Fault tolerance and lessons with Zabbix

Rights and Wrongs while building and operating a large, multi datacenter, Zabbix environment focusing on open-source software.

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Project Goal

Maximum amount of availability depends on:

- **Uncompromised access**
- **Data duplication**
- **Multi component ability**
- **Server duplication**
- **Methodology of Failover and Failback**
- **Speed in communication**
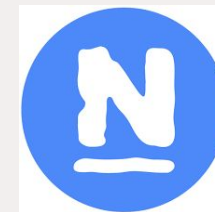
99.99% Uptime seems attainable!
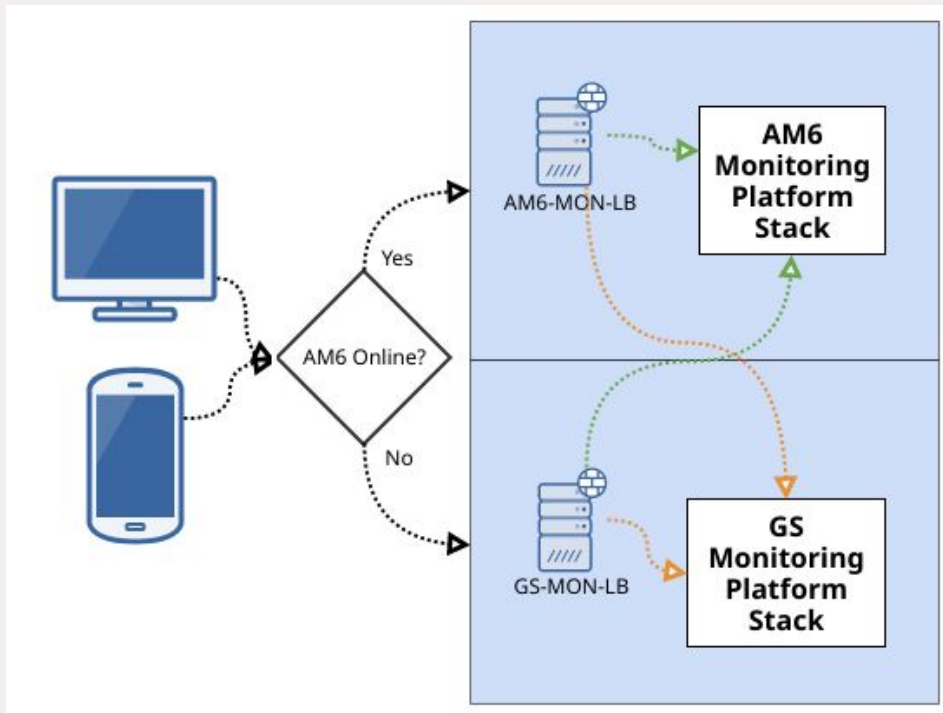
What Should (not) Happen?

Basic Discovery Phase:

- **No Standards**
- **Zabbix, Nagios, PRTG, AWS, Azure, Custom, Others**
- **No Framework (Ticketing, Notification)**
- **Continuity**
- **Centralization**

- **> 4.500 Hosts**
- **> 650.000 Items**
- **> 3TB Year**
- **> 250 Users**

Wishing / Targeting Phase

- **Let's do something fresh!**
- **Contains all the features everybody uses!**
- **Most Open-source as possible!**
- **Multi Datacenter is a MUST**
- **Multi Active Databases for failover**
- **How to keep 10 years of data?**
- **Notifications to multiple systems?**
- **Metrics from everything off the operations**
- **Dashboarding is never too much!**
- **Elasticsearch and Grafana on the mix**
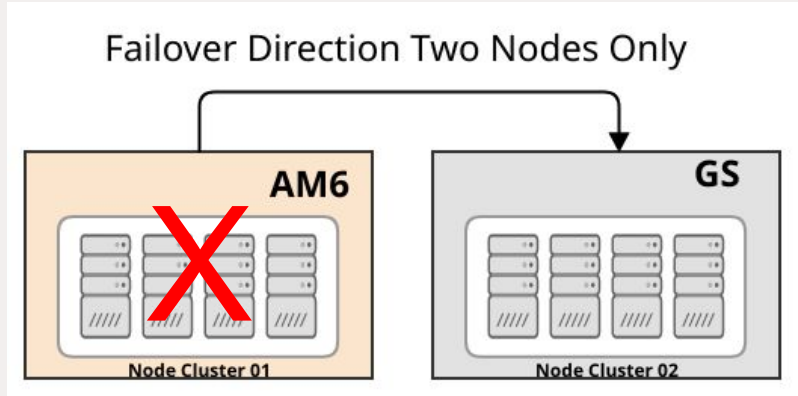- **In-House integration tooling**
- **Automation**

