initMAX

Webinar

Advanced problem detection

all our microphones are muted

ask your questions in Q&A, not in the Chat

use Chat for discussion, networking or applause

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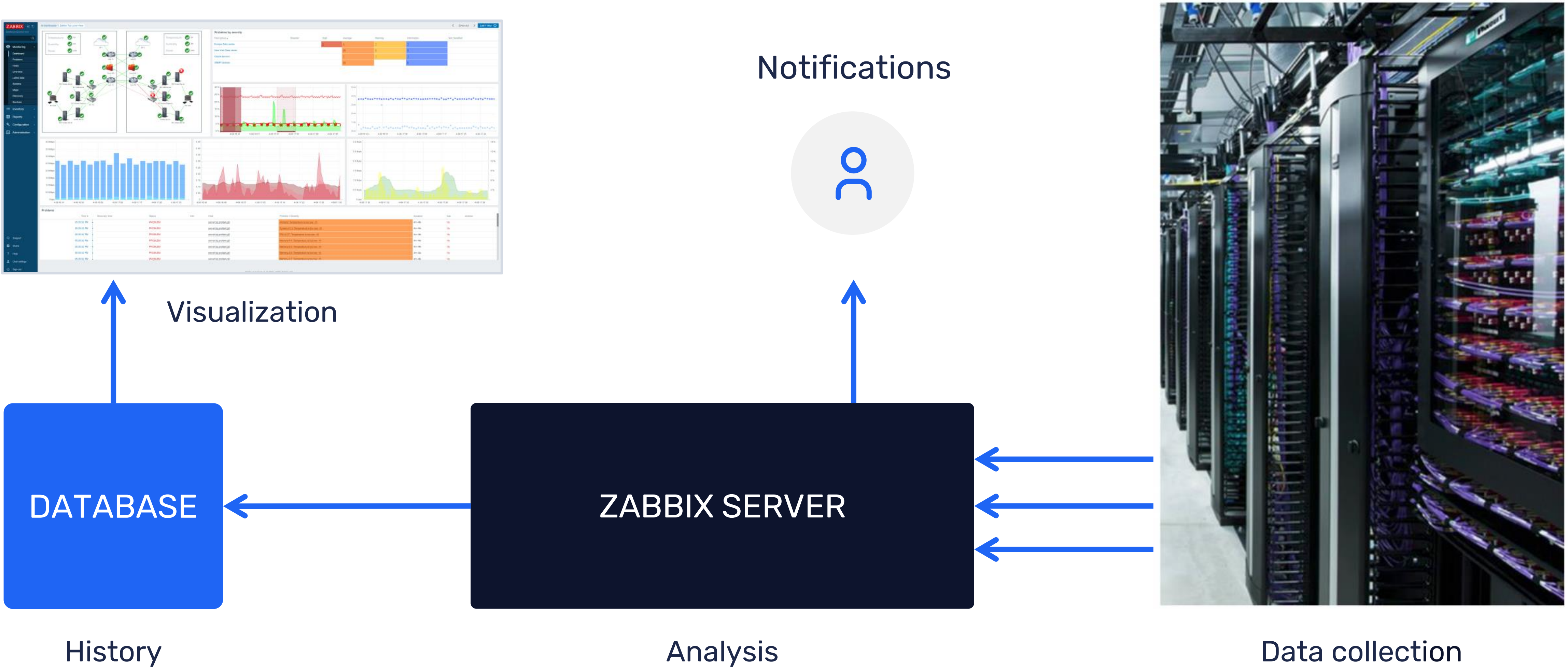
Zabbix data flow

Zabbix data flow



Notifications

Visualization

DATABASE

ZABBIX SERVER

History

Analysis

Data collection

ADVANCED PROBLEM DETECTION

How often to execute checks?

Every N seconds

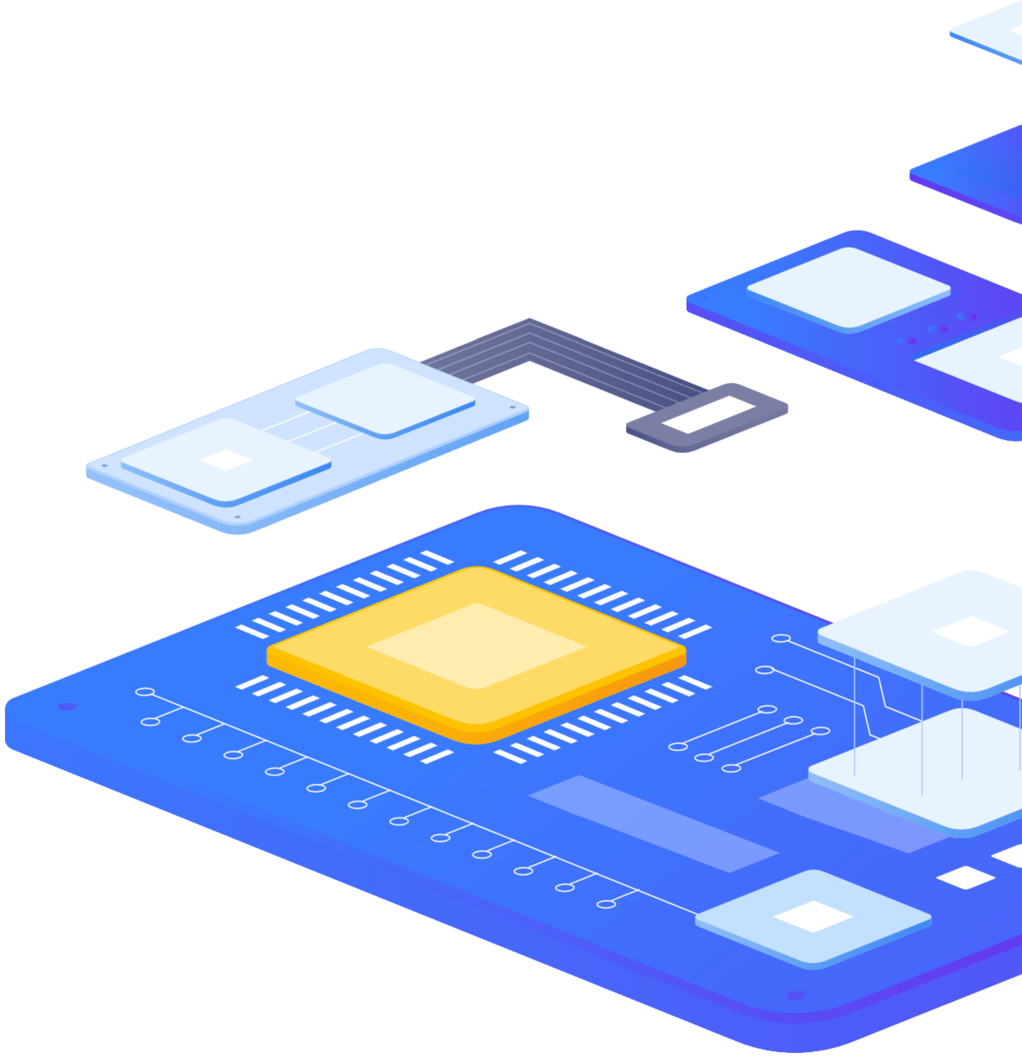
- Zabbix will evenly distribute checks

Different frequency in different time periods

- Every X seconds in working time
- Every Y second in weekend

At a specific time (Zabbix 3.0)

- Ready for business checks
- Every hour starting from 9:00 at working hours (9:00, 10:00,…, 18:00)



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Triggers

ADVANCED PROBLEM DETECTION

Trigger – problem definition

Example

- last(/server/system.cpu.load) > 5

Operators

- - + / *   < > = <> >= <=   not or and

Functions

- min max avg last count date time diff regexp and much more!

Analyze everything: any metric and any host

- last(/node1/system.cpu.load) > 5 and last(/node2/system.cpu.load) > 5 and last(/nodes/tps) < 5000

Trigger Functions

Function group	Functions
Aggregate functions	avg, bucket_percentile, count, histogram_quantile, item_count, kurtosis, mad, max, min, skewness, stddevpop, stddevsamp, sum, sumofsquares, varpop, varsamp
Bitwise functions	bitand, bitlshift, bitnot, bitor, bitrshift, bitxor
Date and time functions	date, dayofmonth, dayofweek, now, time
History functions	change, changecount, count, countunique, find, first, fuzzytime, last, logeventid, logseverity, logsource, monodec, monoinc, nodata, percentile, rate
Trend functions	baselinedev, baselinewma, trendavg, trendcount, trendmax, trendmin, trendstl, trendsum
Mathematical functions	abs, acos, asin, atan, atan2, avg, cbrt, ceil, cos, cosh, cot, degrees, e, exp, expm1, floor, log, log10, max, min, mod, pi, power, radians, rand, round, signum, sin, sinh, sqrt, sum, tan, truncate
Operator functions	between, in
Prediction functions	forecast, timeleft
String functions	ascii, bitlength, bytelength, char, concat, insert, left, length, ltrim, mid, repeat, replace, right, rtrim, trim

ADVANCED PROBLEM DETECTION

Foreach Functions - tip

- avg_foreach
- bucket_rate_foreach
- count_foreach
- exists_foreach
- last_foreach
- max_foreach
- min_foreach
- sum_foreach

Calculated Items on:

Host level

- sum(last_foreach(/host/net.if.in[*]))

Hostgroup level

- avg_foreach(/*/mysql.qps?[group="MySQL Servers"],5m)

