

Production troubleshooting

when every incident becomes an investigation!



France DevOps

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Preamble



git commit



git push →



2 objectives

Mission 1:

“You must be able to do RUN in 3 months’ time”

Mission 2:

“You’re to join the night/weekend on-call rotation 2 months later”



RUN ?

RUN

BUILD

Development

New features

Infrastructure

RUN

maintenance

operation



systems in production

" Daytime on-call "

My first incidents

Incident



Project A



Project B



Project C



Project D



Project E



Project F



Project G



Project H



Project I



Project J



Project K



Project L



Project M

Incident



Project N



Project O



Project P



Project Q

Incident



Project R



Project S



Project T



Project U



Project V



Project W

Incident



Project X



Project Y



Project Z



Project AA



Project AZ



Project AE

Incident



Project AR



Project AT



Project AY



How?

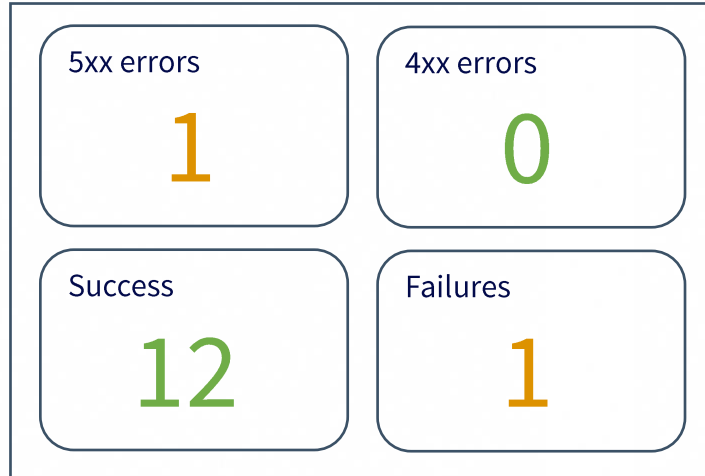


Morning check

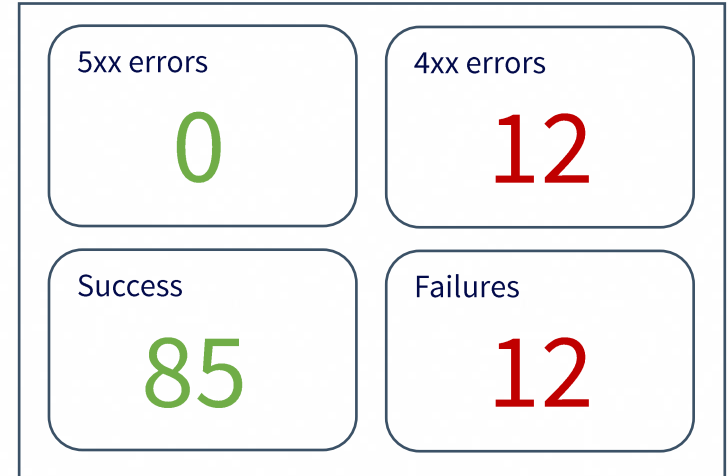
Project A



Project B



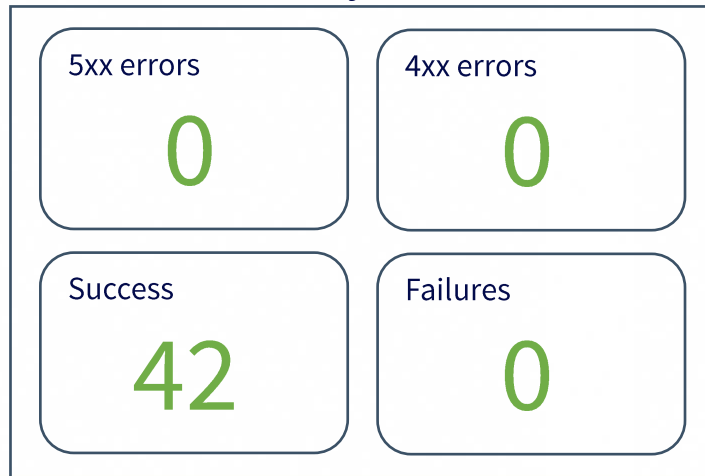
Project C



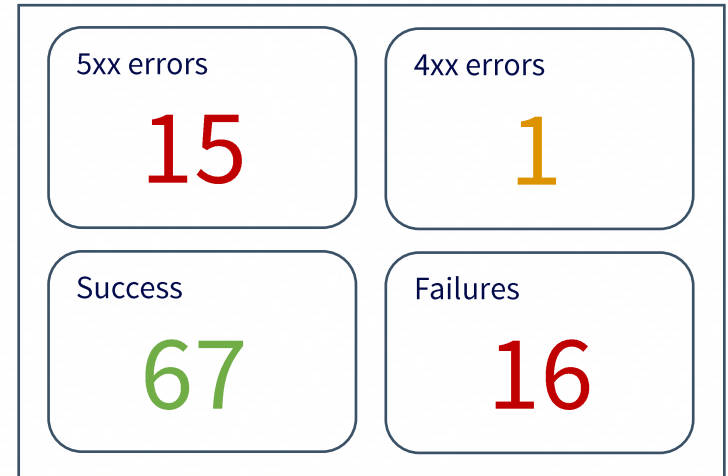
Project D




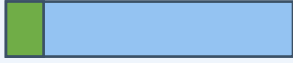
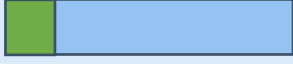


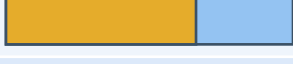


Project E



Project F



Monitor tickets

Affected Item	Log	Date	Priority	Time to resolve
Project A	[project-a] 4xx error	2024-02-02 05:38:01	P5	
Project B	[...] 4xx error	2024-02-02 05:39:04	P4	
Project C	[...] 4xx error	2024-02-02 05:39:06	P5	
Project A	[...] 5xx error	2024-02-02 06:40:12	P5	
Project M	[...] 5xx error	2024-02-02 10:36:02	P5	
Project B	[...] 4xx error	2024-02-02 10:42:08	P3	
Project L	[...] 4xx error	2024-02-02 11:38:06	P5	