Elasticsearch as "Storage"
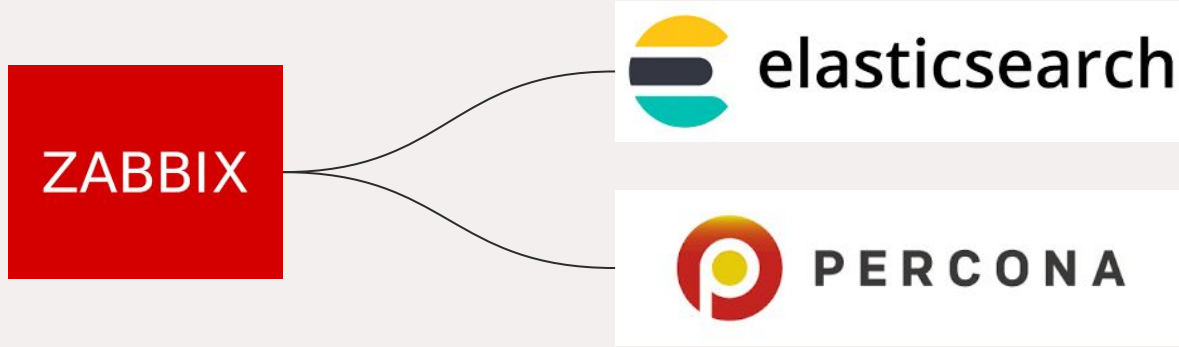
Testing Zabbix against Elasticsearch and Mysql is a breeze -- but there are limitations and broken promises

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The plan on Storage and Failover

One server in each datacenter - Failover Remotely

MySQL Percona Active/Active and Elasticsearch in a Cross Datacenter Setup is feasible

If DC AM6 is considered DEAD

External mechanisms should recognize the death

Point clients from the system to a second DC

The plan on Storage and Failover

Two servers in each datacenter - Failover Local then Remotely
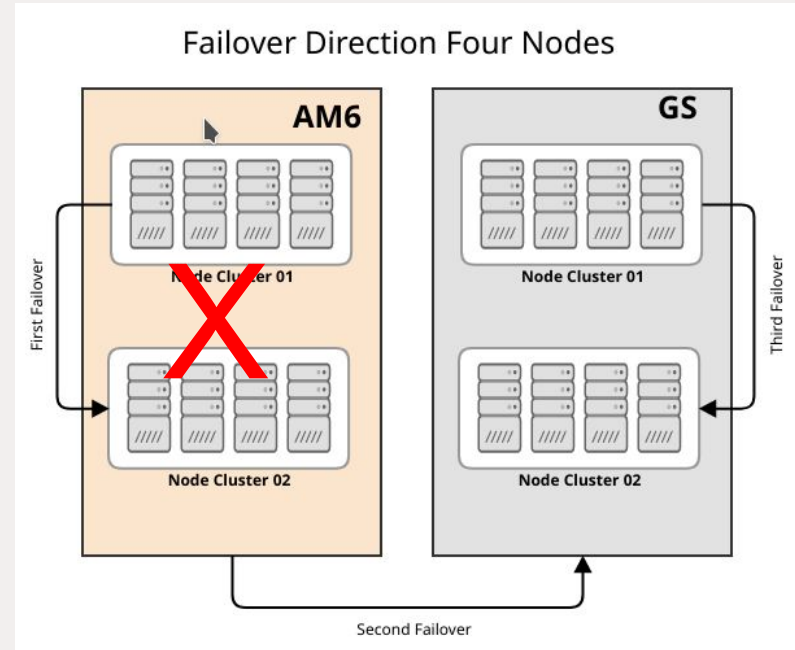
MySQL Percona Active/Active and Elasticsearch in a Cross Datacenter Setup is feasible