ADVANCED PROBLEM DETECTION

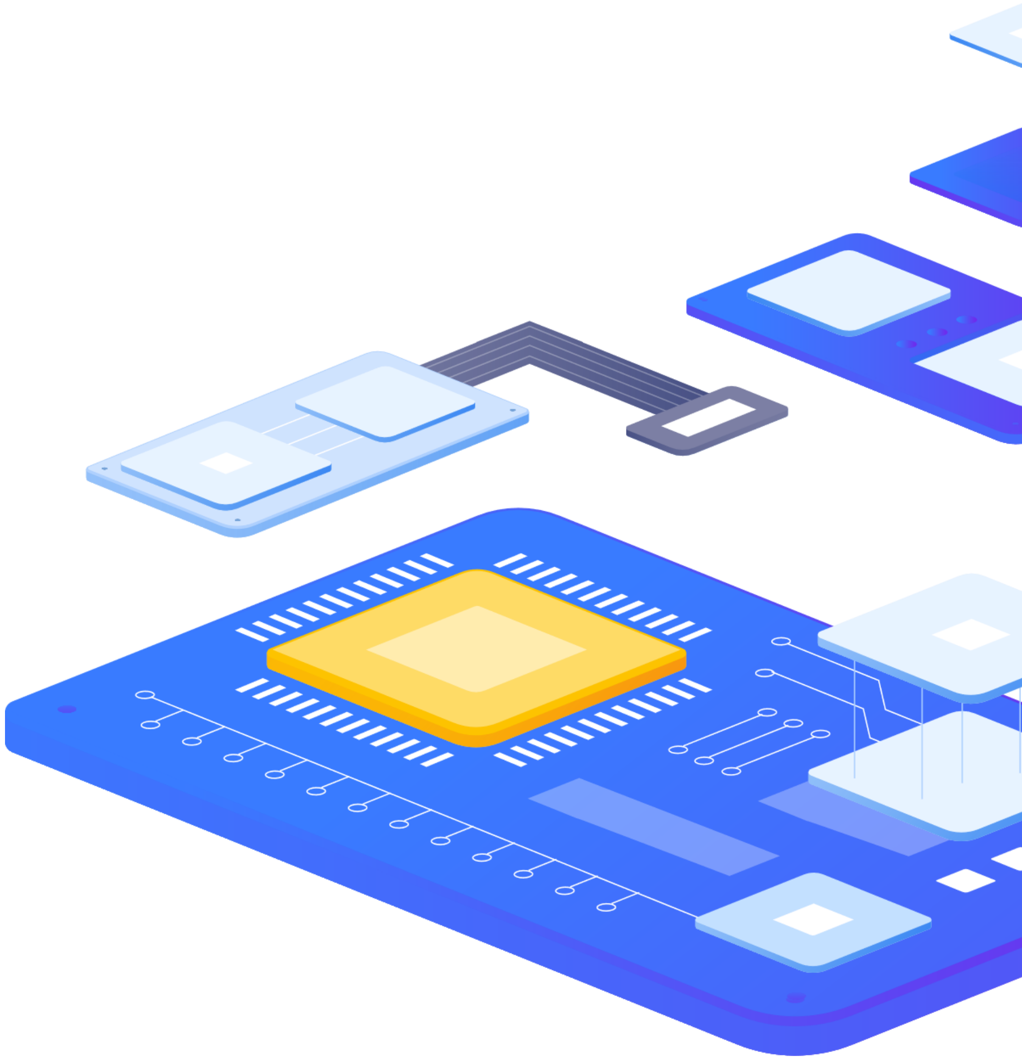
Junior level

Performance

- last(/server/system.cpu.load) > 5

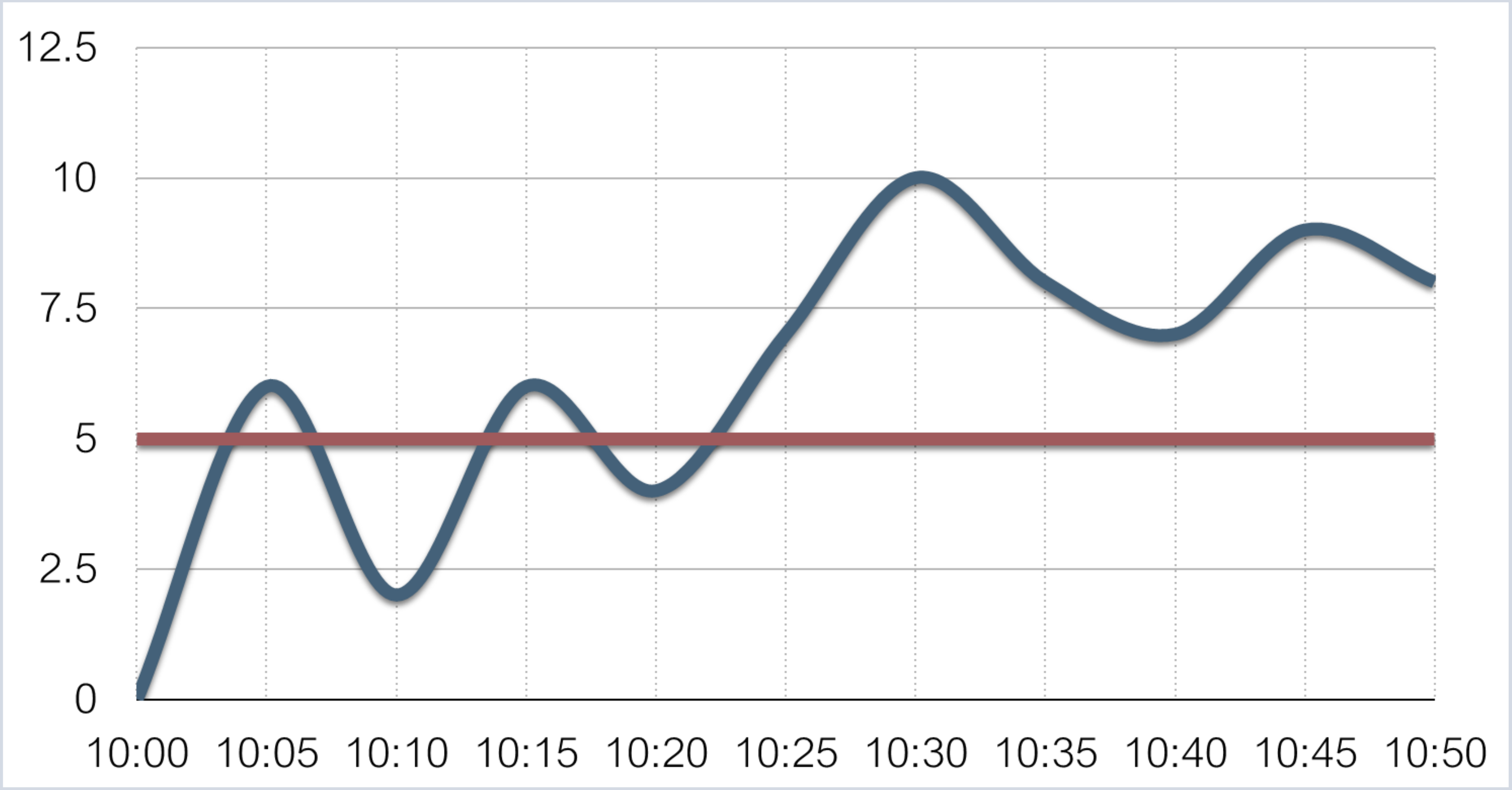
Availability

- last(/server/net.tcp.service[http]) = 0



ADVANCED PROBLEM DETECTION

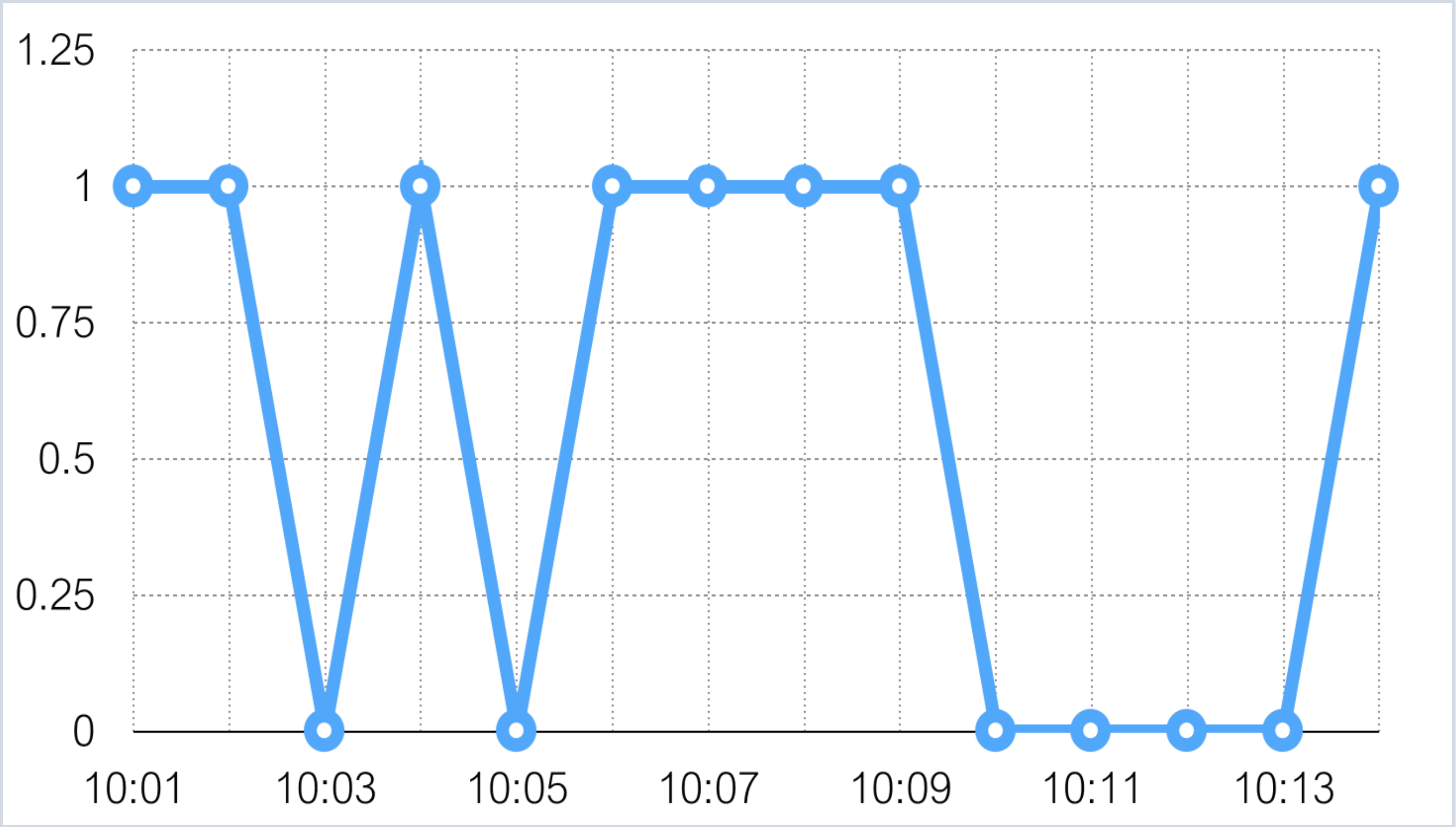
False positives



last(/server/system.cpu.load) > 5

ADVANCED PROBLEM DETECTION

Too sensitive



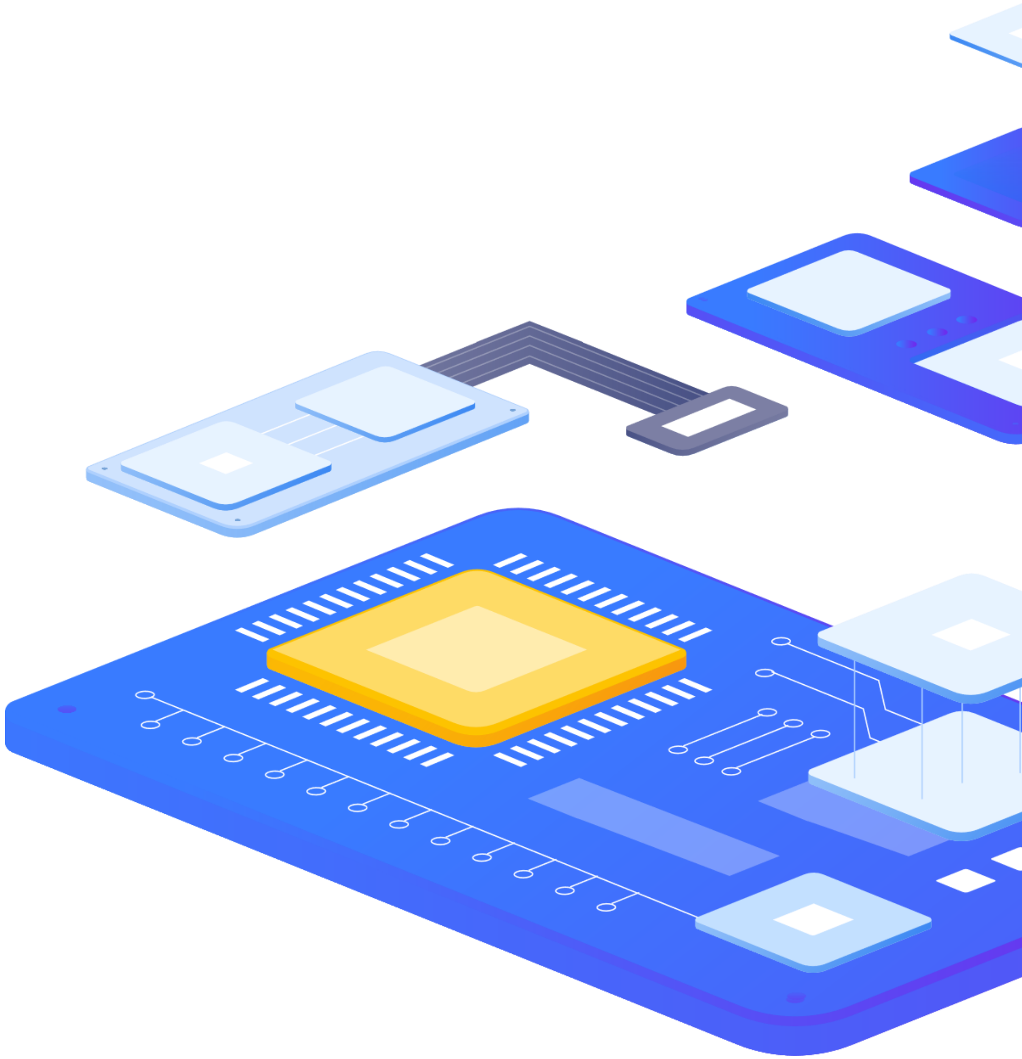
last(/server/net.tcp.service[http]) = 0

Advanced problem detection

Junior level

Too sensitive leads to

- False positives



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False positives

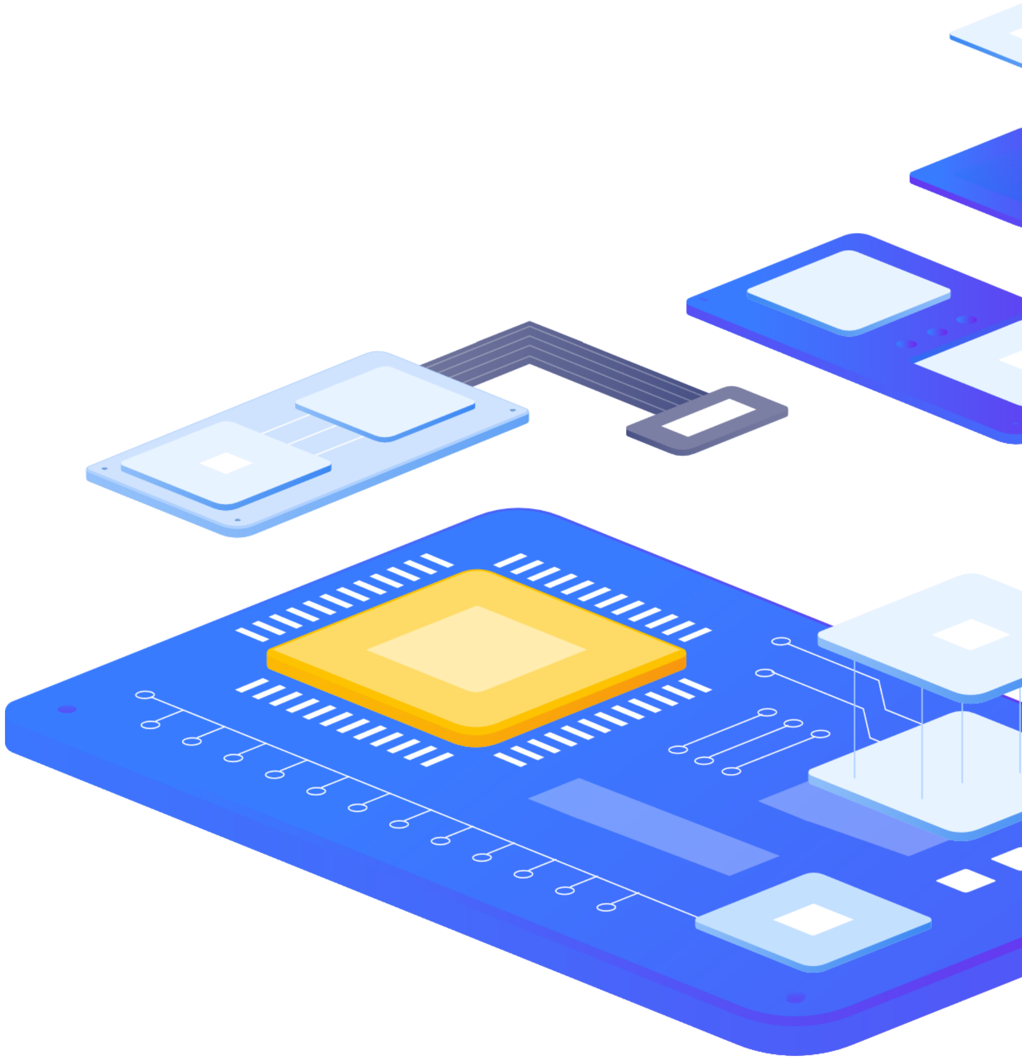
ADVANCED PROBLEM DETECTION

How to avoid false positives?

Be careful and define problems wisely!

What does it really mean?

- system is overloaded
- application does not work
- service is not available



Examples

Problem:

- CPU load > 5

No problem:

- CPU load = 4.99 → **Resolved?**

Problem:

- free disk space < 10%

No problem:

- free disk space = 10.001% → **Resolved?**

Problem:

- SSH check failed

No problem:

SSH is up → **Resolved?**

Analyze history

Performance

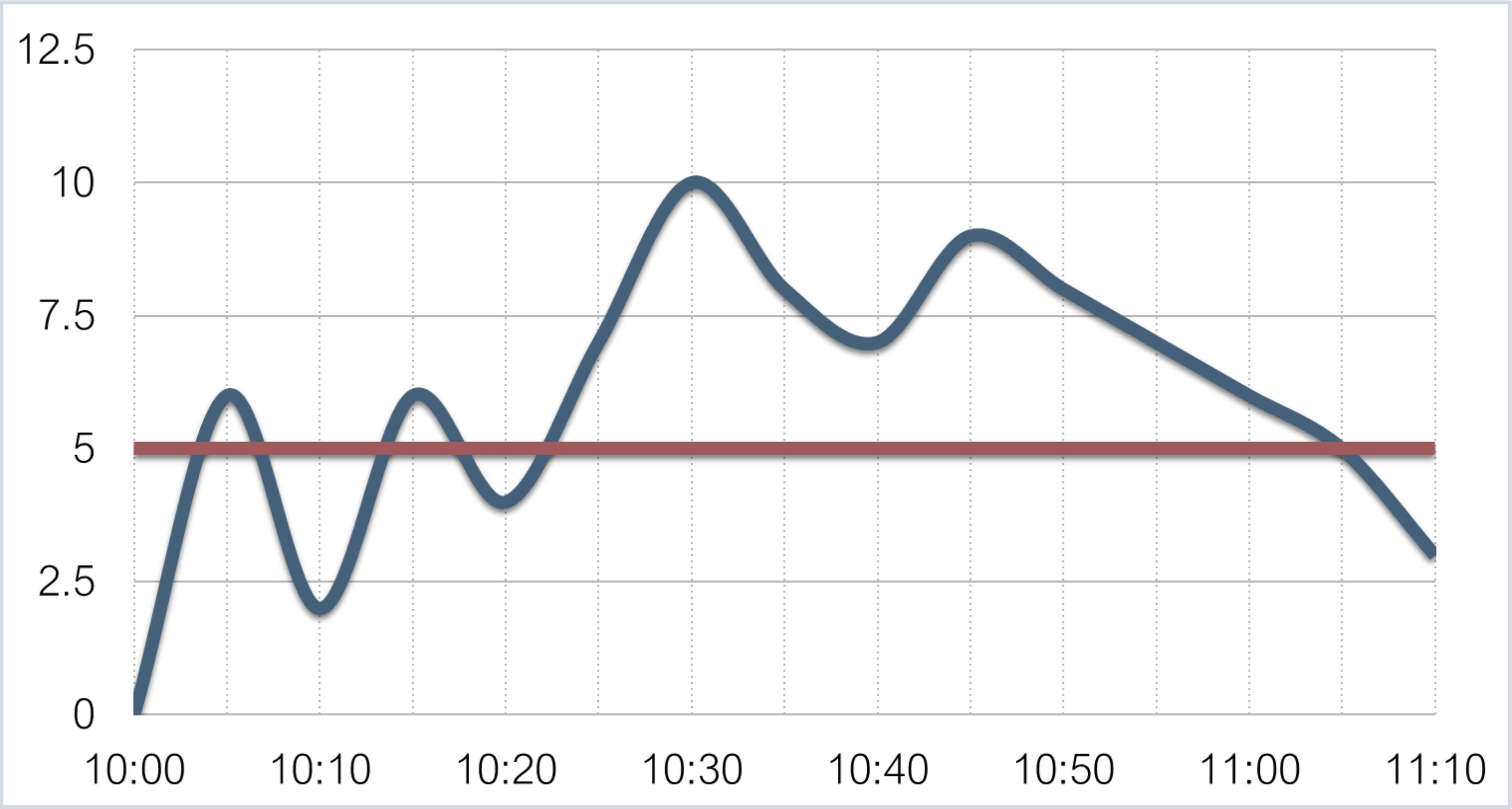
- min(/server/system.cpu.load,10m) > 5

Availability

- max(/server/net.tcp.service[http],5m) = 0
- max(/server/net.tcp.service[http],#3) = 0