Project W	[...] 4xx error	2024-02-02 11:40:45	P5	

Incidents

TTA

Time To Acknowledge



Inform that you are on it

TRS

Time to Restore Service



Contextualization

Troubleshooting

Resolution

Priority

P1

P2

P3

P4

P5

Monitor tickets

Affected Item	Log	Date	Priority	Time to resolve
Project A	[project-a] 4xx error	2024-02-02 05:38:01	P5	
Project B	[...] 4xx error	2024-02-02 05:39:04	P4	
Project C	[...] 4xx error	2024-02-02 05:39:06	P5	
Project A	[...] 5xx error	2024-02-02 06:40:12	P5	
Project M	[...] 5xx error	2024-02-02 10:36:02	P5	
Project B	[...] 4xx error	2024-02-02 10:42:08	P3	
Project L	[...] 4xx error	2024-02-02 11:38:06	P5	
Project W	[...] 4xx error	2024-02-02 11:40:45	P5	
Project S	[...] 5xx error	2024-02-02 12:08:29	P2	

RUN

Be the point of contact
of your team

Troubleshooting



Incident ticket

Affected Item

Project A

Priority

P5

Assignment group

My Team

Assigned to

Seb Ferrer

Short description

[project-a] creating user: ErrValidator: POST /rest/my-api: 403 ...

Description

...

Notes

...

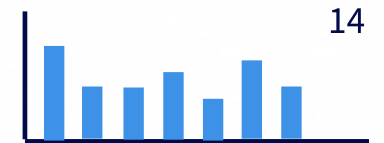
Acknowledged 02/02/2024 – 08:33:04

Created 02/02/2024 – 08:32:44

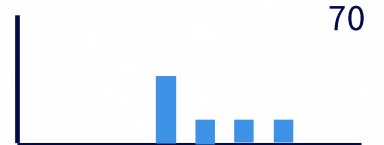


Alert manager

Last 24 hours



Last 30 days



Stack trace

Troubleshooting



Log system



Search in the last 2 days



Project A



message: "creating user" AND operation: "createUser"

timestamp	message
2024-02-02 08:34:12.548951 +02:00	creating user: ErrValidator: ...
2024-02-02 08:34:01.548951 +02:00	creating user: ErrValidator: ...
2024-02-02 08:33:36.548951 +02:00	creating user: ErrValidator: ...
2024-02-02 08:33:24.548951 +02:00	creating user: ErrValidator: ...
2024-02-02 08:33:04.548951 +02:00	creating user: ErrValidator: ...
2024-02-02 08:32:44.548951 +02:00	creating user: ErrValidator: ...