Server 01 on AM6 dies, server 02 assumes

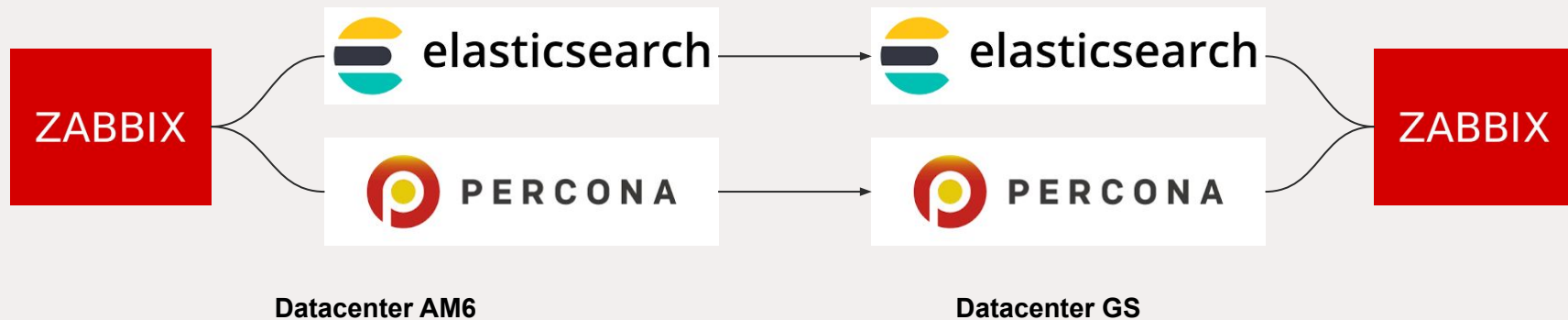**Whole AM6 is unavailable, next DC assumes**

Internal framework see changes locally

External framework see changes globally

Failover Direction Four Nodes

Data "Independency"

Datacenter AM6

Datacenter GS

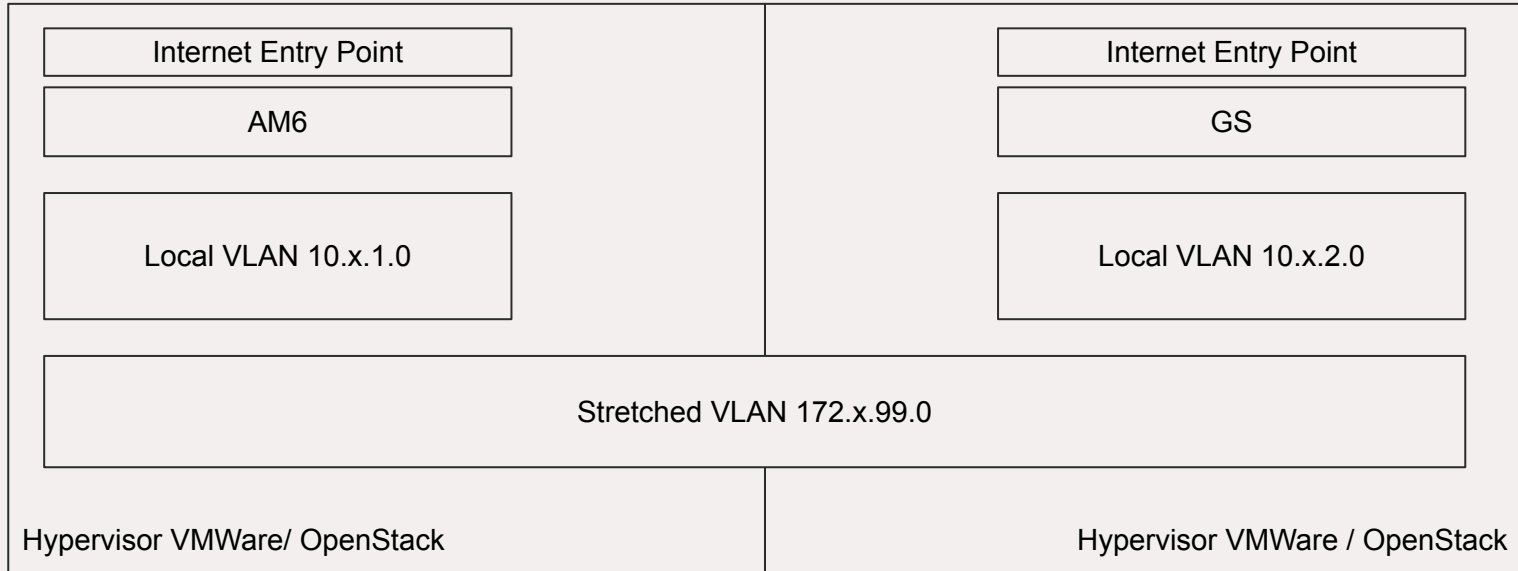When catastrophe strikes one should be able to continue without the other and re-synchronization should be easy