ADVANCED PROBLEM DETECTION

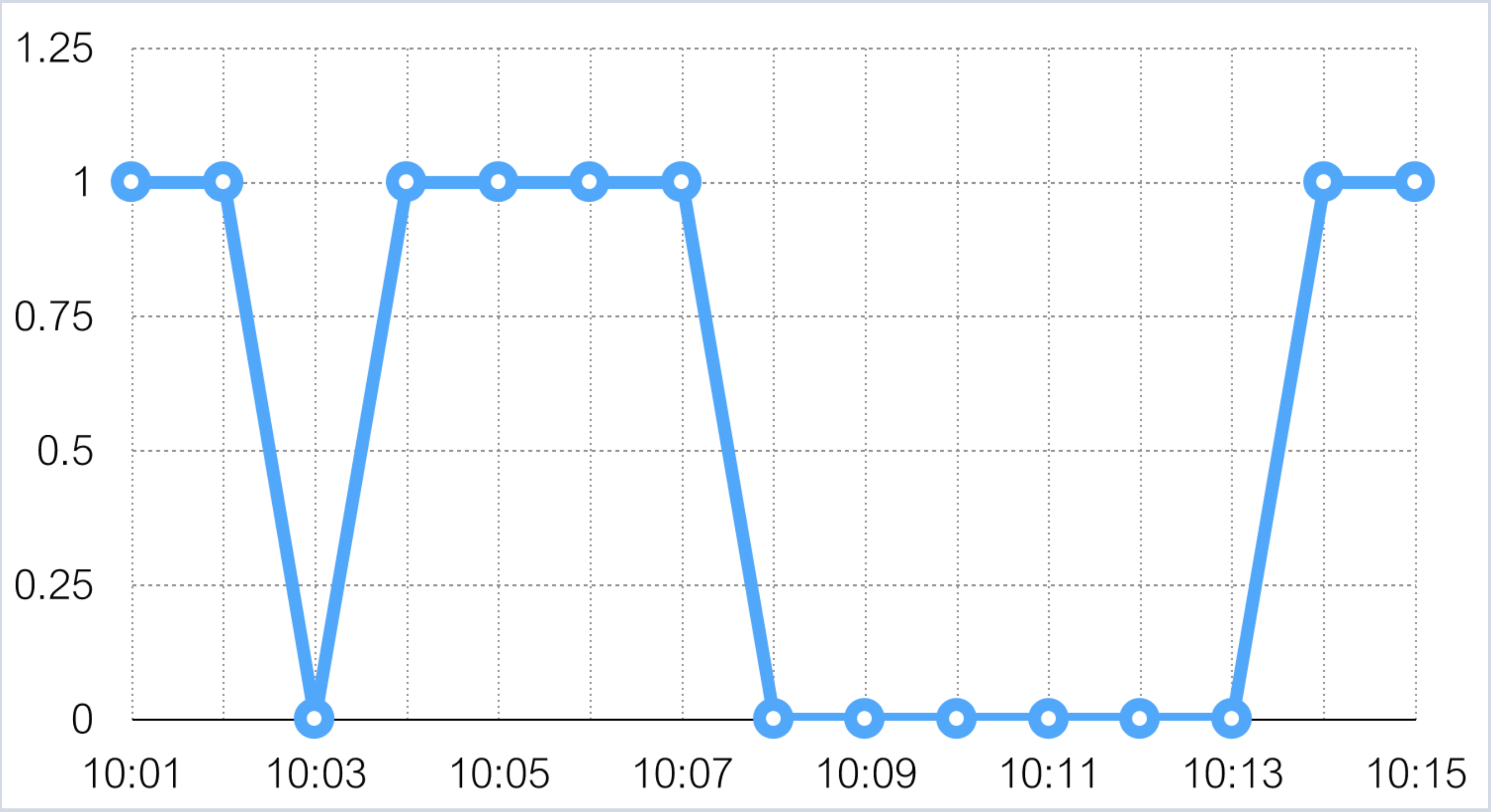
Analyze history



min(/server/system.cpu.load,10m) > 5

ADVANCED PROBLEM DETECTION

Analyze history



max(/server/net.tcp.service[http],#3) = 0

Different conditions for problem and recovery

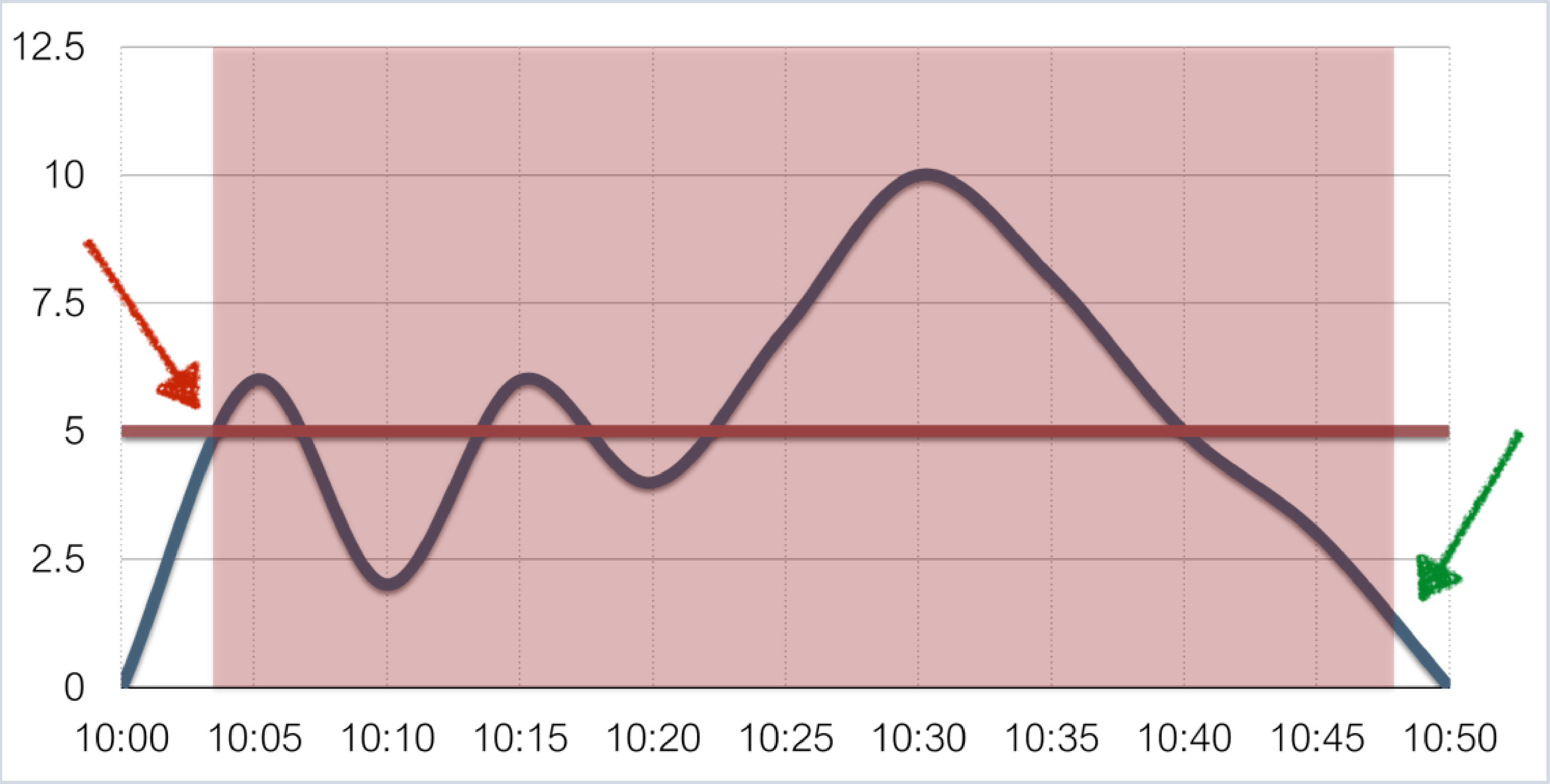
Before

- last(/server/system.cpu.load) > 5

Now

- Problem definition: last(/server/system.cpu.load)>5
- Recovery expression: last(/server/system.cpu.load)}<=1

Different conditions for problem and recovery



Problem definition: last(/server/system.cpu.load)>5 …Recovery expression: last(/server/system.cpu.load)}<=1

Examples

System is overloaded

Problem definition:

- min(/server/system.cpu.load,5m)>3

Recovery expression:

- max(/server/system.cpu.load,2m)<=1

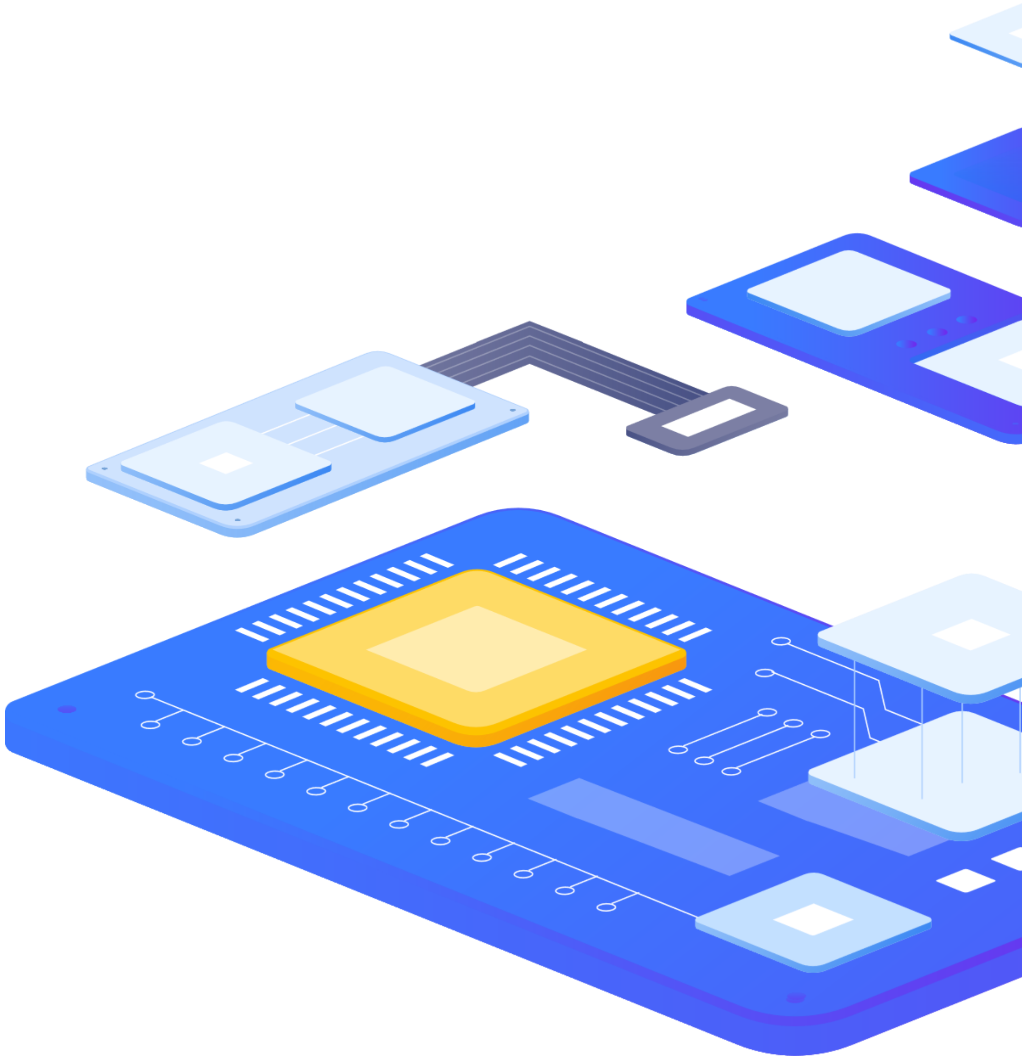
No free disk space /

Problem definition:

- last(/server/vfs.fs.size[/,pfree])<10

Recovery expression:

- min(/server/vfs.fs.size[/,pfree],15m)>30



ADVANCED PROBLEM DETECTION

Examples

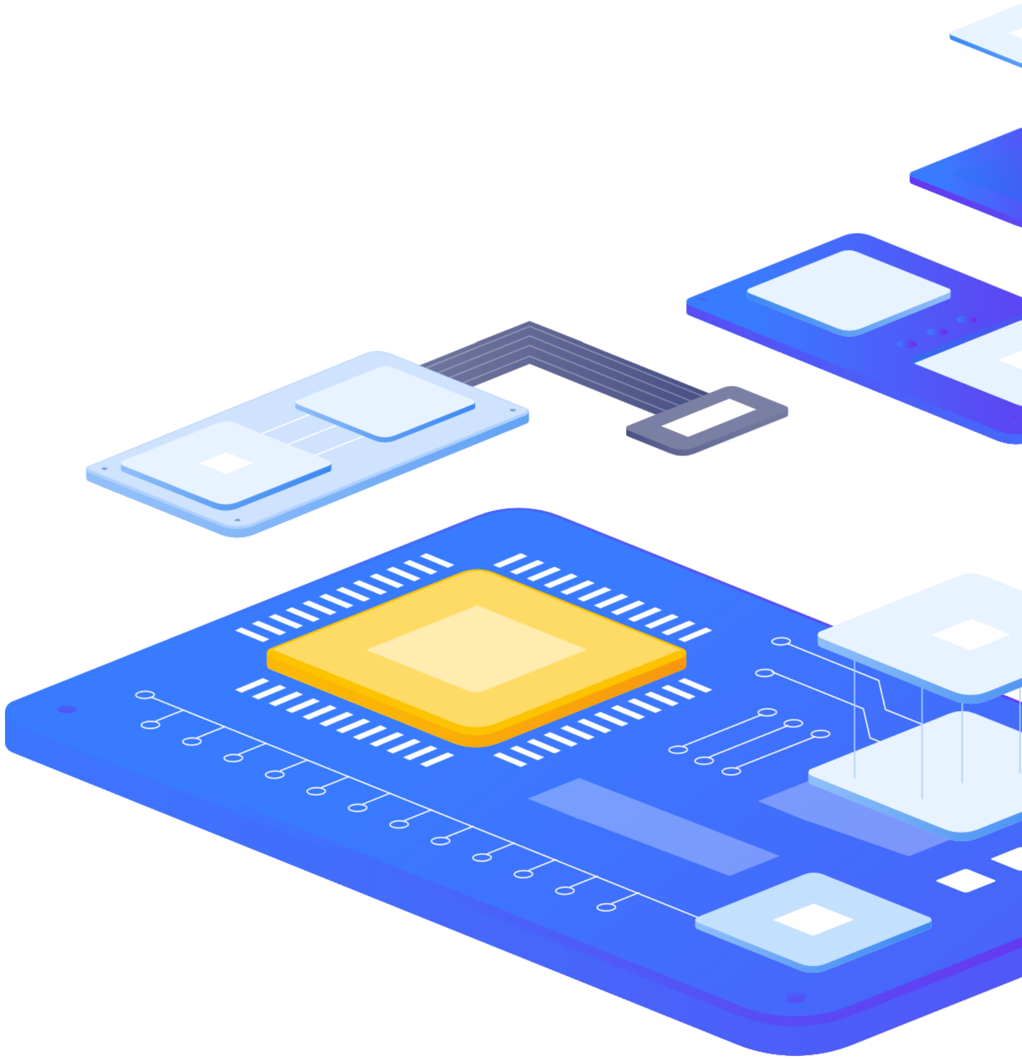
SSH is not available

Problem definition:

- max(/server/net.tcp.service[ssh],#3)=0

Recovery expression:

- min(/server/net.tcp.service[ssh],#10)=1



ADVANCED PROBLEM DETECTION

Anomalies

How to detect?

By comparing with the data from the same period, the period is taken from the past.

