

# Zabbix meets research institute

## Mastering the migration



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Fraunhofer Society

# Fraunhofer Society (German: „Fraunhofer Gesellschaft“) Some background

# Fraunhofer Society - Background

- **Founded in 1949**, the "Fraunhofer Society for the Advancement of Applied Research" (German: „Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V.“) is a German research organization with 75 institutes spread throughout Germany.
- There are also many facilities around the world, e.g. in Africa, Asia, Europe, Middle East, North America and South America.
- The purpose of the association is to conduct **application-oriented research** for the **direct benefit** of companies and for the benefit of society.
- The majority of the organization's 29,000 employees are **qualified scientists and engineers**, who work on an annual research budget of 2.8 billion euros.
- The institutes work in practically **all application-relevant fields of technology**, such as microelectronics, information and communications technology, energy technology, medical technology and more.
- One of the best-known Fraunhofer developments is the MP3 audio data compression method.
- The Fraunhofer Society it is the **biggest organization** for applied research and development services in **Europe**.



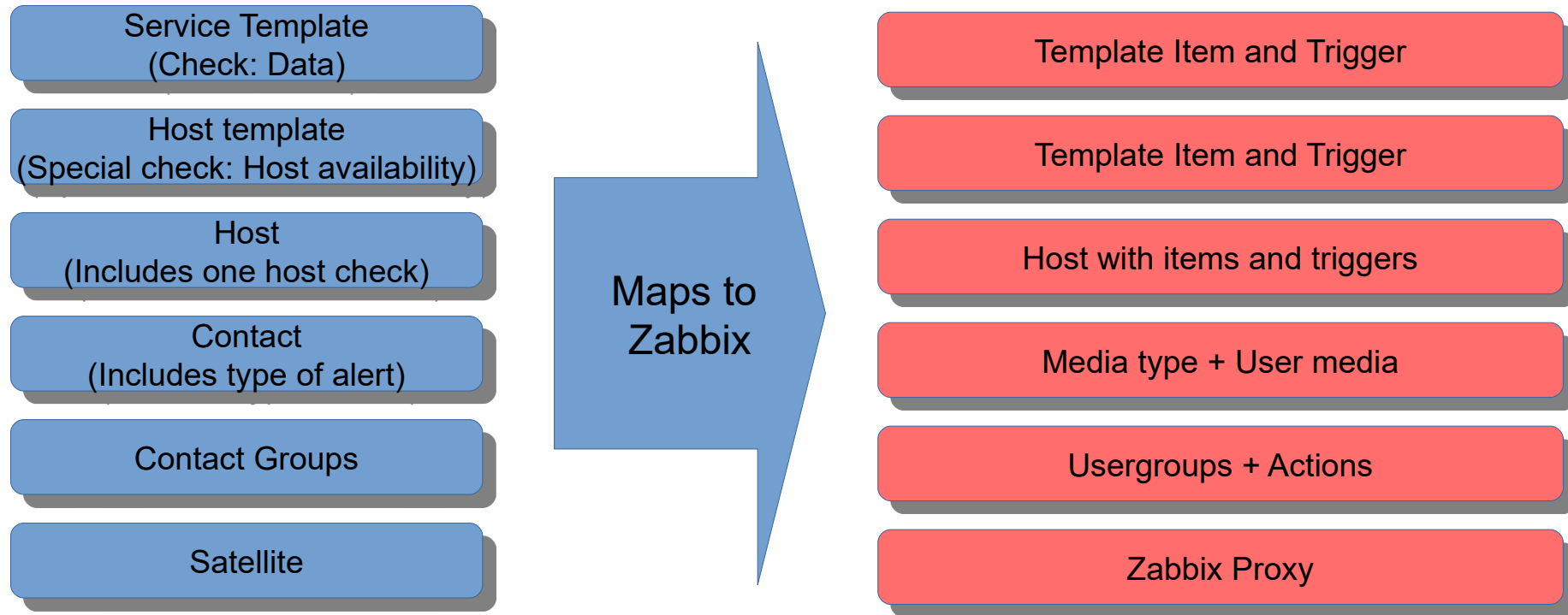
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## Mastering the migration from „openITCOCKPIT“ (using a „Nagios backend“) to Zabbix

A special thanks to Mr. Sebastian Marquardt for the good cooperation!

# Fraunhofer Society – Compare Concepts

Zabbix uses a different approach to data collection, problem analysis and alerting than openITCOCKPIT



There are more entities involved ...

# Fraunhofer Society – Compare Concepts

List of hosts with **host availability status** and details about host availability check

Basic Monitoring

Hosts

Services

Browser

Host Templates

Service Templates

Service Template Grps.

