡 Special thanks to Robert
Sander, the author!



Robert Sander
Top Exchange Contributor

Talk to us at Checkmk Conference!

Supporting material for API developers



Plug-in Playground @ Knowledge Fair

Ask us anything (June 12th)



Breakfast & Knowledge Fair

09:00 - 09:30

Take the opportunity to talk to our developers and consultants before the first presentation of the day. Accompanied by bits and bites for breakfast, you will find several booths at the conference location where you can ask the team behind Checkmk specific questions. Benefit from the exchange with the community and start your day right.



Lunch break & Knowledge Fair

12:30 - 14:00



Coffee break & Knowledge Fair

15:10 - 15:40

Hassle-free updates in the future

Migrate during 2.3 to benefit from this bright new world

- Major chunk you likely already did by migrating check plug-ins to agent_based v1
 - Experience from migrating 600 plug-ins in between meetings and regular work over the last two weeks: very feasible with the helper script
- Migrating metrics, Perf-O-Meters, graphs and rulesets require getting into it - but with positive feedback so far





Cloud



Data Center



IoT

Extensible interfaces



APIs

The **MKP CLI** as the main tool to package extensions.

The **Extension packages** UI in the site to administer extensions.

The **Checkmk Exchange** for sharing and getting extensions.

Monitoring platform

Secure & scalable

slido



Audience Q&A Session



Click Present with Slido or install our [Chrome extension](#) to show live Q&A while presenting.

Checkmk #10

Conference