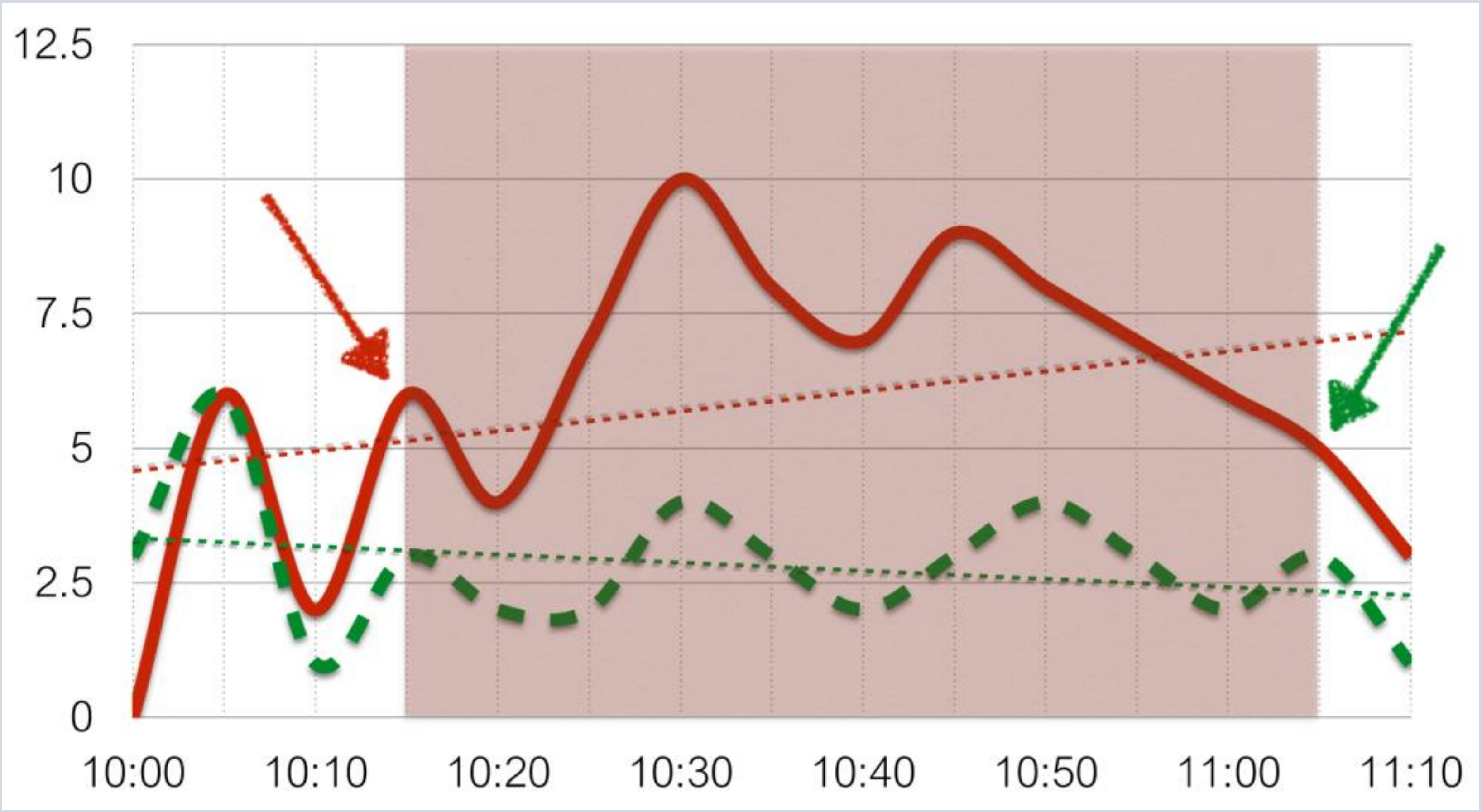
Average CPU load for the last hour is 2x higher than

CPU load for the same period week ago

- avg(/server/system.cpu.load,1h) > 2* avg(/server/system.cpu.load,1h,**7d**)

ADVANCED PROBLEM DETECTION

Anomalies



Comparison with the data 7 days ago

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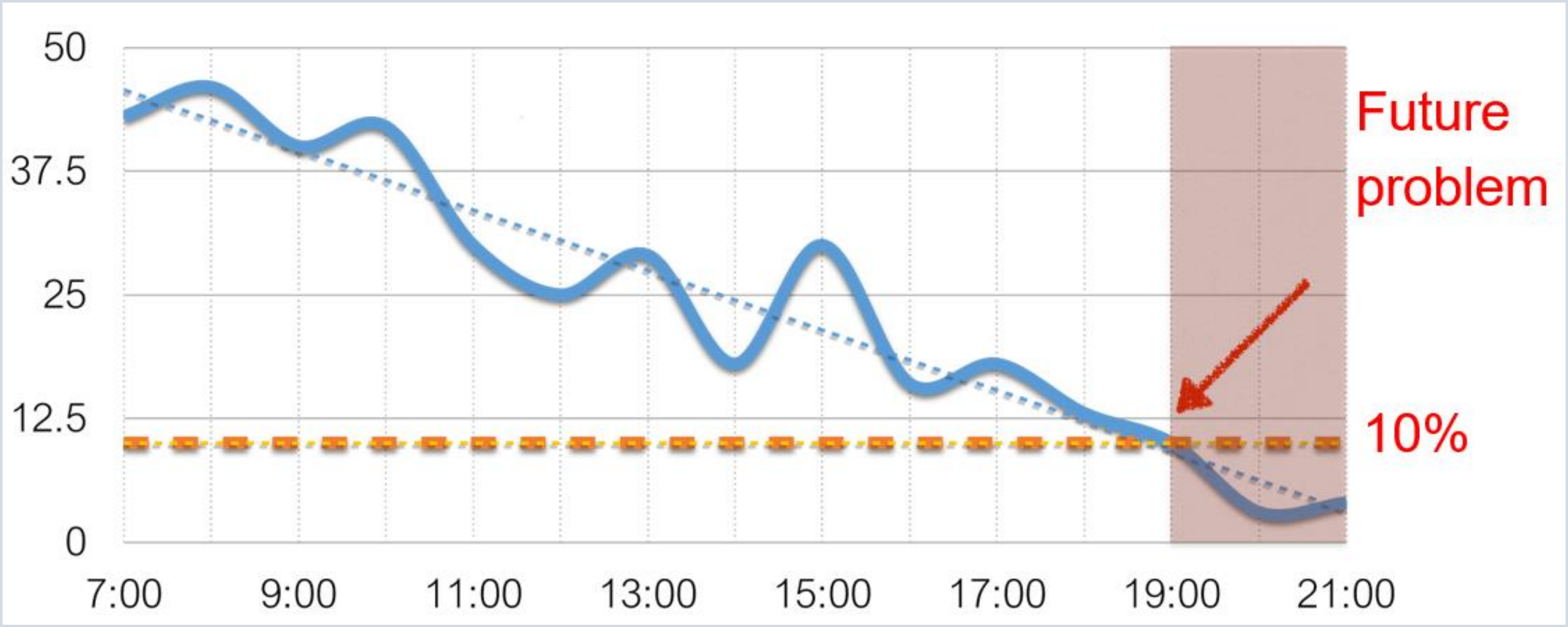
Forecast

ADVANCED PROBLEM DETECTION

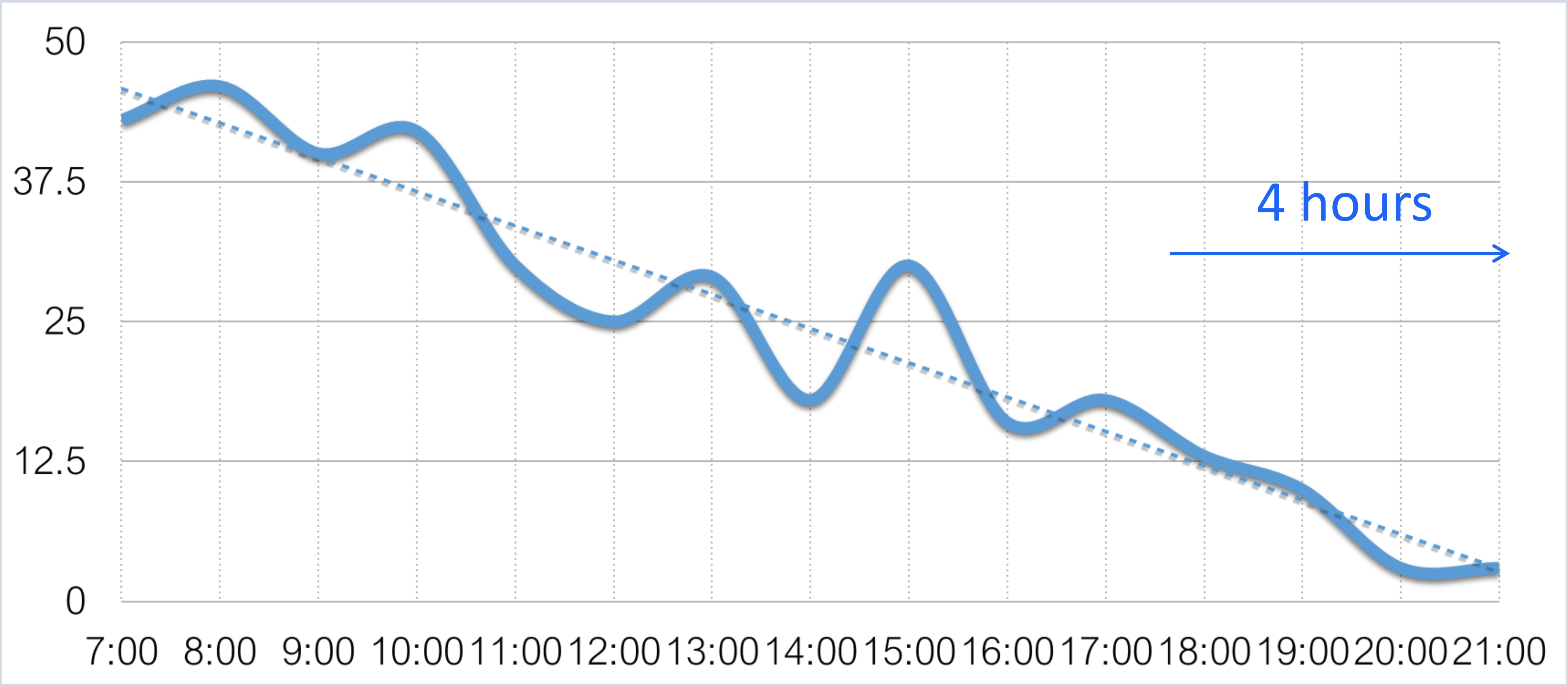
Forecast



Trigger function timeleft

ADVANCED PROBLEM DETECTION

Forecast



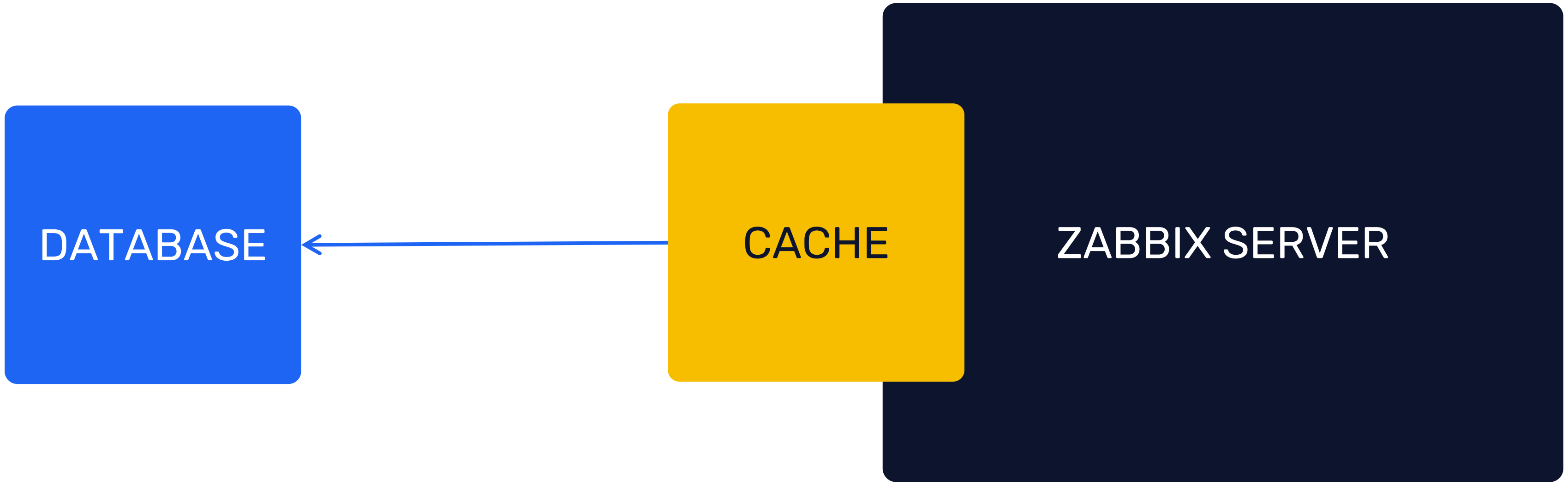
Trigger function forecast

ADVANCED PROBLEM DETECTION

Does history analysis affect performance of Zabbix?

Yes, but not significantly.

Especially as of Zabbix 2.2.0.



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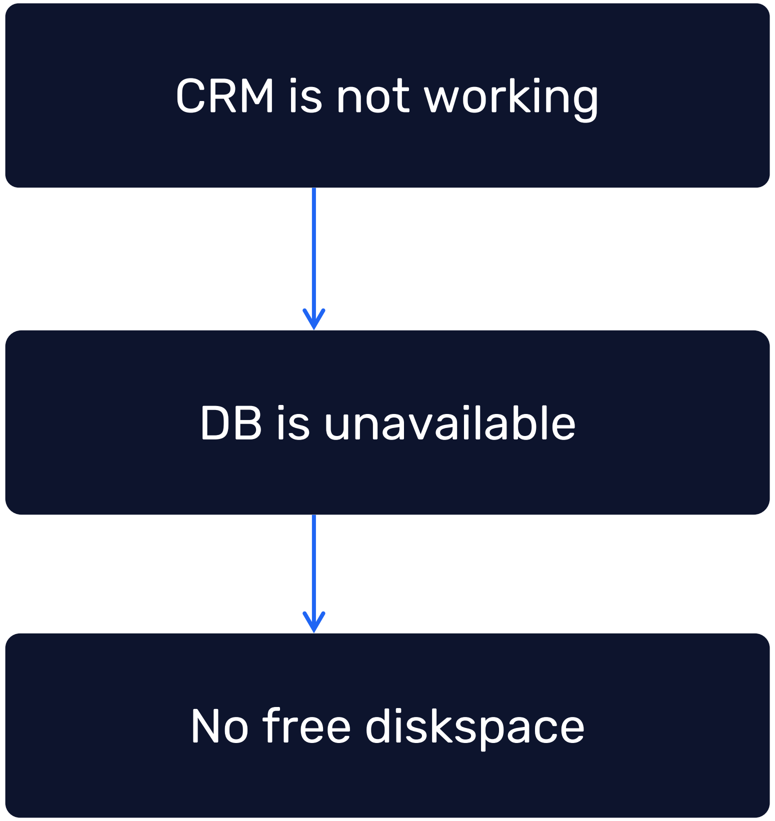
Dependencies