Final Setup per DC - Networking

Internet Entry Point	Internet Entry Point
AM6	GS
Local VLAN 10.x.1.0	Local VLAN 10.x.2.0

Stretched VLAN 172.x.99.0

Hypervisor VMWare/ OpenStack	Hypervisor VMWare / OpenStack

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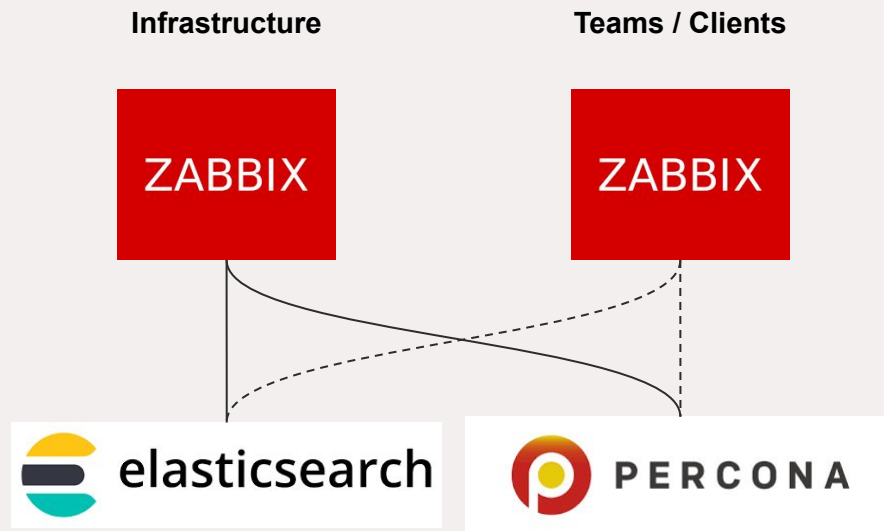
Final Setup per DC - Zabbix

Zabbix Mysql CFG accepts:
- Custom MySQL DB names
- Custom Ports
- Custom Hosts

Zabbix Elasticsearch accepts:
- Only one server, one index

Two Zabbix Servers should be running per Datacenter -- One for Infra and one for Clients / Teams of operations

Infrastructure

Teams / Clients

ZABBIX

ZABBIX

elasticsearch

PERCONA

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Elasticsearch Framework Fix

Infrastructure

ZABBIX

something-uint-dd-mm-yyyy

Teams / Clients

ZABBIX

another-uint-dd-mm-yyyy

elasticsearch

PATCH: https://support.zabbix.com/browse/**ZBXNEXT-4968**

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Elasticsearch Problems

Zabbix Server Error Log

```
14661:20190308:092001.514 cannot get values from elasticsearch, HTTP status code:503
14679:20190308:092032.654 cannot get values from elasticsearch, HTTP status code:429
14709:20190308:092037.705 cannot get values from elasticsearch, HTTP status code:404
```

Unrecoverable errors
503 = Service Unavailable
429 = Too Many Requests

Recoverable Errors
404 = Not Found
400 = Bad Request

Elasticsearch Problems

Elasticsearch Error Log

```
failed to execute bulk item (index) index
source[{"itemid":27534,"ns":397382014,"clock":15546731
34,"value":"18446744073709551615","ttl":604800}]}
```

Elasticsearch CFG Update

Error 400 Fix

http.max_initial_line_length: 16kb

Defaults to 4kb

Header tweaks also might help

DELETE
/_search/scroll/DnF1ZXJ5VGhlbkZldGNoBQAAAAABhkGqFmJ5Vm1xLXpOU
WYteEJzeE1iWjk2MUEAAAAAAjqF4hZCWkhadGlZcVRwNmFreFluR1VfRzZ3A
AAAAAGGQasWYnlWbXEtek5RZi14QnN4TWJaOTYxQQAAAAAC_fPCFmRIam
RiU083U0N1UFp1M0tISUpvNEEAAAAAAgNDERZXdjYzaVFlZFRfTzFOelRyeW
dFY2dB HTTP/1.1
Host: 172.27.84.10:9200
Accept: */*
Content-Type: application/json
Content-Length: -1
Expect: 100-continue