Host Groups

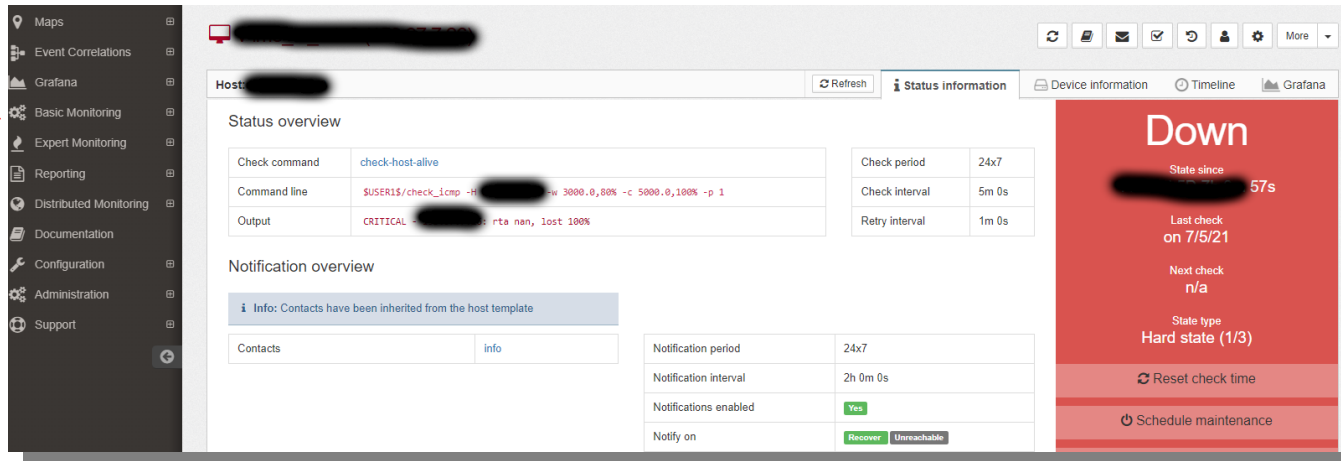
Service Groups

Contacts

Contact Groups

Calendar

Hoststatus					P	Host name	IP address	Last state change	Last check	Host output
<input type="checkbox"/>	<input checked="" type="checkbox"/>				P			09:05:05 - 14.01.2020	11:59:42 - 07.05.2021	CRITICAL lost 100%
<input type="checkbox"/>	<input checked="" type="checkbox"/>				P			12:03:17 - 07.05.2021	12:02:54 - 07.05.2021	CRITICAL lost 100%
<input type="checkbox"/>	<input checked="" type="checkbox"/>				P			10:12:08 - 07.08.2020	12:02:59 - 07.05.2021	CRITICAL rta nan, lost 100%
<input type="checkbox"/>	<input checked="" type="checkbox"/>				P			10:07:34 - 25.02.2020	11:59:07 - 07.05.2021	CRITICAL lost 100%
<input type="checkbox"/>	<input checked="" type="checkbox"/>				P			16:37:13 - 25.02.2020	10:22:11 - 07.05.2021	check_smtp: Invalid hostname/address -



Maps

Event Correlations

Grafana

Basic Monitoring

Expert Monitoring

Reporting

Distributed Monitoring

Documentation

Configuration

Administration

Support

Host: [redacted]

Refresh

Status information

Device information

Timeline

Grafana

Status overview

Check command	check-host-alive
Command line	\$USER1\$check_icmp -H [redacted] -w 3000.0,80% -c 5000.0,100% -p 1
Output	CRITICAL [redacted] rta nan, lost 100%

Check period	24x7
Check interval	5m 0s
Retry interval	1m 0s

Notification overview

Info: Contacts have been inherited from the host template

Contacts	Info
----------	------

Notification period	24x7
Notification interval	2h 0m 0s
Notifications enabled	Yes
Notify on	Recover Unreachable

Down

State since [redacted] 57s

Last check on 7/5/21

Next check n/a

State type Hard state (1/3)

Reset check time

Schedule maintenance

# Fraunhofer Society – Compare Concepts

## Host availability status definition and details about host availability check

Host: [redacted] Refresh Status information

Status overview

Check command	check-host-alive
Command line	\$USER1\$/check_icmp -H [redacted] -w 3000.0,80% -c 5000.0,100% -p 1
Output	CRITICAL - [redacted] : rta nan, lost 100%

Notification overview

Info: Contacts have been inherited from the host template

Contacts	info
Notification period	24x7

Command type

Host check command

check-host-alive

Command line \*

\$USER1\$/check\_icmp -H \$HOSTADDRESS\$ -w \$ARG1\$ -c \$ARG2\$ -p 1

A \$-sign needs to be escaped manually (\\$). Semicolons (;) needs to be defined as user defined macro.  
Nagios supports up to 32 \$ARGx\$ macros (\$ARG1\$ through \$ARG32\$)

Description

# Fraunhofer Society – Compare Concepts

**Service availability status** definition and details about service availability check

Service overview

Active

Not monitored

Disabled

Refresh

Service status

Check command	v2_check_ping
Command line	\$USER1\$/check_ping -H -w 300.0,20% -c 700.0,60% -p 5
Output	PING CRITICAL - Packet loss = 100%
Performance data	rta=700.000000ms;300.000000;700.000000;0.000000 pl=100%;20;60;0

Check period	v2_24x7
Check interval	1m 0s
Retry interval	1m 0s





## Do the work

-

## Migrate host/groups and user/groups

# Fraunhofer Society – Do the work



Migrate existing host/groups, user/groups and keep checks

## Goal

- Export host/groups from openITCOCKPIT and import them into Zabbix.
- Export user/groups and media from openITCOCKPIT and import them into Zabbix.
- Keep information about the checks per host.

## Challenges

- How to get the hosts/groups from openITCOCKPIT?
- How to get the user/groups and media from openITCOCKPIT?
- How to get the information about the checks from openITCOCKPIT and keep them in Zabbix?



# Fraunhofer Society – Do the work



Migrate existing host/groups, user/groups and keep checks

## Approach

- Use openITCOCKPIT REST-API to get information about host/groups (container) and checks.
- Use openITCOCKPIT REST-API to get information about user/groups and media.
- Create entities in Zabbix via Zabbix API, based on JSON output from openITCOCKPIT.
- Store information about checks in the host description field to facilitate template mapping.