Monitoring

Last 24 hours

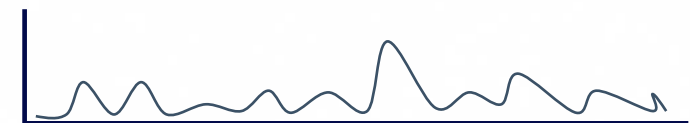
Restarts



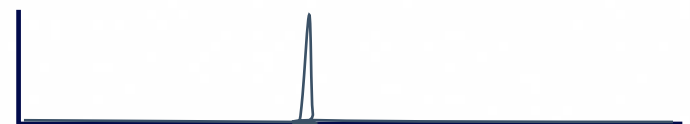
Uptime

28 days ago

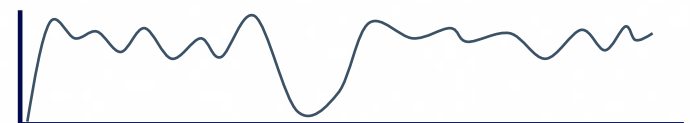
HTTP 4xx errors



HTTP 5xx errors



Nb issues created



Troubleshooting

history-based method



Fast
Someone has surely already met this error
Reducing learning curve



Limited to known issues
May be misleading
Less learning

Bottom-up



Thorough
Helps identify the root cause
Better understanding of the project

Drill down



Time-consuming
Risk of following a wrong path

Troubleshooting

Root Cause Analysis (RCA)



Troubleshooting

Ask yourself the right question

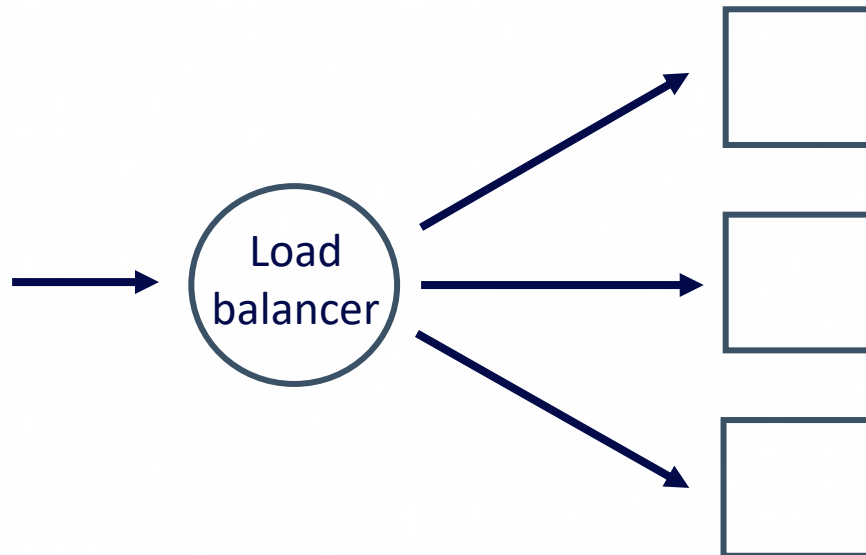
What problem am I trying to solve?



Troubleshooting – Case 1

Problem: Website very slow

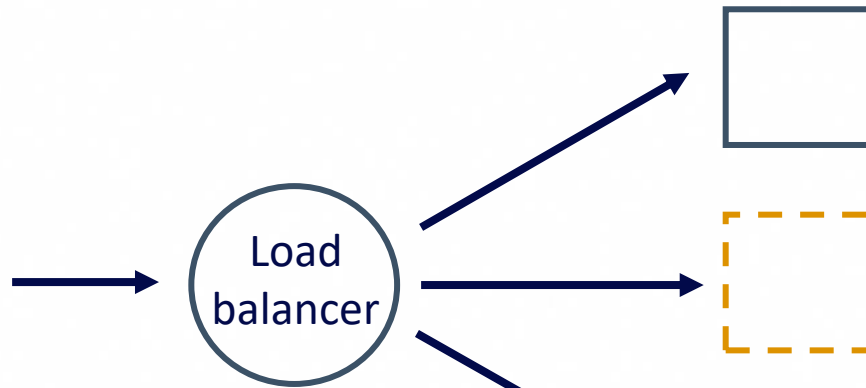
Issue:



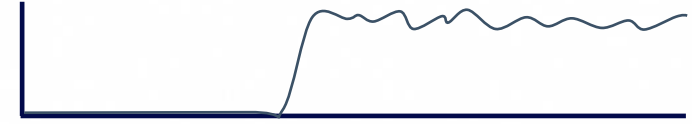
Troubleshooting - Case 1

Problem: Website very slow

Issue:



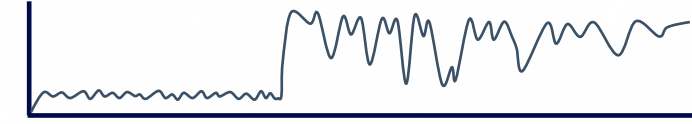
HTTP 5xx errors



HTTP 200



Latency



Message

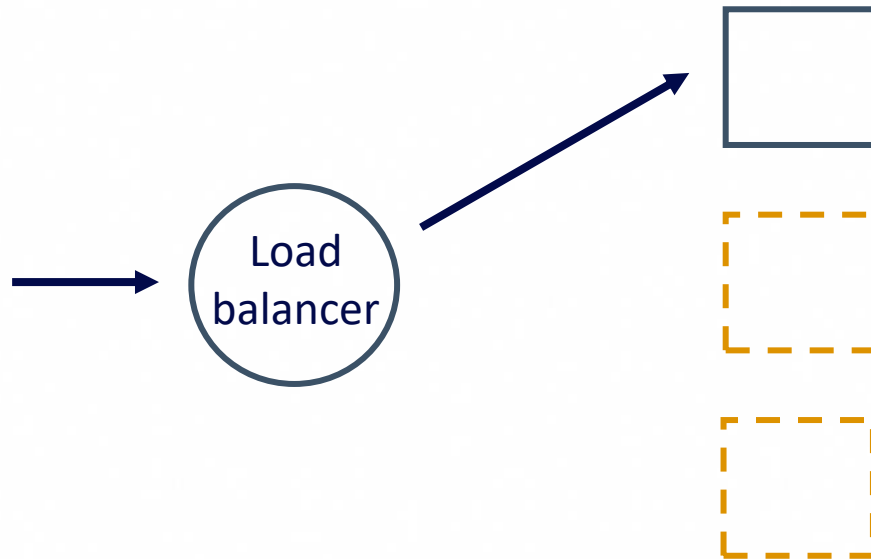
Instance

Error 500: ...	instance-b
Error 500: ...	instance-b
Error 500: ...	instance-c
Error 500: ...	instance-b
Error 500: ...	instance-c
Error 500: ...	instance-c

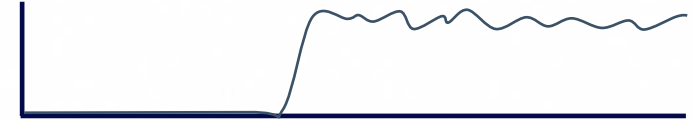
Troubleshooting - Case 1

Problem: Website very slow

Issue:



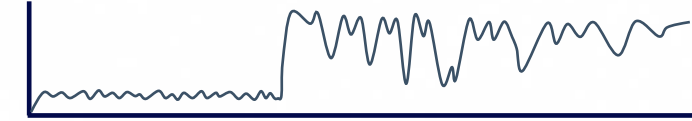
HTTP 5xx errors



HTTP 200



Latency



Message

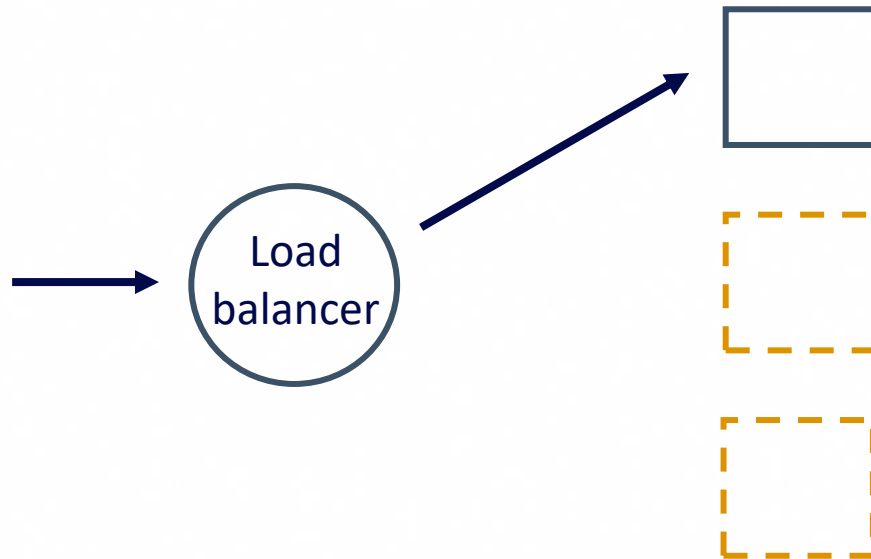
Instance

Error 500: ...	instance-b
Error 500: ...	instance-b
Error 500: ...	instance-c
Error 500: ...	instance-b
Error 500: ...	instance-c
Error 500: ...	instance-c