HTTP/1.0 400 Bad request
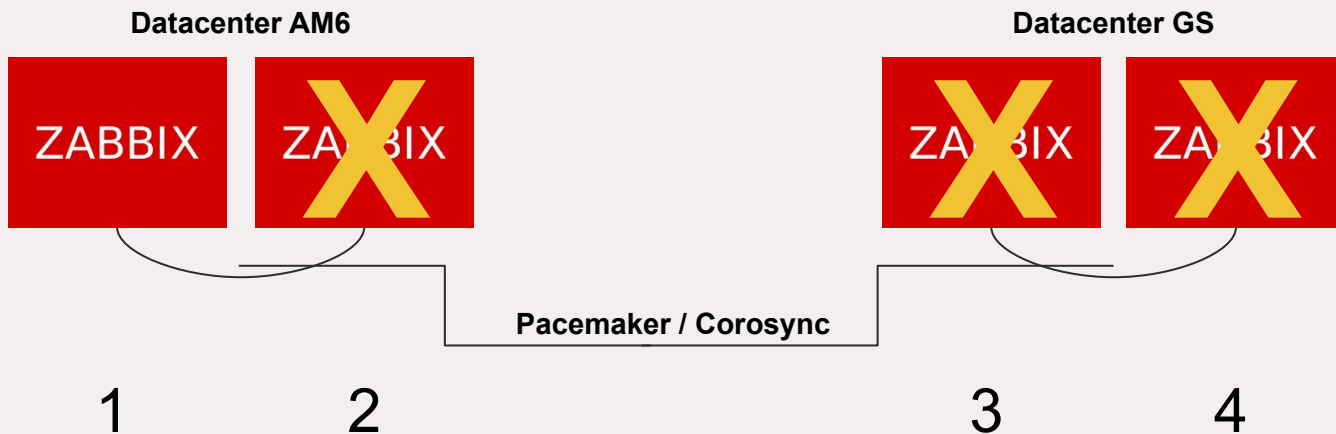Cache-Control: no-cache
Connection: close
Content-Type: text/html

<html><body><h1>400 Bad request</h1>
Your browser sent an invalid request.
</body></html>

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PaceMaker, Only One Server Please

Datacenter AM6

Datacenter GS

ZABBIX   ZABBIX   ZABBIX   ZABBIX

Pacemaker / Corosync

1   2   3   4

Zabbix Servers in standby cannot run simultaneously, or they will "corrupt" data and create confusion

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Multiple Front End / Same Server

infra-monitor

global-monitor

HA PROXY
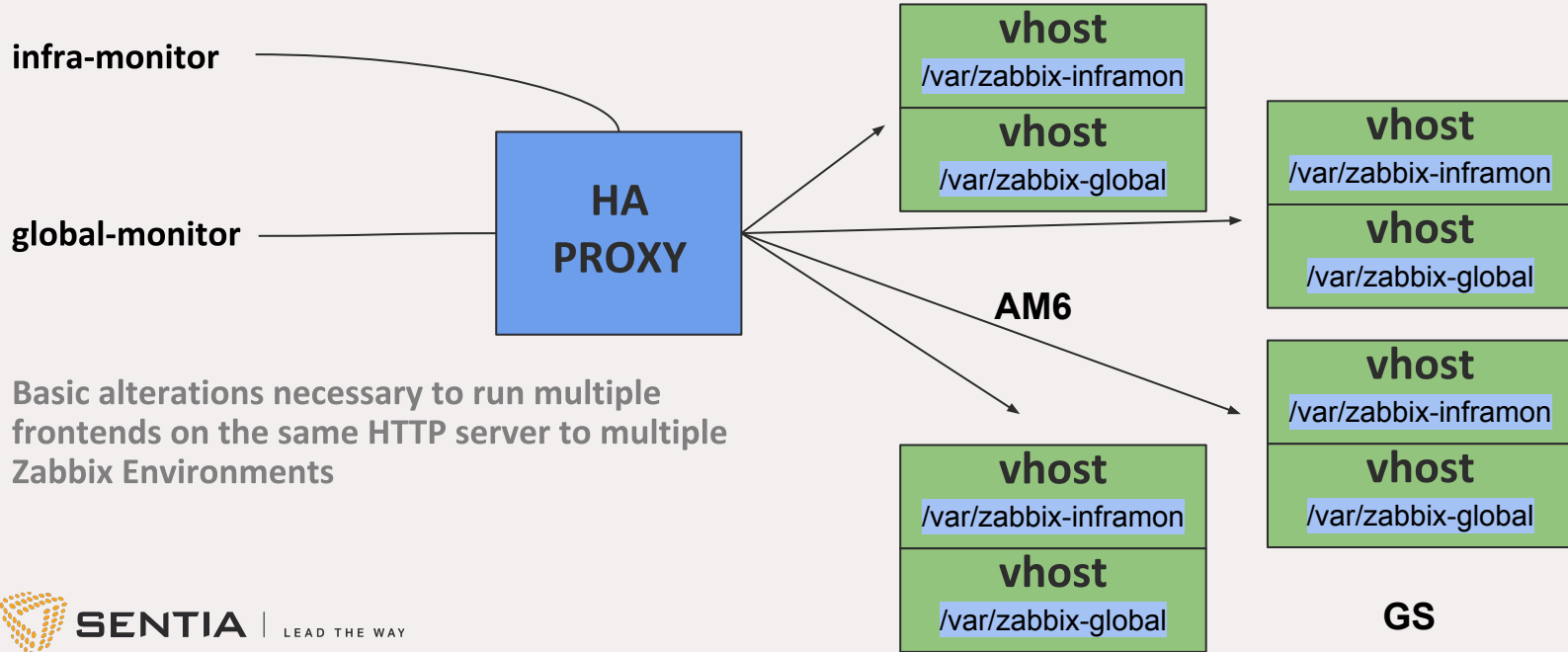
Basic alterations necessary to run multiple frontends on the same HTTP server to multiple Zabbix Environments