Get all hosts: `https://<openITCOCKPIT url>/hosts.json`

Get specific hosts: `https://<openITCOCKPIT url>/hosts/<id>.json`

Get all users: `https://<openITCOCKPIT url>/contacts.json`

Get specific user: `https://<openITCOCKPIT url>/contacts/<id>.json`



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# Fraunhofer Society – Do the work

**Get all hosts:** <https://<openITCOCKPIT url>/hosts.json>

```
{
  "id": "249",
  "uuid": "xxxx-xxxx-xxxx-xxxx-xxxxxxxx",
  "name": "xxxxxxx",
  "description": "xxxxxxx",
  "active_checks_enabled": null,
  "address": "abc.xxxxxx.xyz",
  "satellite_id": "5",
  "container_id": "3",
  "tags": null
},
{
  "id": "337",
  "uuid": "xxxx-xxxx-xxxx-xxxx-xxxxxxxx",
  "name": "xxxxxxx",
  "description": "xxxxxxx",
  "active_checks_enabled": null,
  "address": "abc.xxxxxx.xyz",
  "satellite_id": "2",
  "container_id": "3",
  "tags": null
}
```

Hostname

Hostdescription

Zabbix Proxy

Zabbix Hostgroups



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# Fraunhofer Society – Do the work

**Get all users:** <https://<openITCOCKPIT url>/contacts.json>

```
{
  "id": "135",
  "uuid": "xxxx-xxxx-xxxx-xxxx-xxxxxxxx",
  "name": "xxxxxxx",
  "description": "",
  "email": "abc@xxxxxxxxxxx.xxx",
  "phone": "xxxxxxxx",
  "user_id": "121",
  "host_timeperiod_id": "1",
  "service_timeperiod_id": "1",
  "host_notifications_enabled": "1",
  "service_notifications_enabled": "1",
  "notify_service_recovery": "1",
  "notify_service_warning": "1",
  "notify_service_unknown": "1",
  "notify_service_critical": "1",
  ...
},
{
  ...
}
```

Username

Media Email

Media SMS

Media Severities



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# Fraunhofer Society – Do the work

Result of import via Zabbix API using the JSON output from openITCOCKPIT

\* Host name

Visible name

\* Groups 

ITCockpit

\* Interfaces

Type	IP address	DNS name	Connect to	Port	Default
Agent	<input type="text" value=""/>	<input type="text" value=""/>	<input type="button" value="IP"/> <input checked="" type="button" value="DNS"/>	<input type="text" value="10050"/>	<input checked="" type="radio"/> Remove

[Add](#)

Description Migrated from OpenITCOCKPIT

ID: 1778  
UUID:   
Description: None  
Services:

disk c

\$USER15/check\_npipe -H  -c CheckDriveSize -a ShowAll MinWarnFree=10% MinCritFree=5% Drive=c:

cpuload

\$USER15/check\_npipe -H  -c check\_cpu

service nxlog

\$USER15/check\_npipe -H  -c check\_service -a service=nxlog

memory

\$USER15/check\_npipe -H  -c check\_memory -a type=physical "warn=free<15%" "crit=free<5%"

kerberos

\$USER15/check\_krb5 -H  -realm= -principals= keytab=/usr/lib/krb5/plugins/nagios.keytab --port=88

service salt

\$USER15/check\_npipe -H  -c check\_service -a service=salt-minion

LDAP\_BIND

\$USER15/check\_ldap -H  -b "dc=sit,=de" -D "=users" -s sit,dc==de -P "=E" -S -p 636 -w 10 -c 10 -t 20

Monitored by proxy

Help for  
further  
migration

## Do the work

-

## Migrate checks and templates

# Fraunhofer Society – Do the work



## Migrate checks and templates

### Goal

- Migrate checks and templates to Zabbix.
- Improve monitoring while migrating by utilizing Zabbix features.

### Challenges

- How to create Zabbix templates based on data from openITCOCKPIT?
- How to create Zabbix actions based on data from openITCOCKPIT?
- How to assign created Zabbix templates to hosts based on data from openITCOCKPIT?



# Fraunhofer Society – Do the work



## Migrate checks and templates

### Approach

- Use information in imported hostdescription field.
- Use information from openITCOCKPIT templates.
- Create new Zabbix templates, that at minimum cover what was monitored before.
- Assign templates to hosts. For simple checks do it automatically via Zabbix API.
- Create Zabbix Actions.

Simple checks: ICMP Ping, SSH Service, Telnet Service, SMTP, TCP Checks, HTTP/HTTPS Services.

Any non standard checks: Do it manually, case by case :-)



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# Fraunhofer Society – Do the work

Result of import via Zabbix API + manual linking

All hosts / [redacted] Enabled **ZBX** SNMP JMX IPMI Applications 39 Items 237 Triggers 101 Graphs 56 Discovery rules 4