Troubleshooting - Case 1

Problem: Website very slow

Issue:



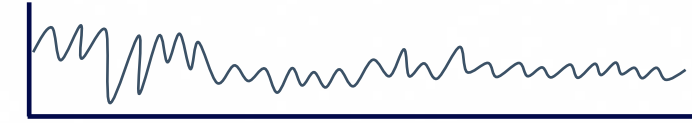
HTTP 5xx errors



HTTP 200



Latency



Message

Instance

Troubleshooting – Case 2

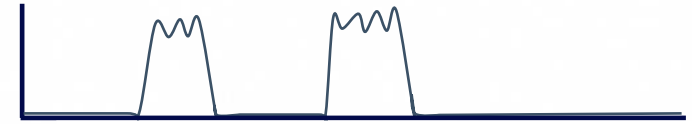
Problem: Website very slow

Issue: Database connection failed

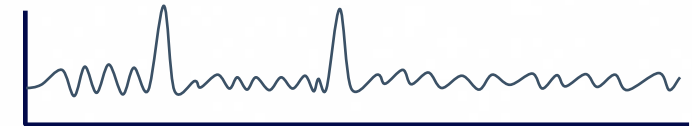
Temp. Fix: ↗ Rate limiting

Fix: Connexions optimization
Cache
Scaling

HTTP 5xx errors



Database connexions



Accounts	Nb connexions
User 42	140
User 53	18
User 65	12

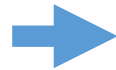
Message

Database connection failed
Database connection failed
Database connection failed
Database connection failed
Database connection failed
Database connection failed

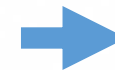
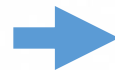
Troubleshooting – Case 3



"operation failed"



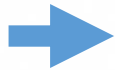
When ?



Acknowledgement

Watch alerts

Monitoring /
Assessing the extent
of the damage



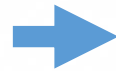
creating user: operation failed
creating user: operation failed
creating user: operation failed

Find logs

Troubleshooting – Case 3



Find logs



message

creating user: success
creating user: operation failed
creating user: success
creating user: success
creating user: operation failed
creating user: operation failed

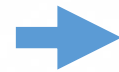
operation

CreateUser
CreateUser
CreateUser
CreateUser
CreateUser
CreateUser

Troubleshooting – Case 3



Find logs



message	pod_id
creating user: success	app-54fb9-n4vkg
creating user: operation failed	app-54fb9-n4vkg
creating user: success	app-54fb9-n4vkg
creating user: success	app-54fb9-n4vkg
creating user: operation failed	app-54fb9-n4vkg
creating user: operation failed	app-54fb9-n4vkg
	app-54fb9-n4vkg

Troubleshooting

Scope the issue

Who?

What?

When?

Reproduce

Gather information

Document

Troubleshooting – Five whys

Problem: I'm late for work

Why? I left home later than usual

Why? My alarm didn't go off

Why? My phone was off

Why? The battery was empty

Why? I didn't plug in my phone before going to bed

Troubleshooting – Five whys

Problem: Users can no longer connect to the application

Why? The authentication system returns an error 500

Why? The authentication service is unable to query the user database

Why? The authn service cannot establish a connection to the database

Why? The database server is unreachable

Why? A recent firewall configuration change



*Develop your applications as if
you were going to maintain them.*

Because you are.