vhost
/var/zabbix-inframon

vhost
/var/zabbix-global

AM6

vhost
/var/zabbix-inframon

vhost
/var/zabbix-global

vhost
/var/zabbix-inframon

vhost
/var/zabbix-global

vhost
/var/zabbix-inframon

vhost
/var/zabbix-global

GS

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Zabbix Front End Changes v:4.0.3

PHP FE: cp /usr/share/zabbix/ /usr/share/zabbix-infra/

CFG: cp /etc/zabbix /etc/zabbix-infra

edit **include/classes/core/ZBase.php:276**

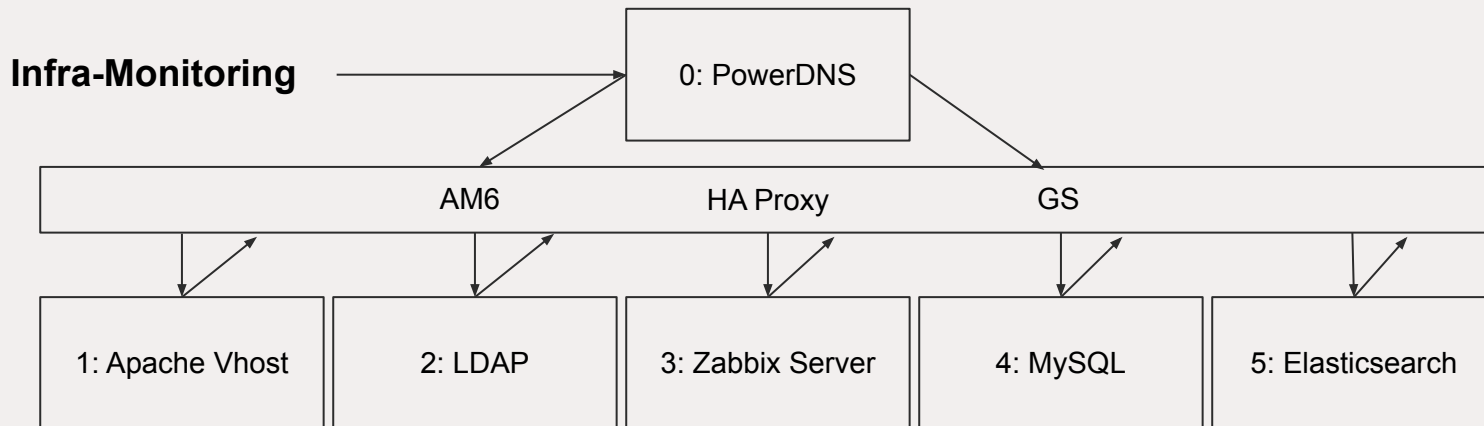path to maintenance.php -- /etc/zabbix-infra/