ADVANCED PROBLEM DETECTION

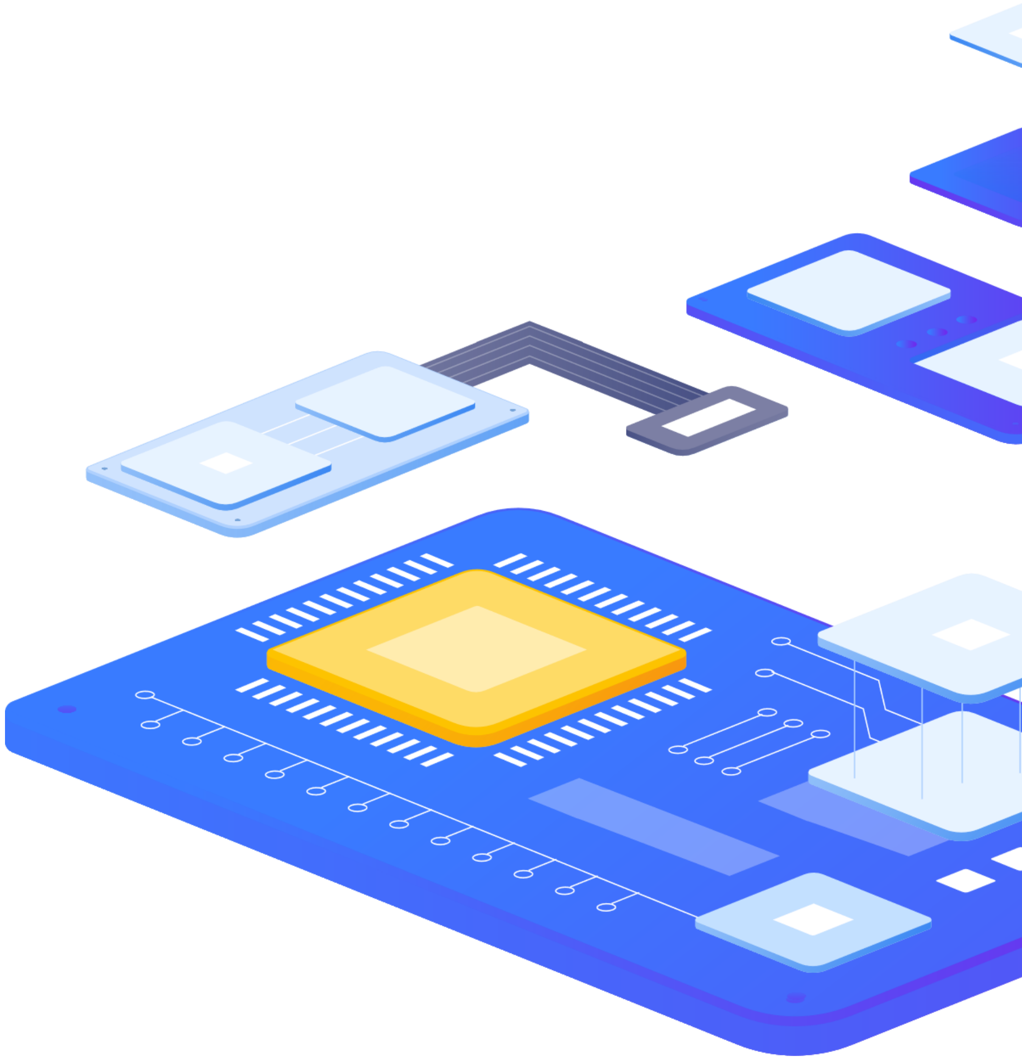
Dependencies



CRM is not working

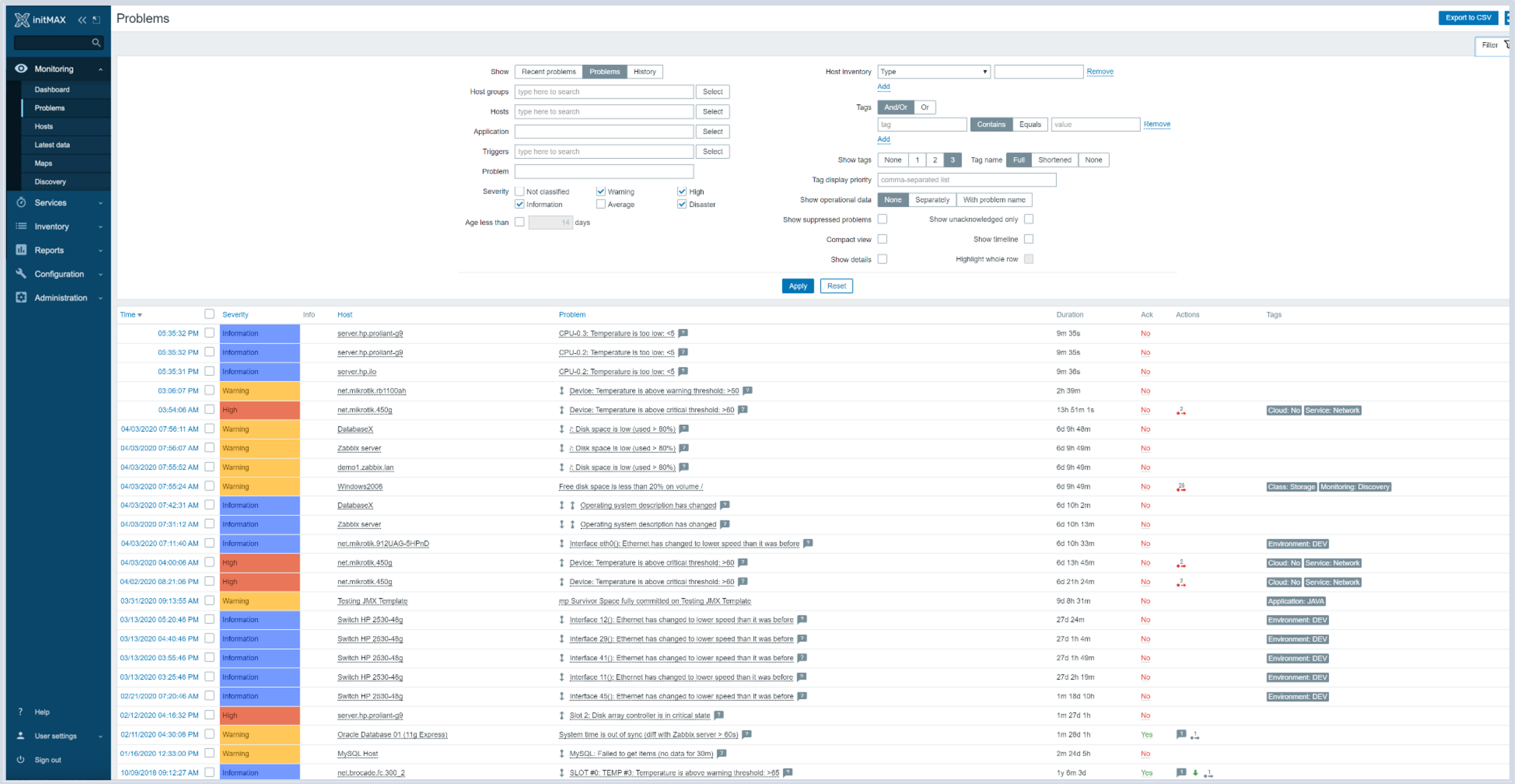
DB is unavailable

No free diskspace



ADVANCED PROBLEM DETECTION

Section „Problems“



Show: Recent problems [✓ Problems] History

Host groups: type here to search — Select

Hosts: type here to search — Select

Application: — Select

Triggers: type here to search — Select

Problem:

Severity: □ Not classified ☑ Warning ☑ High ☑ Information □ Average ☑ Disaster

Age less than □ 14 days

Host inventory: Type ▾ — Remove — Add

Tags: [✓ And/Or] Or — tag [✓ Contains] Equals value — Remove — Add

Show tags: None 1 2 [✓ 3] Tag name [✓ Full] Shortened None

Tag display priority: comma-separated list

Show operational data: [✓ None] Separately With problem name

Show suppressed problems □ Show unacknowledged only □

Compact view □ Show timeline □

Show details □ Highlight whole row □

Time ▾	□	Severity	Info	Host	Problem	Duration	Ack	Actions	Tags
05:35:32 PM	□	Information		server.hp.proliant-g9	CPU-0.3: Temperature is too low: <5	9m 35s	No		
05:35:32 PM	□	Information		server.hp.proliant-g9	CPU-0.2: Temperature is too low: <5	9m 35s	No		
05:35:31 PM	□	Information		server.hp.ilo	CPU-0.2: Temperature is too low: <5	9m 36s	No		
03:06:07 PM	□	Warning		net.mikrotik.rb1100ah	Device: Temperature is above warning threshold: >50	2h 39m	No		
03:54:06 AM	□	High		net.mikrotik.450g	Device: Temperature is above critical threshold: >60	13h 51m 1s	No	2	Cloud: No Service: Network
04/03/2020 07:56:11 AM	□	Warning		DatabaseX	/: Disk space is low (used > 80%)	6d 9h 48m	No		
04/03/2020 07:56:07 AM	□	Warning		Zabbix server	/: Disk space is low (used > 80%)	6d 9h 49m	No		
04/03/2020 07:55:52 AM	□	Warning		demo1.zabbix.lan	/: Disk space is low (used > 80%)	6d 9h 49m	No		
04/03/2020 07:55:24 AM	□	Warning		Windows2008	Free disk space is less than 20% on volume /	6d 9h 49m	No	26	Class: Storage Monitoring: Discovery
04/03/2020 07:42:31 AM	□	Information		DatabaseX	Operating system description has changed	6d 10h 2m	No		
04/03/2020 07:31:12 AM	□	Information		Zabbix server	Operating system description has changed	6d 10h 13m	No		
04/03/2020 07:11:40 AM	□	Information		net.mikrotik.912UAG-5HPnD	Interface eth0(): Ethernet has changed to lower speed than it was before	6d 10h 33m	No		Environment: DEV
04/03/2020 04:00:06 AM	□	High		net.mikrotik.450g	Device: Temperature is above critical threshold: >60	6d 13h 45m	No	2	Cloud: No Service: Network
04/02/2020 08:21:06 PM	□	High		net.mikrotik.450g	Device: Temperature is above critical threshold: >60	6d 21h 24m	No	2	Cloud: No Service: Network
03/31/2020 09:13:55 AM	□	Warning		Testing JMX Template	mp Survivor Space fully committed on Testing JMX Template	9d 8h 31m	No		Application: JAVA
03/13/2020 05:20:46 PM	□	Information		Switch HP 2530-48g	Interface 12(): Ethernet has changed to lower speed than it was before	27d 24m	No		Environment: DEV
03/13/2020 04:40:46 PM	□	Information		Switch HP 2530-48g	Interface 29(): Ethernet has changed to lower speed than it was before	27d 1h 4m	No		Environment: DEV
03/13/2020 03:55:46 PM	□	Information		Switch HP 2530-48g	Interface 41(): Ethernet has changed to lower speed than it was before	27d 1h 49m	No		Environment: DEV
03/13/2020 03:25:46 PM	□	Information		Switch HP 2530-48g	Interface 11(): Ethernet has changed to lower speed than it was before	27d 2h 19m	No		Environment: DEV
02/21/2020 07:20:46 AM	□	Information		Switch HP 2530-48g	Interface 45(): Ethernet has changed to lower speed than it was before	1m 18d 10h	No		Environment: DEV
02/12/2020 04:16:32 PM	□	High		server.hp.proliant-g9	Slot 2: Disk array controller is in critical state	1m 27d 1h	No		
02/11/2020 04:30:06 PM	□	Warning		Oracle Database 01 (11g Express)	System time is out of sync (diff with Zabbix server > 60s)	1m 28d 1h	Yes	1 1	
01/16/2020 12:33:00 PM	□	Warning		MySQL Host	MySQL: Failed to get items (no data for 30m)	2m 24d 5h	No		
10/09/2018 09:12:27 AM	□	Information		net.brocade.fc.300_2	SLOT #0: TEMP #3: Temperature is above warning threshold: >65	1y 6m 3d	Yes	1 1	

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Tags

Tags

Tag word: meaning

Customer: Alza
Customer: Globus

Datacenter: NY2
Datacenter: San Francisco

Area: Performance
Area: Availability
Area: Security

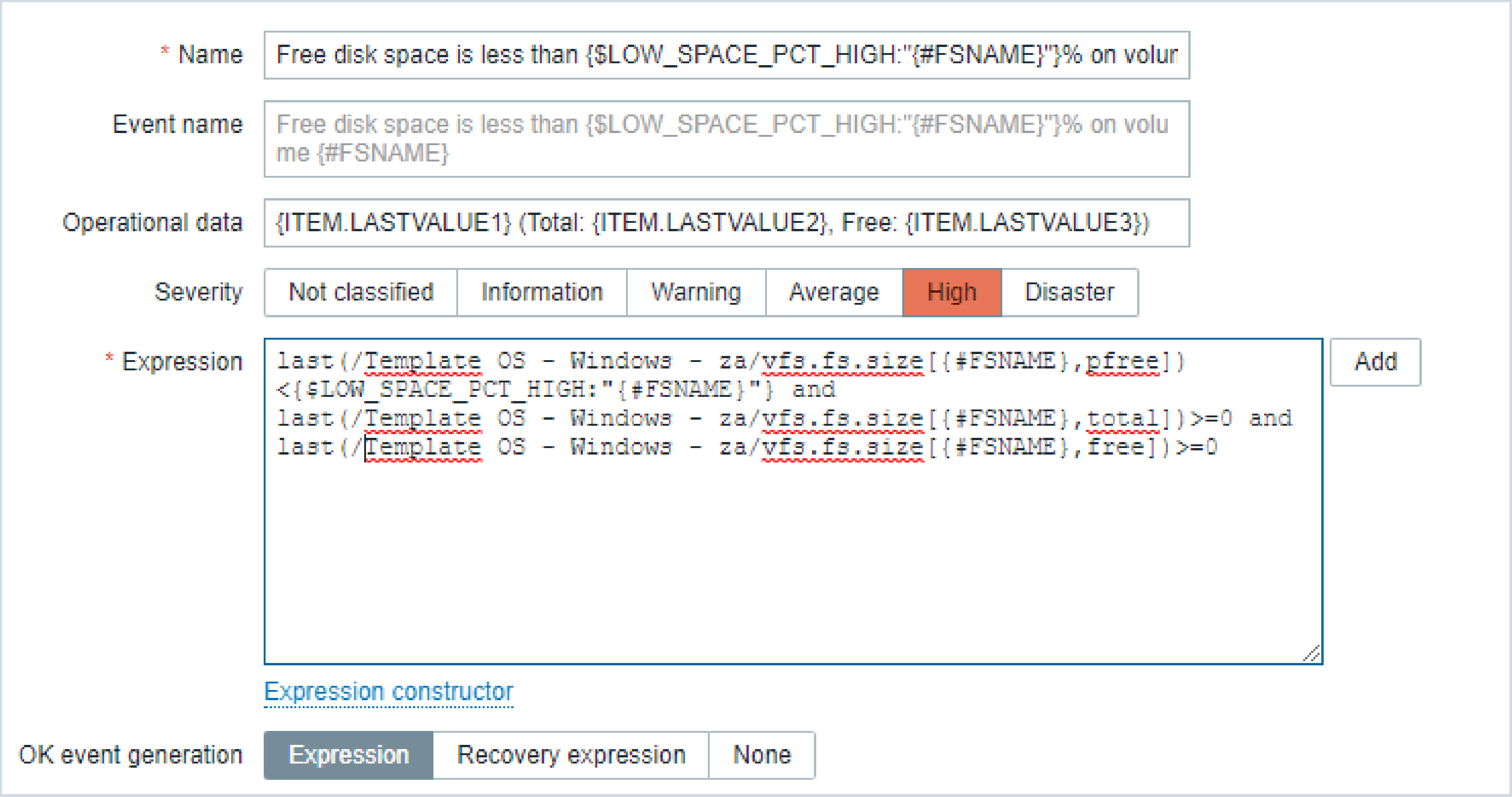
Environment: Staging
Environment: Test

User impact: None
User impact: Critical

ADVANCED PROBLEM DETECTION

Use of obtained values

Use of useful information in tags or names



* Name	Free disk space is less than {$LOW_SPACE_PCT_HIGH:"{#FSNAME}"}% on volur
Event name	Free disk space is less than {$LOW_SPACE_PCT_HIGH:"{#FSNAME}"}% on volume {#FSNAME}
Operational data	{ITEM.LASTVALUE1} (Total: {ITEM.LASTVALUE2}, Free: {ITEM.LASTVALUE3})
Severity	Not classified / Information / Warning / Average / [✓ High] / Disaster
* Expression	see below
OK event generation	[✓ Expression] / Recovery expression / None

```
last(/Template OS - Windows - za/vfs.fs.size[{#FSNAME},pfree])
<{$LOW_SPACE_PCT_HIGH:"{#FSNAME}"} and
last(/Template OS - Windows - za/vfs.fs.size[{#FSNAME},total])>=0 and
last(/Template OS - Windows - za/vfs.fs.size[{#FSNAME},free])>=0
```