Host **Templates** IPMI Tags Macros Inventory Encryption

Linked templates

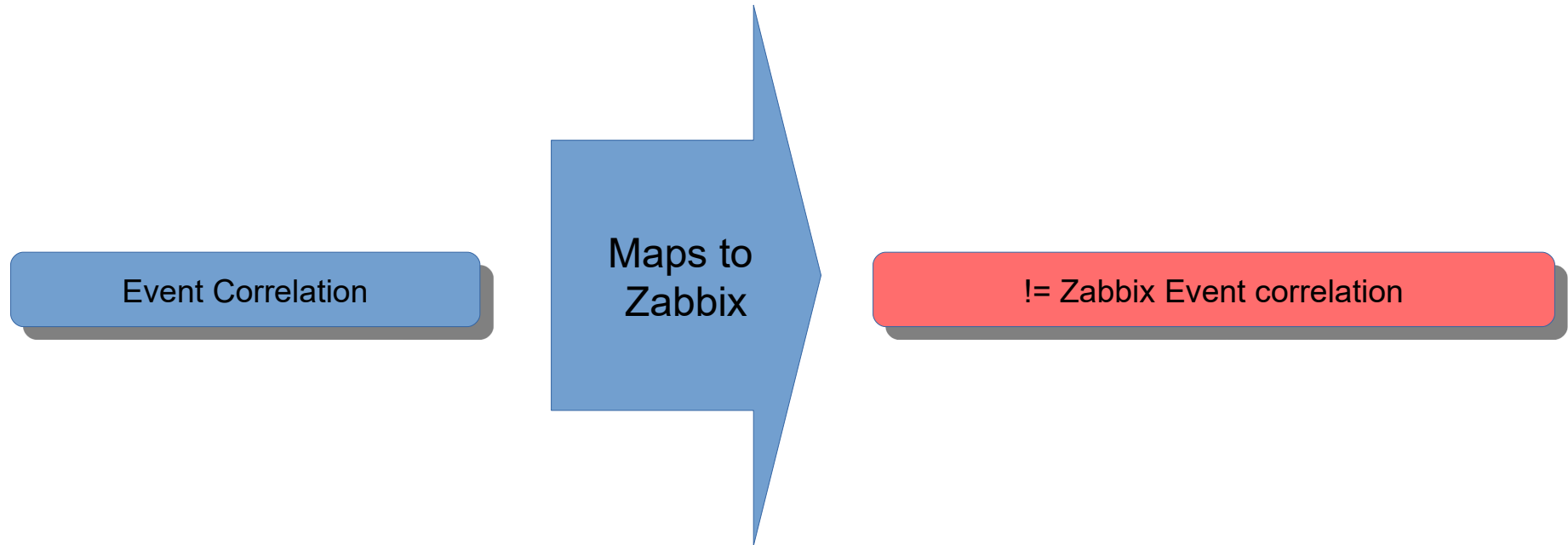
Name	Action
Template App [redacted]	<a href="#">Unlink</a> <a href="#">Unlink and clear</a>
Template APT [redacted]	<a href="#">Unlink</a> <a href="#">Unlink and clear</a>
Template HTTPS [redacted]	<a href="#">Unlink</a> <a href="#">Unlink and clear</a>
Template Module [redacted]	<a href="#">Unlink</a> <a href="#">Unlink and clear</a>
Template Module Linux systemd by Zabbix agent 2	<a href="#">Unlink</a> <a href="#">Unlink and clear</a>
Template OS Linux by Zabbix agent	<a href="#">Unlink</a> <a href="#">Unlink and clear</a>

Link new templates

Do the work  
-  
The challenging part

# Fraunhofer Society – The challenging part

openITCOCKPIT (with additional enterprise modules) has a special feature that Zabbix does not have



# Fraunhofer Society – The challenging part

## Event correlation in openITCOCKPIT

Type to search

- Dashboard
- Maps
- Event Correlations
  - Event Correlations
  - EVC Hosttemplates
  - EVC Servicetemplates
  - Settings
- Grafana
- Basic Monitoring
- Expert Monitoring
- Reporting
- Distributed Monitoring
- Documentation
- Configuration
- Administration

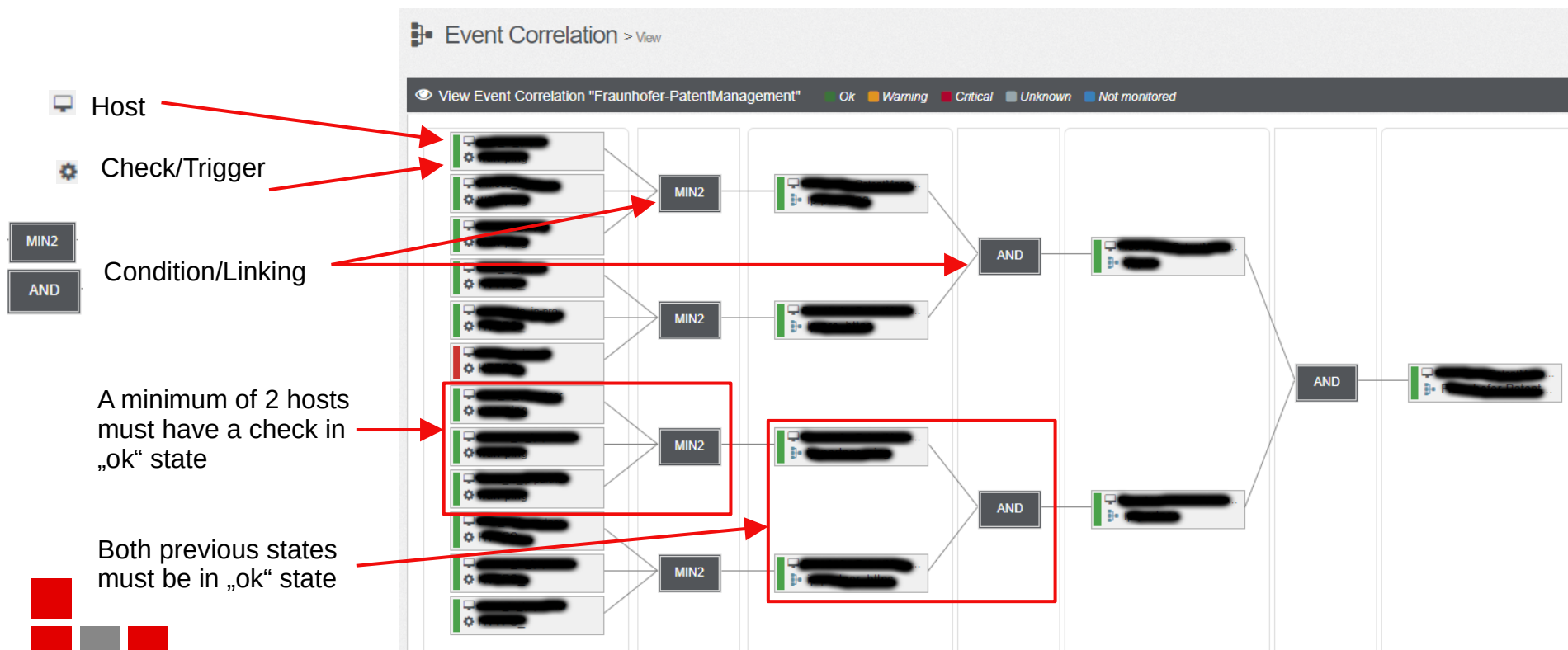
### Event correlation > List

Eventcorrelation name	Eventcorrelation description
-----------------------	------------------------------