edit **include/classes/core/CConfigFile.php:27**

path to zabbix.conf.php -- /etc/zabbix-infra/

CFG File excerpts:

```
global $DB, $HISTORY, $HISTORY_PREFIX;
$DB['DATABASE']              = 'zabbix_infra';
$ZBX_SERVER            = '172.27.84.10'; // haproxy
$HISTORY['url']   = [
        'uint' => 'http://172.27.84.10:9200',
        'dbl' => 'http://172.27.84.10:9200',
        'str' => 'http://172.27.84.10:9200',
        'log' => 'http://172.27.84.10:9200',
        'text' => 'http://172.27.84.10:9200'
];
// Value types stored in Elasticsearch.
$HISTORY['types'] = ['uint', 'dbl', 'str', 'log', 'text'];
$HISTORY_PREFIX='infra'; //  **## SENTIA PATCH ONLY ##**
```

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Front End Access Layer

Infra-Monitoring → 0: PowerDNS

AM6   HA Proxy   GS

1: Apache Vhost | 2: LDAP | 3: Zabbix Server | 4: MySQL | 5: Elasticsearch

Apache VHost configuration has no secrets, but HA Proxy
becomes the basic layer in between everything

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PowerDNS with LUA

```
User / Proxies
      |
   Monitor-
   URI UP
   /      \
 AM6       GS
```
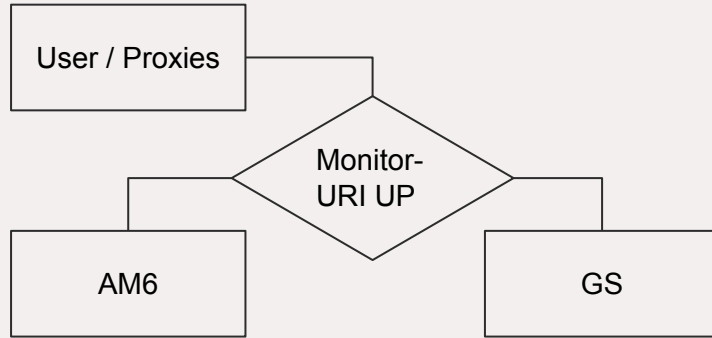
inframon-sentia.net   1   IN   LUA   A
 "ifurlup('https://infra-monitoring/site-alive', {
   {'185.133.296.111'}, {'213.264.142.222'}
 })"

Notes on External DNS failover:
- DNS should be **outside** of both DCs
- Test **monitor-uri** technique from haproxy
- **ifurlup** have orderable targets

Notes on Internal DNS failover:
- DNS Should be **Internal** on both DCs
- **Same monitor-uri** component as test source
- Pointing to **internal addresses** for sync

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MySQL Percona Active/Passive/Slave

Active/Active

Active/Passive

Active/Slave
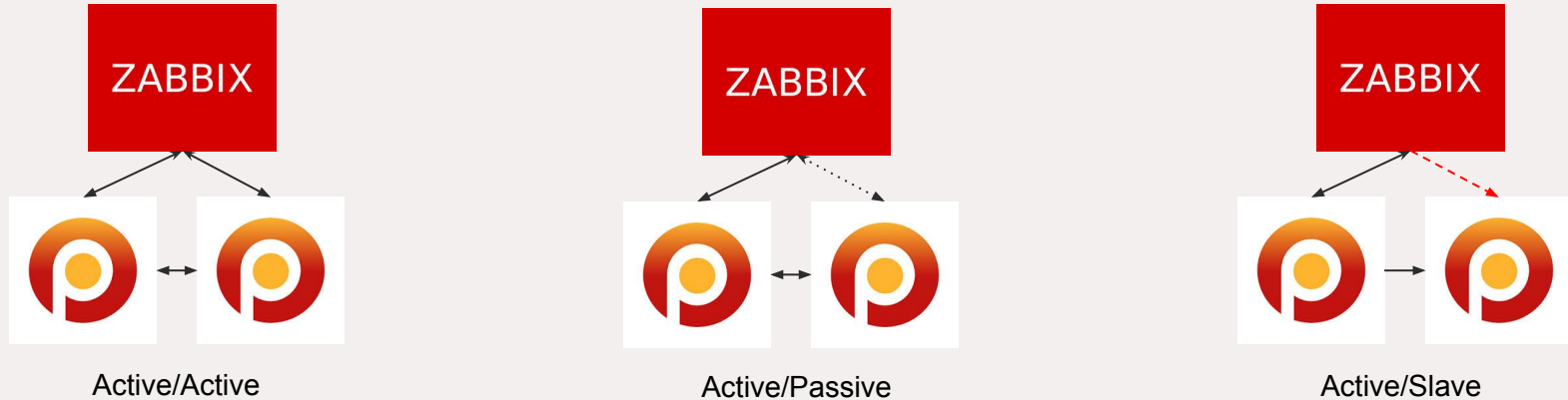
The more automatic the better, if no manual action required is perfect.