ADVANCED PROBLEM DETECTION

Possible reactions

- Event correlation
- Automatized problem solving
- Manual problem closing
- Sending notifications to a user or a group of users
- Registration of tasks in the Helpdesk system

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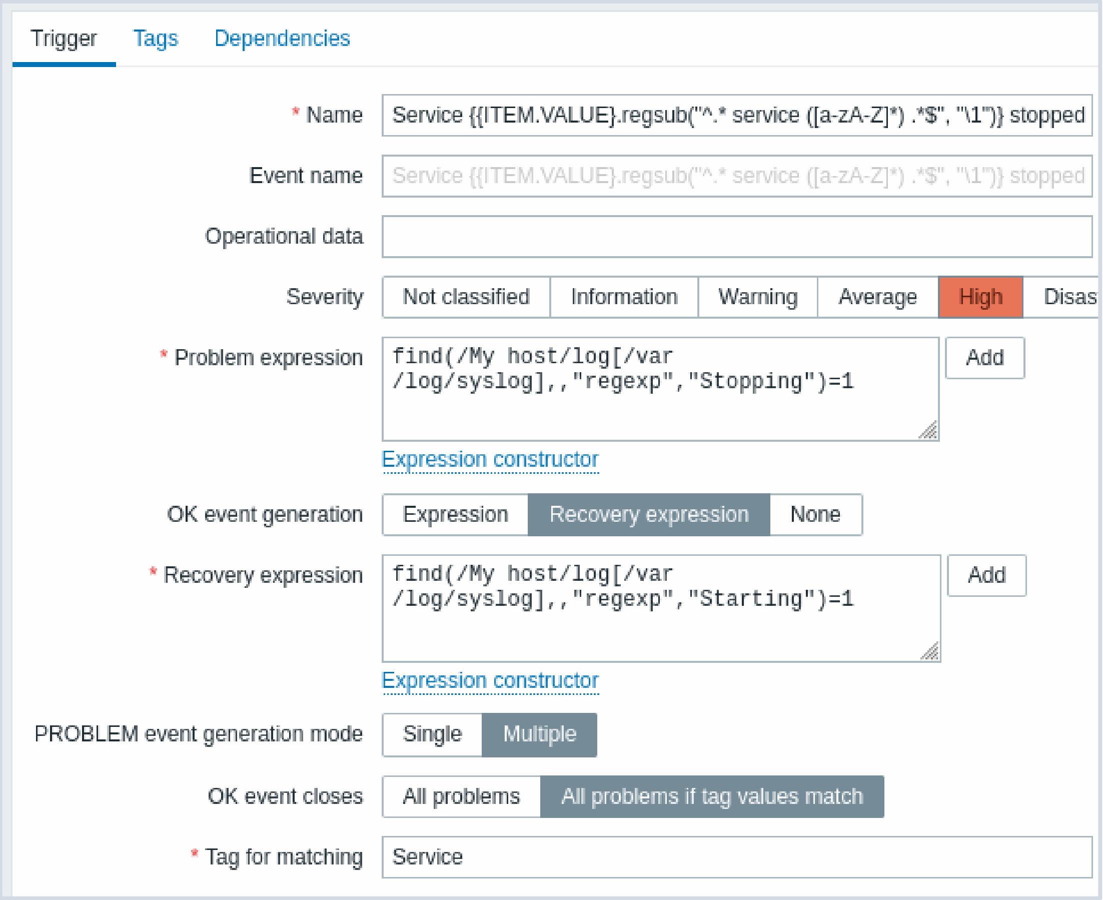
Event correlations

ADVANCED PROBLEM DETECTION

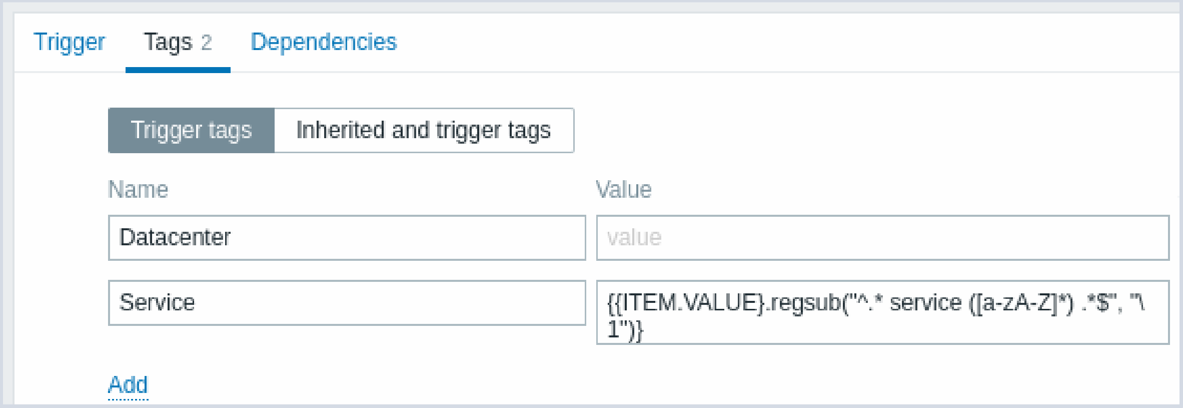
Event correlation on trigger level

Correlation of events at the trigger level allows you to compare individual problems reported by a single trigger.



Trigger | Tags | Dependencies

* Name	Service {{ITEM.VALUE}.regsub("^.* service ([a-zA-Z]*) .*$", "\1")} stopped
Event name	Service {{ITEM.VALUE}.regsub("^.* service ([a-zA-Z]*) .*$", "\1")} stopped
Operational data	
Severity	Not classified Information Warning Average [✓ High] Disas
* Problem expression	find(/My host/log[/var /log/syslog],,"regexp","Stopping")=1
OK event generation	Expression [✓ Recovery expression] None
* Recovery expression	find(/My host/log[/var /log/syslog],,"regexp","Starting")=1
PROBLEM event generation mode	Single [✓ Multiple]
OK event closes	All problems [✓ All problems if tag values match]
* Tag for matching	Service



Trigger | Tags 2 | Dependencies

[✓ Trigger tags] Inherited and trigger tags

Name	Value
Datacenter	value
Service	{{ITEM.VALUE}.regsub("^.* service ([a-zA-Z]*) .*$", "\1")}

Event correlation on trigger level

How does it work?

10/Feb/2022:06:25:30 service Jira stopped	“Service Jira stopped”	PROBLEM

ADVANCED PROBLEM DETECTION

Event correlation on trigger level

How does it work?

10/Feb/2022:06:25:30 service Jira stopped	“Service Jira stopped”	PROBLEM
10/Feb/2022:06:27:32 service MySQL stopped	“Service MySQL stopped”	PROBLEM

ADVANCED PROBLEM DETECTION

Event correlation on trigger level

How does it work?

10/Feb/2022:06:25:30 service Jira stopped	“Service Jira stopped”	PROBLEM
10/Feb/2022:06:27:32 service MySQL stopped	“Service MySQL stopped”	RESOLVED
10/Feb/2022:06:28:11 service MySQL started		

Event correlation on trigger level

How does it work?

10/Feb/2022:06:25:30 service Jira stopped	“Service Jira stopped”	PROBLEM
10/Feb/2022:06:27:32 service MySQL stopped	“Service MySQL stopped”	RESOLVED
10/Feb/2022:06:28:11 service MySQL started		
10/Feb/2022:06:34:22 service Redis stopped	“Service Redis stopped”	PROBLEM

ADVANCED PROBLEM DETECTION

Event correlation on trigger level

How does it work?

10/Feb/2022:06:25:30 service Jira stopped	“Service Jira stopped”	**PROBLEM**
10/Feb/2022:06:27:32 service MySQL stopped	“Service MySQL stopped”	**RESOLVED**
10/Feb/2022:06:28:11 service MySQL started		
10/Feb/2022:06:34:22 service Redis stopped	“Service Redis stopped”	**RESOLVED**
10/Feb/2022:06:37:58 service Redis started		

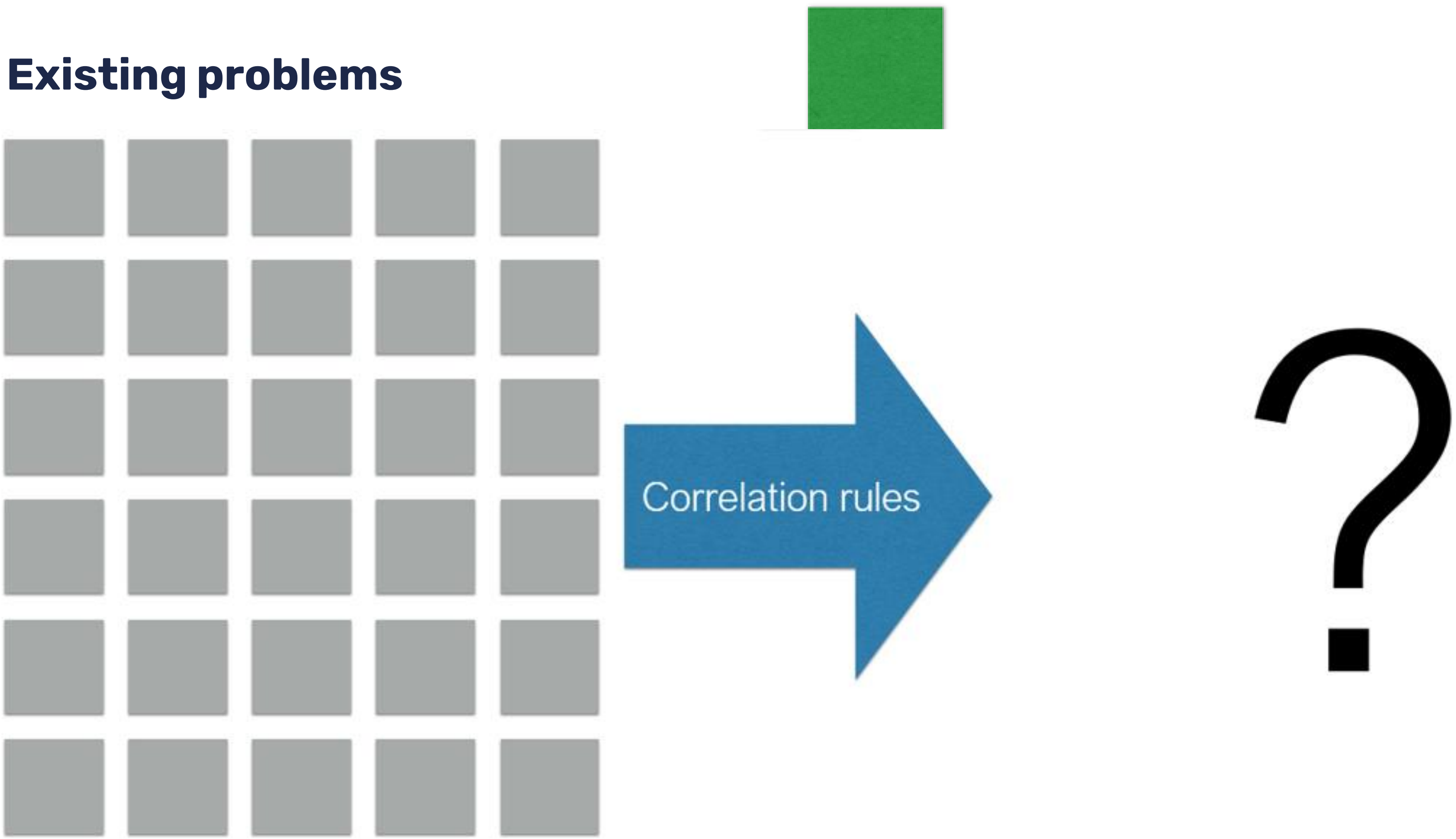
ADVANCED PROBLEM DETECTION

Event correlation on trigger level

How does it work?

10/Feb/2022:06:25:30 service Jira stopped	“Service Jira stopped”	RESOLVED
10/Feb/2022:06:27:32 service MySQL stopped	“Service MySQL stopped”	RESOLVED
10/Feb/2022:06:28:11 service MySQL started		
10/Feb/2022:06:34:22 service Redis stopped	“Service Redis stopped”	RESOLVED
10/Feb/2022:06:37:58 service Redis started		
10/Feb/2022:06:55:31 service **Jira** started		