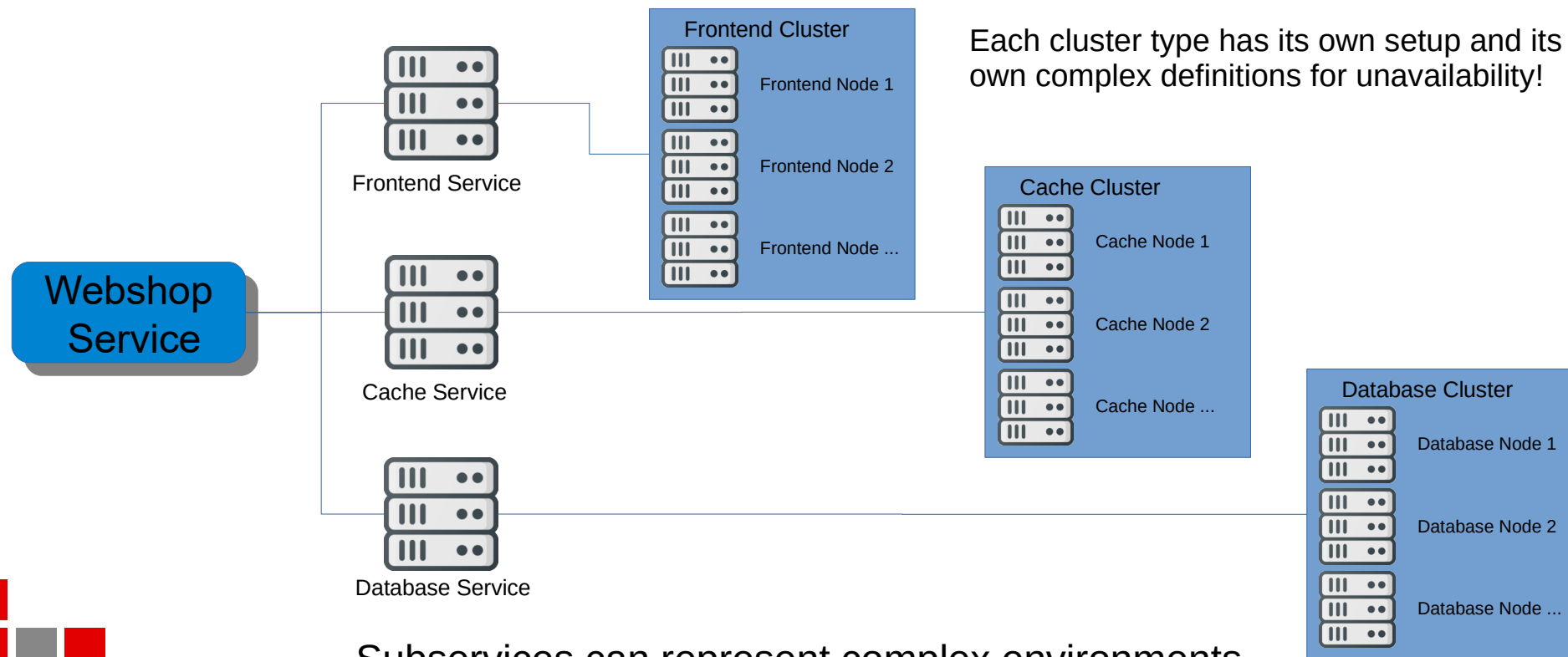
# Fraunhofer Society – The challenging part