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MySQL Percona XTraDB Problems

General Notes:
- **Multi Database write is not an advantage**
- **Async failures stop the whole cluster**

What can be a problem?
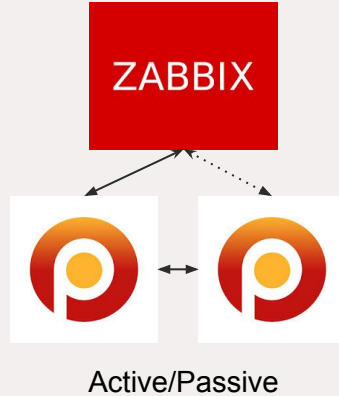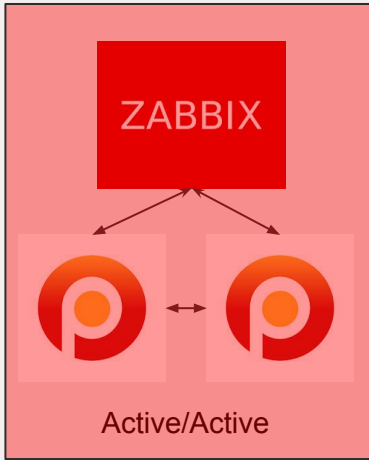- **Disk Speed**
- **Data Volume**
- **Latency**

2019-03-21T01:01:38.719314Z 8 [Note] InnoDB: **BF-BF X lock conflict**,mode: 1027 supremum: 0
2019-03-21T01:01:38.719325Z 8 [Note] InnoDB: conflicts states: my: 0 locked: 0
RECORD LOCKS space id 951 page no 459 n bits 152 index PRIMARY of table **`zabbix_infra`.`problem`** trx id 9444233 lock_mode X locks rec but not gap
2019-03-21T01:01:38.719356Z 8 [ERROR] Slave SQL: Could not execute **Delete_rows event on table zabbix_infra.problem; Can't find record in 'problem', Error_code: 1032; handler error HA_ERR_KEY_NOT_FOUND;** the event's master log FIRST, end_l og_pos 8314, Error_code: 1032

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Other Observations

- **Percona Requires an Arbiter, one per datacenter, in a second Pacemaker cluster**
- **Pacemaker can run stretching both Datacenters or two separated Pacemaker clusters controlled by a Booth Cluster Ticket Manager**
- **Elasticsearch can run in CCS (Cross Cluster) or if the latency is very very low, one cluster can be stretched**
- **Kibana, Grafana, Zabbix FE, other web services can run all from the same servers as multiple instances**
- **All the communication for the internal components are only done via the stretched VLAN**
- **Servers and Configurations can be all deployed using Ansible**
- **MySQL load balancing via haproxy requires advanced techniques for node availability checks**
- **Ingestion pipelines can help on new methods of indices rotation**
- **Grafana has compatibility problems with Elasticsearch**

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Migration steps for our case

Export configurations from client / group

Import / Test all the configuration on the new server

Proxy configuration to new destination

Notification tests ACL Cascading Harmonization

First Steps

Connectivity

No historical data

Observation

Preparation

Firewalls

Manual work

Finalization

Conclusions

- **Multi Datacenter is feasible and works!**
- **Elasticsearch may be better to environments with less volume of data (up to 4.0.x)**
- **Active / Active with Percona is promising but not perfect, difficult to say where the problem really comes from**
- **With the multiple different forms of implicitly changing the configuration, this setup can have multiple forms of failback… If one scenario doesn't work for you, small changes can be done to recover from architecture failures**
- **Increasing all proxy buffers will guarantee to avoid data loss with changes on the server, failing over or doing changes for updates and unforeseen load changes**
- **Keeping each DC as much independent as possible the better**

THANK YOU