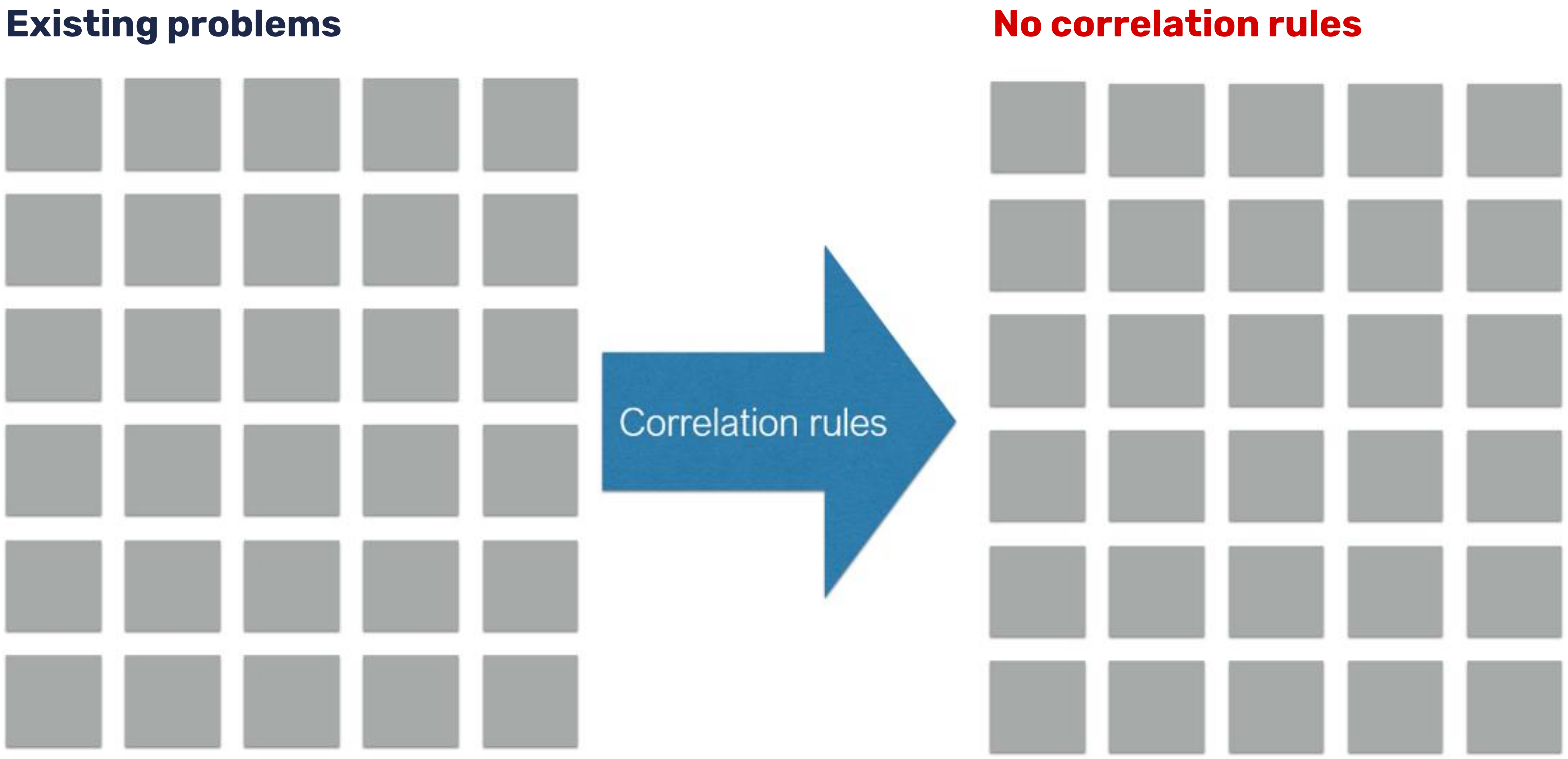
Event correlation



A new problem appears

Existing problems

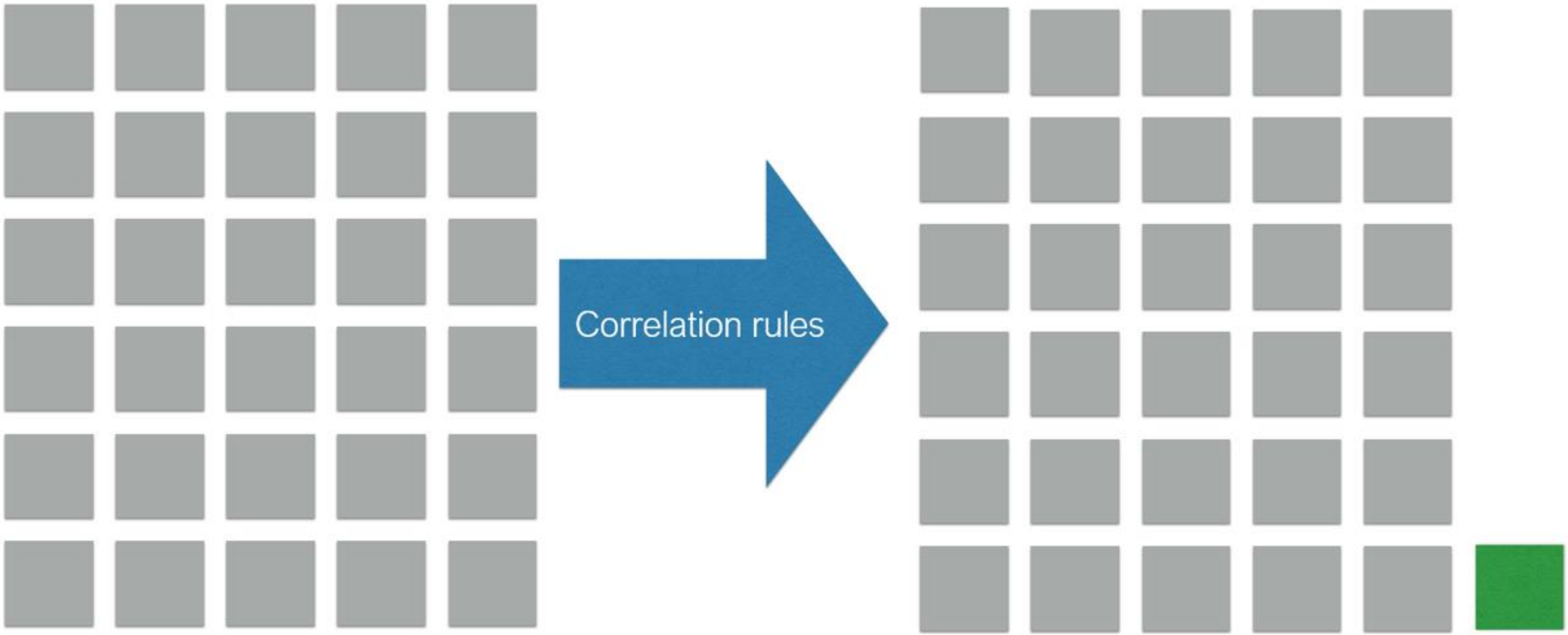
Event correlation



Event correlation

Existing problems

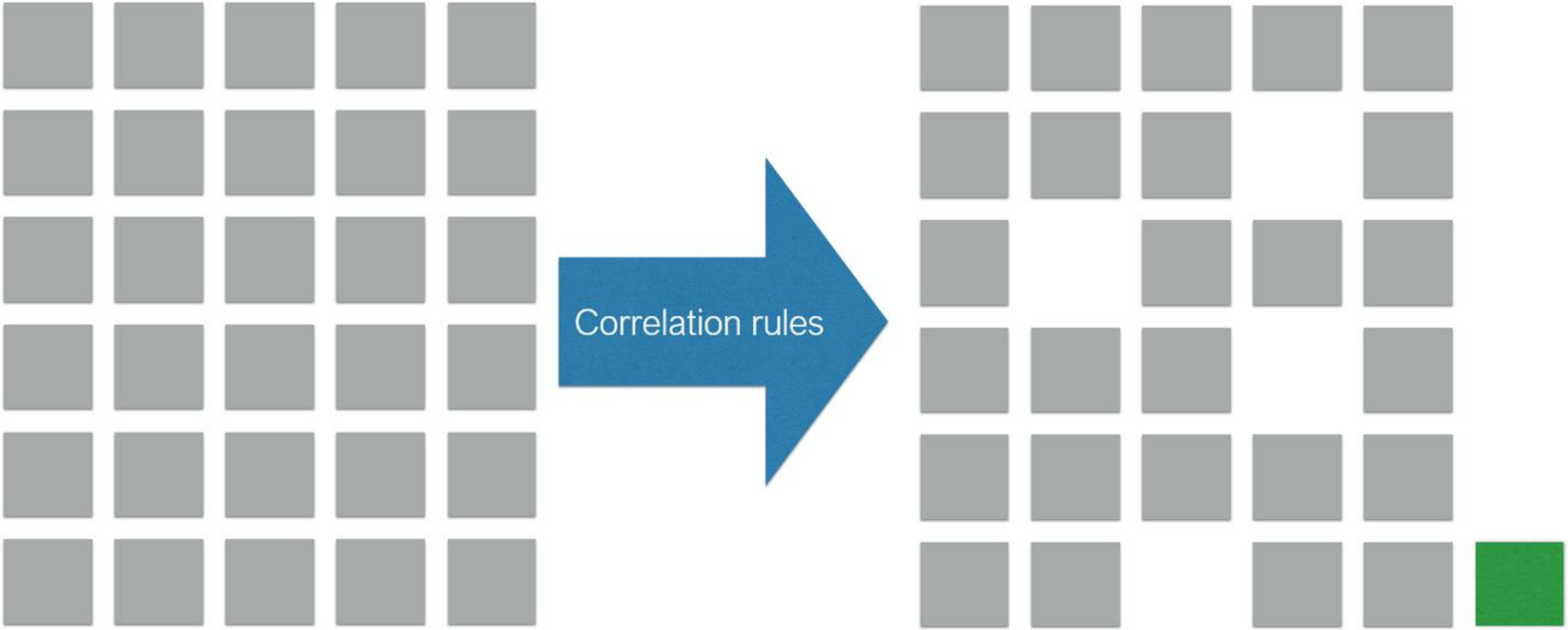
No correlation rules



Event correlation

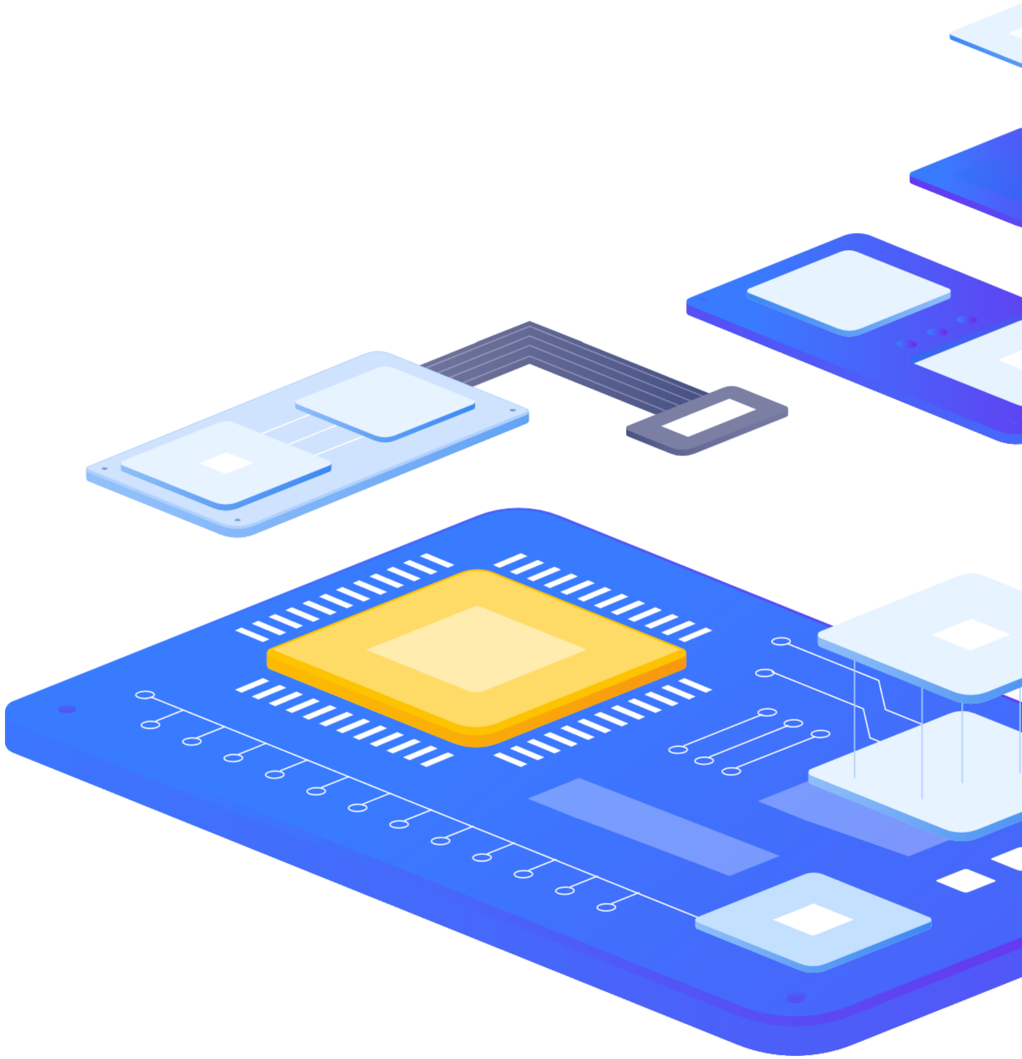
Existing problems

Correlation rules (close old)



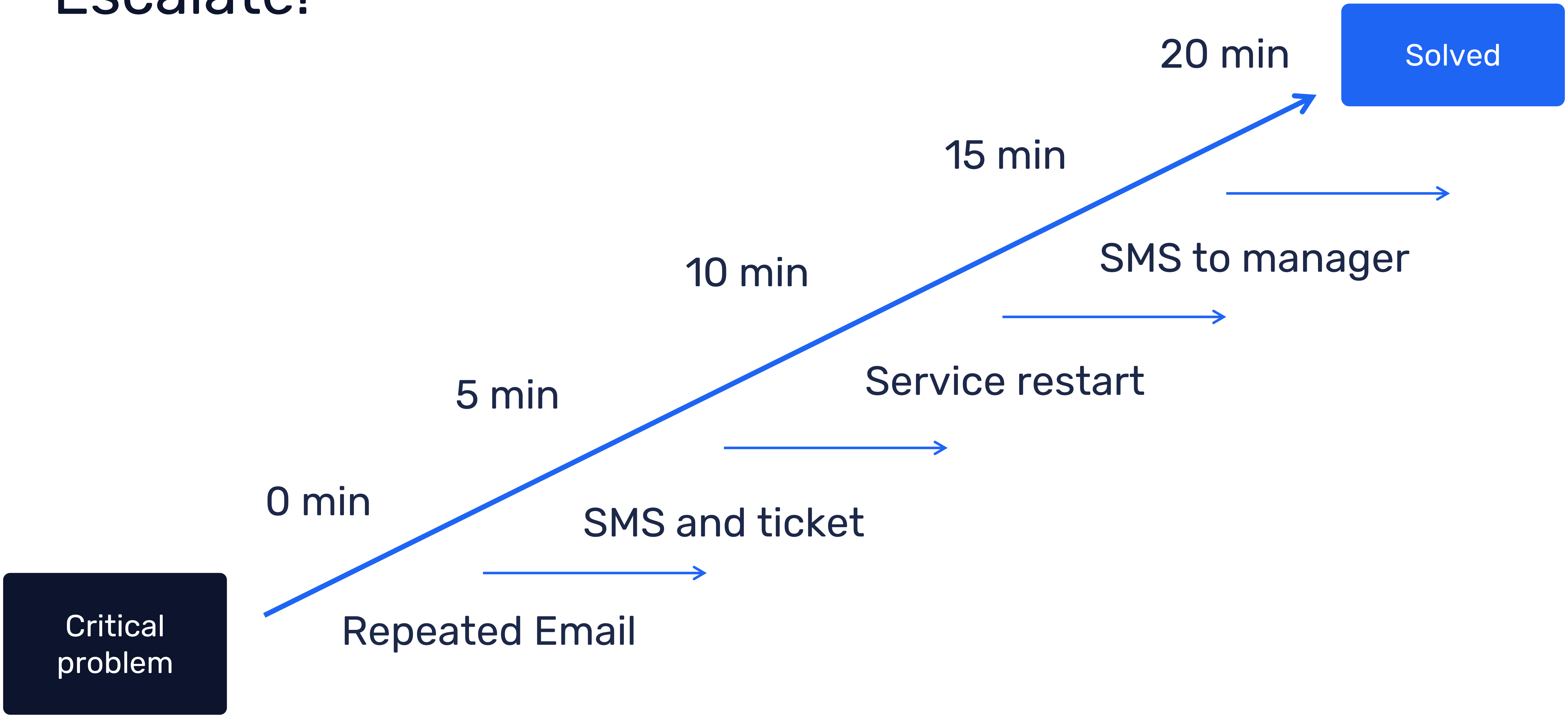
Escalate!

- Immediate reaction
- Delayed reaction
- Notification if automatic action failed
- Repeated notifications
- Escalation to a new level



ADVANCED PROBLEM DETECTION

Escalate!



Critical problem

0 min

Repeated Email

5 min

SMS and ticket

10 min

Service restart

15 min

SMS to manager

20 min

Solved

ADVANCED PROBLEM DETECTION

In summary

- Analyze history
- No problem!= Solution
- Use different conditions for problem definition and recovery
- Pay attention to anomaly detection
- Use correlation
- Resolve common problems automatically
- Do not hesitate to escalate!