Event correlation in openITCOCKPIT, used to create advanced service monitoring



## Event correlation (or better „Advanced Services“) in more detail

# Fraunhofer Society – Advanced Services



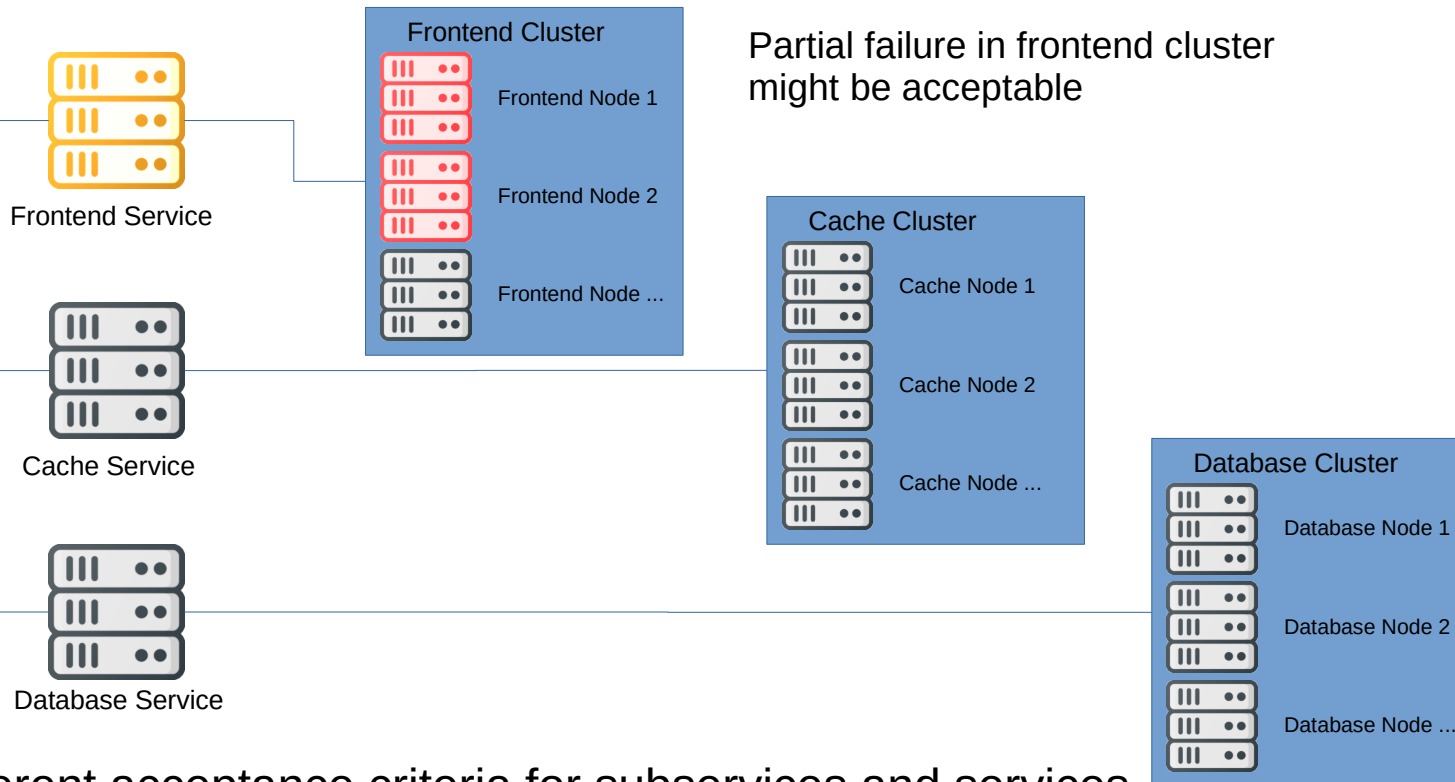
Subservices can represent complex environments



# Fraunhofer Society – Advanced Services

Main Service is working, but subservice shows „warning state“.

**Webshop Service**

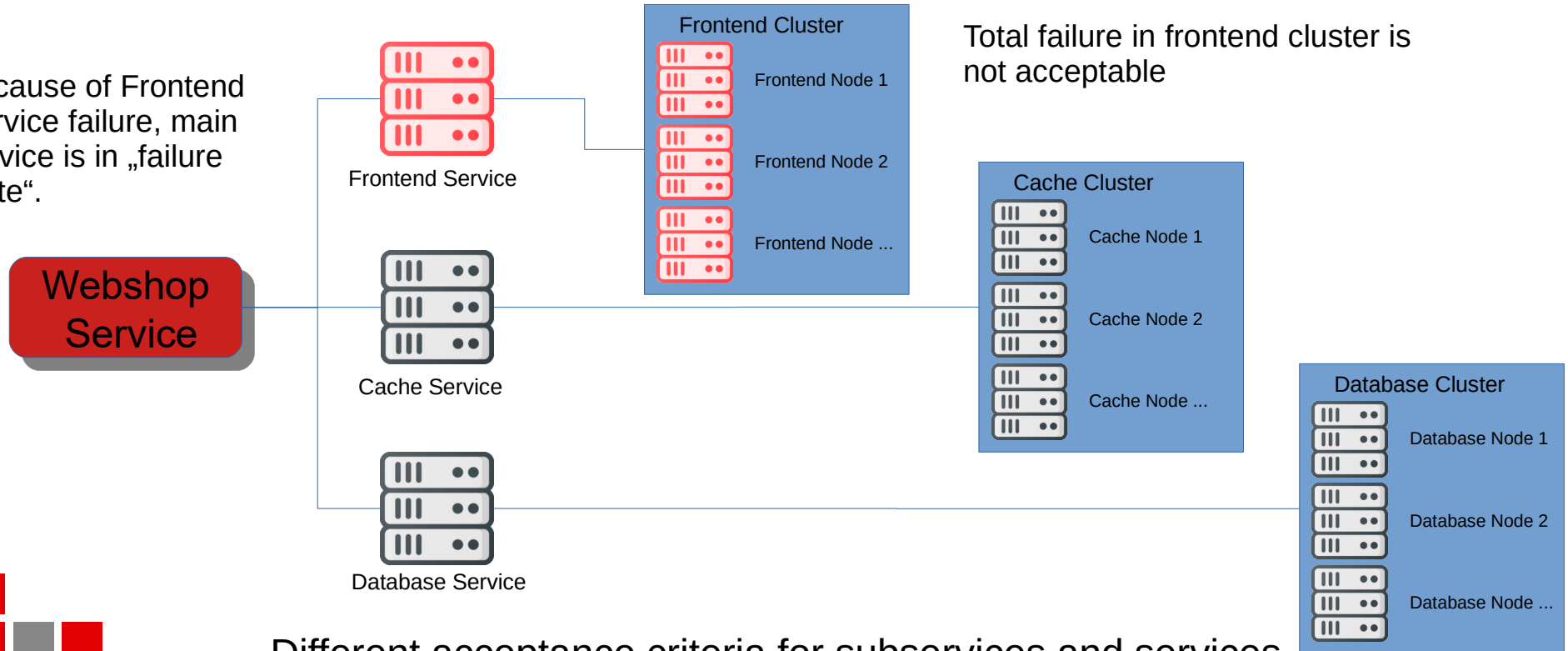


Different acceptance criteria for subservices and services

# Fraunhofer Society – Advanced Services

Because of Frontend Service failure, main service is in „failure state“.

Total failure in frontend cluster is not acceptable

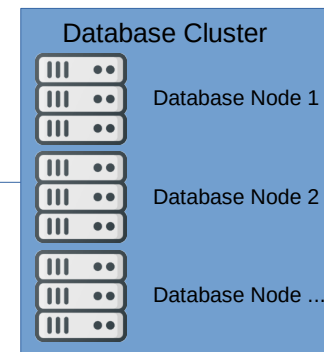
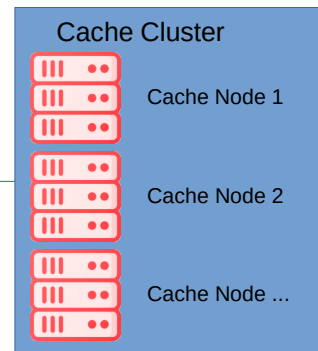
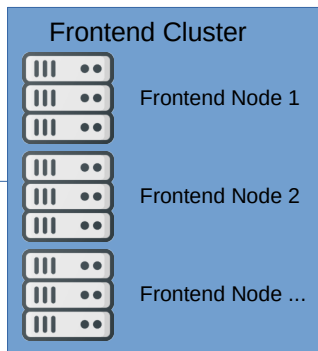
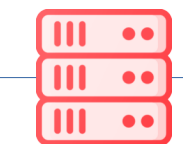
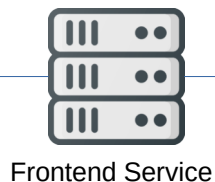


Different acceptance criteria for subservices and services

# Fraunhofer Society – Advanced Services

Because of Cache Service failure, main service is in „warning state“.

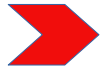
**Webshop Service**



Total failure in cache cluster is acceptable, but service is in warning state

Different acceptance criteria for subservices and services

# Fraunhofer Society – Advanced Services



Create a service modul that mimics openITCOCKPIT's event correlation

## Goal

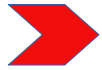
- Mimic the functionality of openITCOCKPIT's event correlation in Zabbix.
- Use the solution to recreate all existing configurations from the openITCOCKPIT installation.
- Develop the solution update safe, without touching the Zabbix source code.
- Be compatible with Zabbix 5.0, 5.2 and 5.4.

## Challenges

- How to integrate into Zabbix (with respect to configuration and visualization)?
- How to make it update safe?



# Fraunhofer Society – Advanced Services



Create a service modul that mimics openITCOCKPIT's event correlation

## Approach

- Use Zabbix host, trigger and services for configuration.
- Use tags to create relations between hosts.
- Develop a backend service that does the heavy lifting, using the Zabbix API.
- Develop a Zabbix frontend module for visualization and configuration to be update safe.
- The frontend module should communicate with the backend service and show relations as flowcharts.

Zabbix frontend module API was introduced in Zabbix 5.0

Zabbix frontend module API != Zabbix JSON-RPC over HTTP API



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## „Advanced Service monitoring“ The solution in Zabbix

# Fraunhofer Society – Implementation

Service KPI's

Service List shows services with issues or misconfiguration  
(Click to open **service flowchart**)

Service List with current states  
(Click to open **service flowchart**)

New Menu Entry to access module

IntelliTrend Advanced Services for Zabbix v1.2.4

Services: No Configuration Issues

Hosts: No Configuration Issues

Triggers: No Configuration Issues

Tag Names: Host: SvcMonHost, Item: SvcMonKey, Limit: IasVLimit

Services with unsupported items

Service	Services	Triggers	Items	Hosts
1.) [redacted]	4	19	3	11

Services

Service	Services	Triggers	Items	Hosts
1.) [redacted]	3	20	6	7
2.) [redacted]	1	10	1	4
3.) [redacted]	1	7	1	3

Modules

Filter

Name	Version	Author	Description	Status
Advanced Services Module	1.2.4	Wolfgang Alper	Advanced service monitoring with Zabbix.	Enabled