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Expression macros

ADVANCED PROBLEM DETECTION

{?EXPRESSION_MACROS}

- If defined, this name will be used to create the problem event name, instead of the trigger name.
- The event name may be used to build meaningful alerts containing problem data
- The same set of macros is supported as in the trigger name, plus {TIME} and {?EXPRESSION} expression macros.
- Supported since Zabbix 5.2.0
- Can be used in different locations – **Event Name,** Maps, name of Graphs

{?EXPRESSION_MACROS}

Junior

- Problem: Load of **Exchange** server increased by more than 10% last month

Expert

- Problem: Load of **Exchange** server increased by **24**% in **July** (**0.69**) comparing to **June** (**0.56**)

- Load of {HOST.HOST} server increased by
  - {{?100*trendavg(//system.cpu.load,1M:now/M)/trendavg(//system.cpu.load,1M:now/M-1M)}.fmtnum(0)}% in
  - {{TIME}.fmttime(%B,-1M)}
  - ({{?trendavg(//system.cpu.load,1M:now/M)}.fmtnum(2)}) comparing to
  - {{TIME}.fmttime(%B,-2M)}
  - ({{?trendavg(//system.cpu.load,1M:now/M-1M)}.fmtnum(2)})

https://www.zabbix.com/documentation/6.0/en/manual/config/triggers/expression?hl=expression#examples-of-triggers

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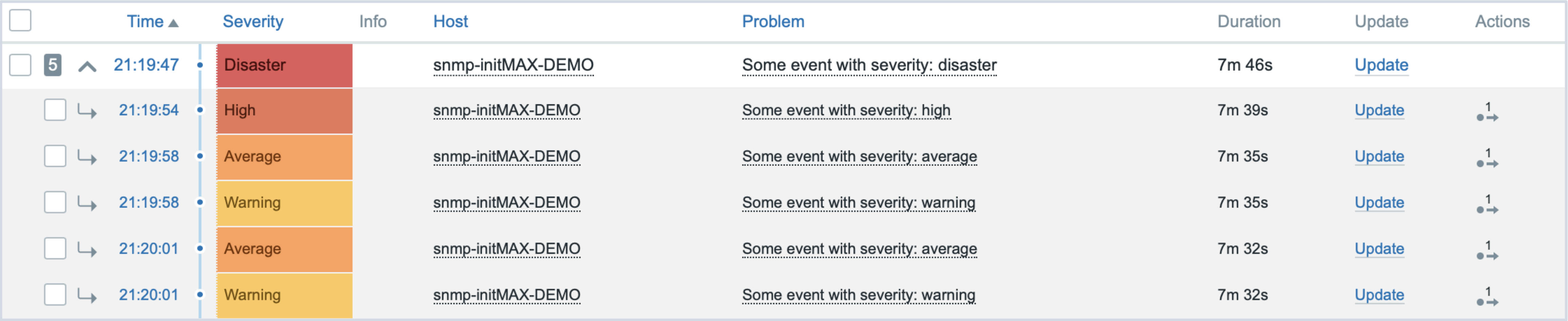
Cause and symptoms

ADVANCED PROBLEM DETECTION

Cause and symptom events

Zabbix 6.4 adds the ability to mark events as Cause or Symptom events. This allows Zabbix users to filter events in a way, where they can see only root cause problems, instead of being overwhelmed by symptom events

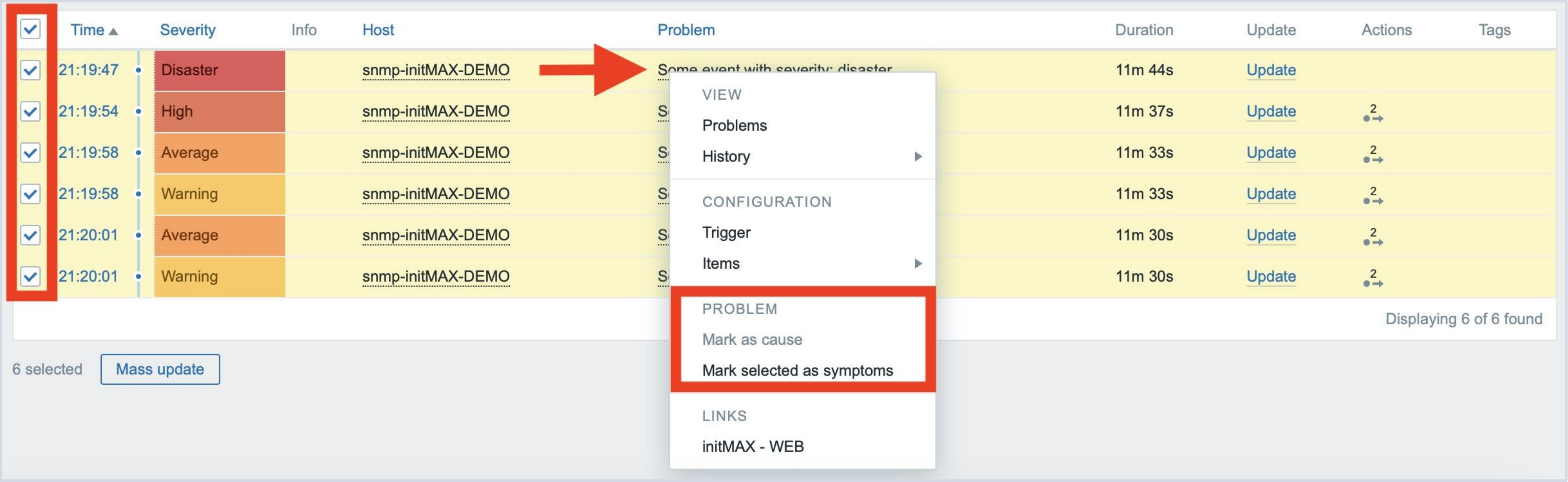


☐	Time ▲	Severity	Info	Host	Problem	Duration	Update	Actions
☐ 5 ^	21:19:47	Disaster		snmp-initMAX-DEMO	Some event with severity: disaster	7m 46s	Update	
☐ ↳	21:19:54	High		snmp-initMAX-DEMO	Some event with severity: high	7m 39s	Update	1
☐ ↳	21:19:58	Average		snmp-initMAX-DEMO	Some event with severity: average	7m 35s	Update	1
☐ ↳	21:19:58	Warning		snmp-initMAX-DEMO	Some event with severity: warning	7m 35s	Update	1
☐ ↳	21:20:01	Average		snmp-initMAX-DEMO	Some event with severity: average	7m 32s	Update	1
☐ ↳	21:20:01	Warning		snmp-initMAX-DEMO	Some event with severity: warning	7m 32s	Update	1

ADVANCED PROBLEM DETECTION

Cause and symptom events

- Events can now be marked as cause or symptom events
- By default, all new problems are considered as cause events



☑	Time ▲	Severity	Info	Host	Problem	Duration	Update	Actions	Tags
☑	21:19:47	Disaster		snmp-initMAX-DEMO	Some event with severity: disaster	11m 44s	Update		
☑	21:19:54	High		snmp-initMAX-DEMO	S	11m 37s	Update	2	
☑	21:19:58	Average		snmp-initMAX-DEMO	S	11m 33s	Update	2	
☑	21:19:58	Warning		snmp-initMAX-DEMO	S	11m 33s	Update	2	
☑	21:20:01	Average		snmp-initMAX-DEMO	S	11m 30s	Update	2	
☑	21:20:01	Warning		snmp-initMAX-DEMO	S	11m 30s	Update	2	

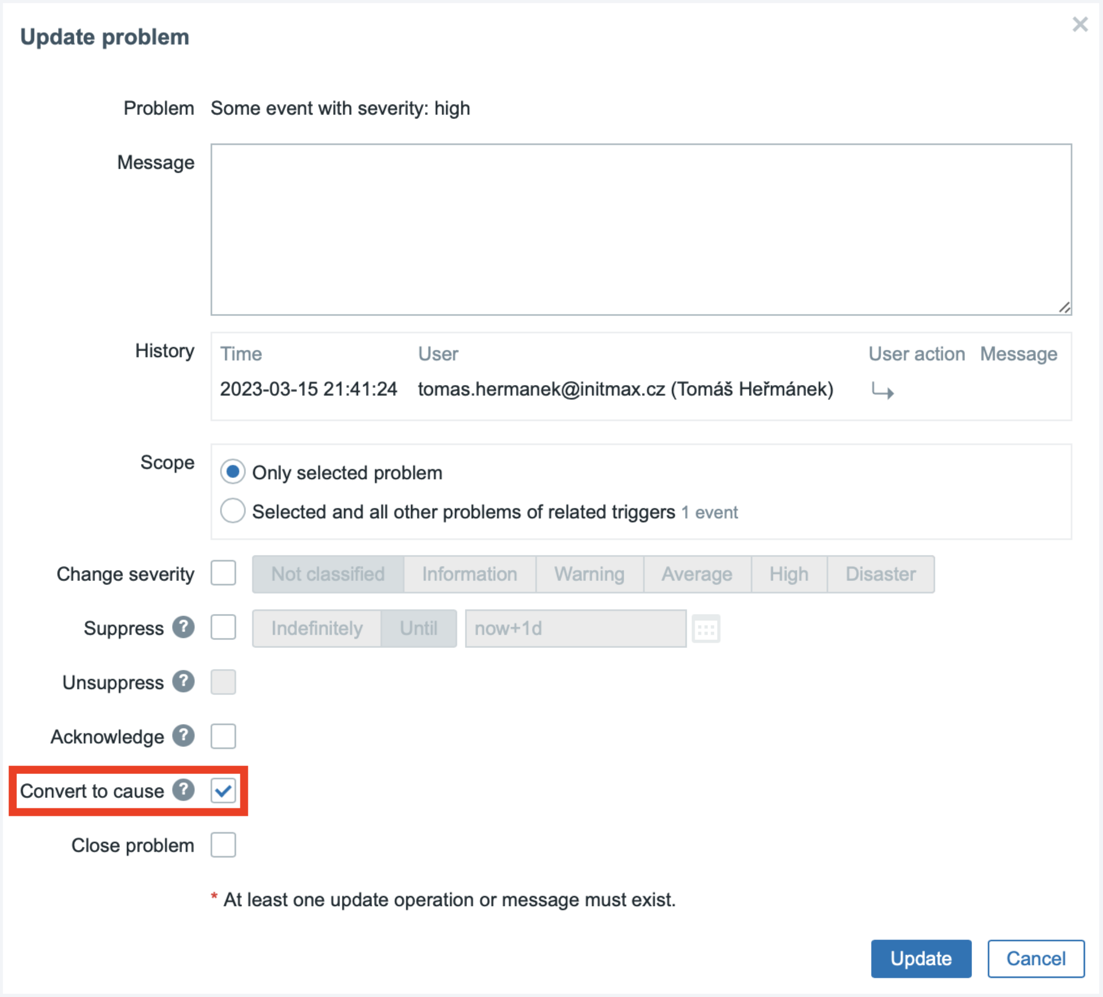
Displaying 6 of 6 found

6 selected Mass update

ADVANCED PROBLEM DETECTION

Cause and symptom events

- Symptom events can be converted to cause events by pressing the update button in the problem list (previously – Ack button)



Update problem

Problem	Some event with severity: high
Message	
History	
Scope	● Only selected problem ○ Selected and all other problems of related triggers 1 event
Change severity	□ Not classified / Information / Warning / Average / High / Disaster
Suppress ?	□ Indefinitely / Until now+1d
Unsuppress ?	□
Acknowledge ?	□
Convert to cause ?	☑
Close problem	□

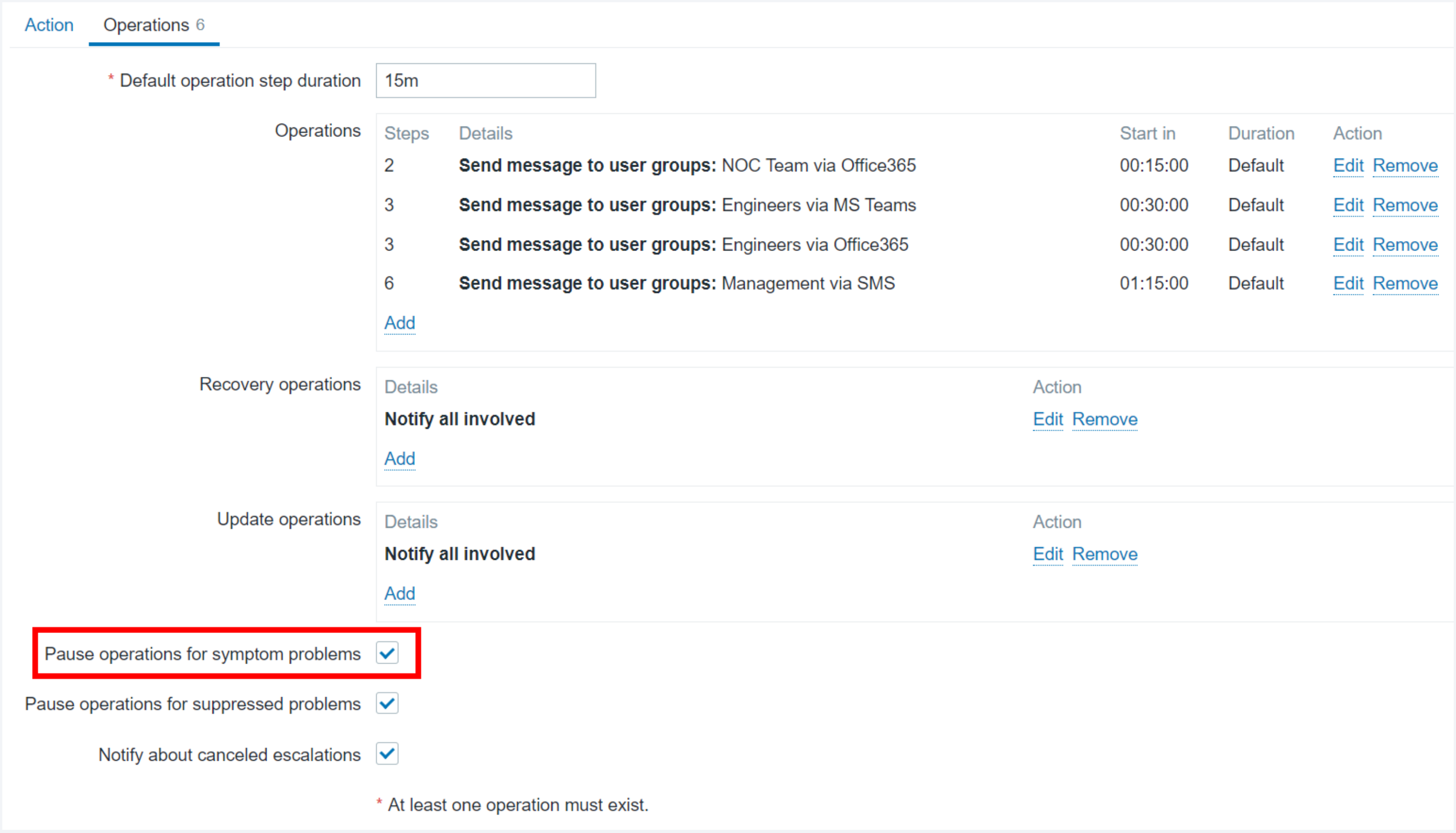
Time	User	User action	Message
2023-03-15 21:41:24	tomas.hermanek@initmax.cz (Tomáš Heřmánek)	↳	

* At least one update operation or message must exist.

ADVANCED PROBLEM DETECTION

Symptom problems – actions

- It is possible to pause operations for symptom problems



Action | Operations 6

* Default operation step duration: 15m

Operations

Steps	Details	Start in	Duration	Action
2	**Send message to user groups:** NOC Team via Office365	00:15:00	Default	Edit Remove
3	**Send message to user groups:** Engineers via MS Teams	00:30:00	Default	Edit Remove
3	**Send message to user groups:** Engineers via Office365	00:30:00	Default	Edit Remove
6	**Send message to user groups:** Management via SMS	01:15:00	Default	Edit Remove

Add

Recovery operations

Details	Action
Notify all involved	Edit Remove

Add

Update operations

Details	Action
Notify all involved	Edit Remove

Add

Pause operations for symptom problems ☑

Pause operations for suppressed problems ☑

Notify about canceled escalations ☑

* At least one operation must exist.

Symptom problems – actions

Multiple new macros have been introduced to present cause events

- Cause event name - {EVENT.CAUSE.NAME}
- Cause event tags - {EVENT.CAUSE.TAGS}
- Cause event severity - {EVENT.CAUSE.SEVERITY
- Cause event status - {EVENT.CAUSE.STATUS}
- Cause event value - {EVENT.CAUSE.VALUE}
- More about new cause macros can be found in documentation https://www.zabbix.com/documentation/6.4/en/manual/appendix/macros/supported_by_location#cause-and-symptom-events

These macros can be used in

- Trigger-based notifications and commands
- Problem update notifications and commands
- Manual event action scripts

ADVANCED PROBLEM DETECTION

Cause and symptom events – API changes

Multiple event related API calls now support filtering by cause and symptom events

- event.get and problem.get – new symptom parameter (true – symptom, false – cause)
- Cause event ID can also be returned in the request response:

```
{
    "jsonrpc": "2.0",
    "result": [
        {
            "eventid": "9695",
            "source": "0",
            "object": "0",
            "objectid": "13926",
            "clock": "1347970410",
            "value": "1",
            "acknowledged": "1",
            "ns": "413316245",
            "name": "MySQL is down",
            "severity": "5",
            "r_eventid": "0",
            "c_eventid": "0",
            "correlationid": "0",
            "userid": "0",
            "cause_eventid": "0",
            …
```

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Demo

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Questions

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