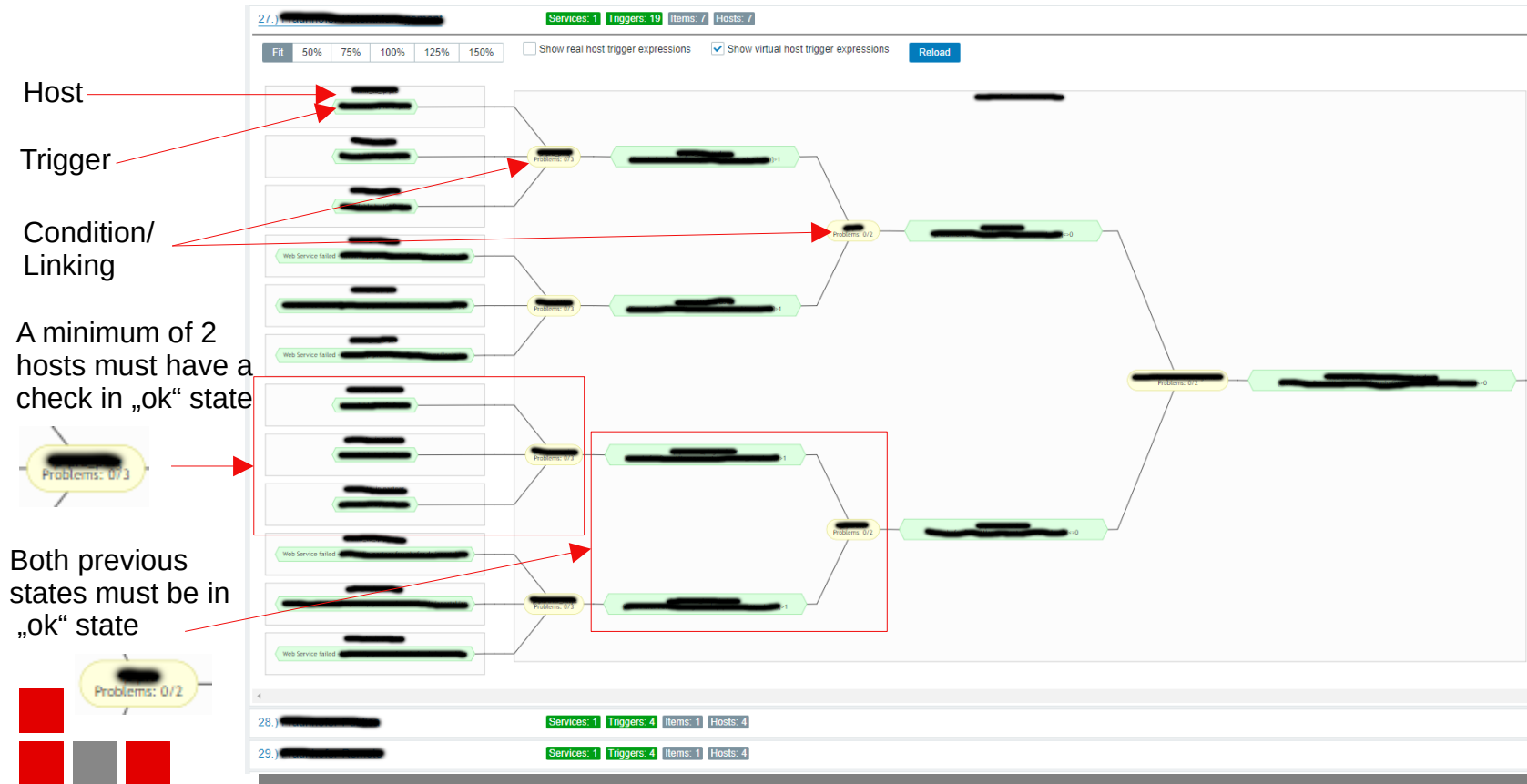
Displaying 1 of 1 found

New frontend module using frontend API



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# Fraunhofer Society – Implementation



Flowchart **renders in realtime** from actual Zabbix configuration

Flowchart **shows involved entities** like hosts, items, triggers and services

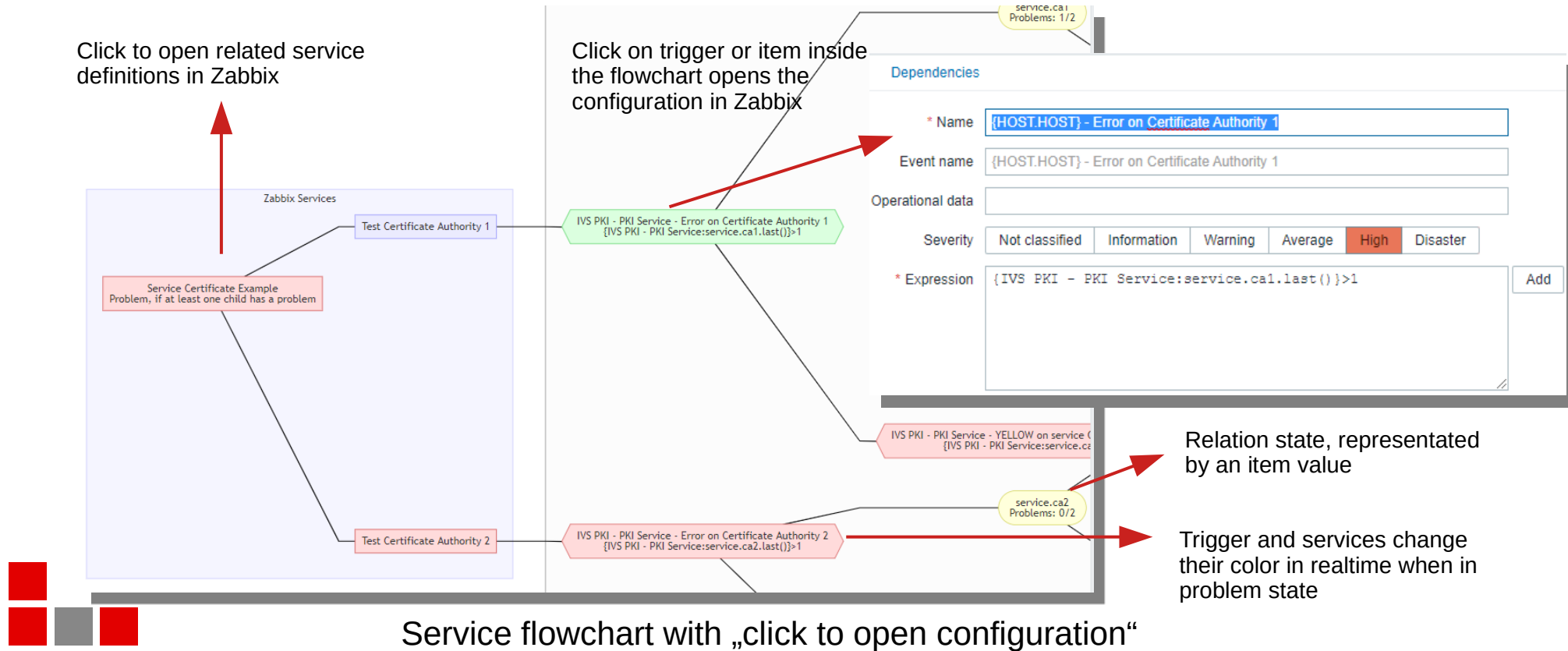
**Zoom** buttons allow to Zoom in/out **without page reload**

**Stats** show number of entities involved, including their **current state**

**Any entity is clickable** and opens the corresponding Zabbix configuration



# Fraunhofer Society – Design with demo data



# Zabbix meets research institute

## Mastering the migration

Thank You!



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