~ a cool colleague

Logs

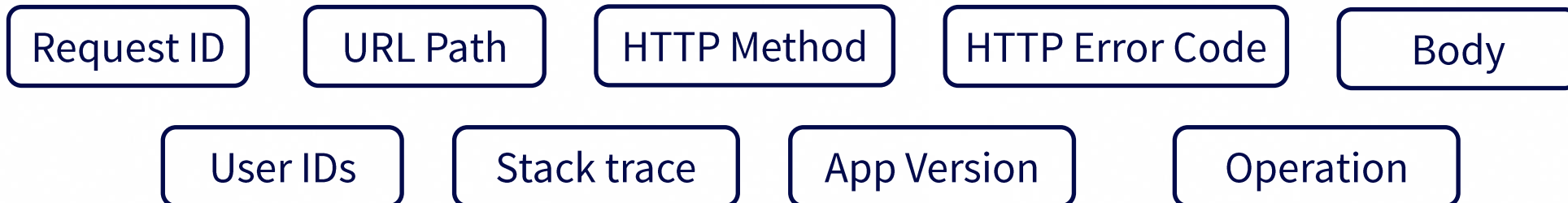
To avoid



Log level



Write relevant logs



Logs

```
var user User
err := json.NewDecoder(r.Body).Decode(&user)
if err != nil {
    logrus.Errorf("decoding json: %v", err)
    http.Error(w, "invalid data", http.StatusBadRequest)
    return
}

// ...

logrus.Infof("user %s (id: %d) successfully processed", user.Name, user.ID)
```

Logs

```
logrus.Infof("user %s (id: %d) successfully processed", user.Name, user.ID)
```

```
INFO[0000] user Alice (id: 42) successfully processed
```

```
INFO[0000] user Bob (id: 44) successfully processed
```


Logs

```
logrus.Infof("user %s (id: %d) successfully processed", user.Name, user.ID)
```

```
logrus.WithFields(logrus.Fields{  
    "user_id": user.ID,  
    "name": user.Name,  
    "operation": "userProcessing",  
}).Info("user processing success")
```

Logs

```
logrus.WithFields(logrus.Fields{  
  "user_id": user.ID,  
  "name":    user.Name,  
  "operation": "userProcessing",  
}).Info("user processing success")
```

```
user processing success  
user processing success
```

```
user_id: 42  
name: Alice  
operation: userProcessing
```

```
user_id: 44  
name: Bob  
operation: userProcessing
```

```
message: "user processing success" AND user_id:42
```

Monitoring / dashboards

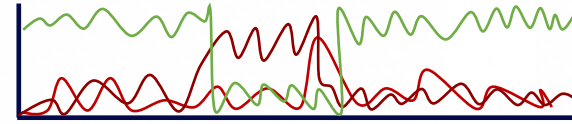
Restarts



Uptime

28 days ago

All requests

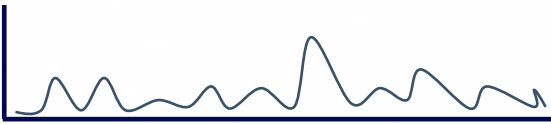


200 292

4xx 4

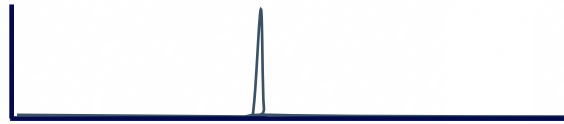
5xx 23

HTTP 4xx errors



Nb errors
24

HTTP 5xx errors

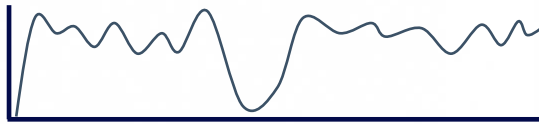


Nb errors
2

Response time (ms)



Nb users created



Nb users
845

Errors

Date	User ID	Error
2024-02-02 08:34:12.548951 +02:00	158686	creating user: POST /api/users: 403..
2024-02-02 08:34:01.548951 +02:00	694245	creating user: POST /api/users: 500..
2024-02-02 08:33:36.548951 +02:00	524215	creating user: POST /api/users: 403..
2024-02-02 08:33:24.548951 +02:00	218556	creating user: POST /api/users: 403..

Monitoring / dashboards

Define the right color

-  Everything's OK
-  Be careful
-  It's broken

The rest in white

Communicate information quickly

Clear information

Chose the right type of charts

Organize the information

Make it customizable

Monitoring / dashboards

Why?

Performance tracking

Issue detection

Quick insights

Reliability Assurance

Productivity

User experience

Reactivity

What?

Application



Error rates

Performance



Database, request rates, response time, network latency, ...

Availability



Health check

Database



DB queries performance

Resources



CPU, RAM, bandwidth, ...

...and everything that can lead to an alert

Alerts



Logs

Monitoring

Application-Level Errors

Alerts



Logs

Monitoring

Application-Level Errors

Alerts

groups:

- name: api_alerts

rules:

- alert: HighHTTP500Rate

expr: rate(http_requests_total{status="500"}[5m]) > 0.05

for: 2m

labels:

severity: critical

annotations:

summary: "High rate of HTTP 500 errors"

description: "More than 5% of requests are failing with status 500 over the last 5 minutes."

Prometheus alerting rules

Alertmanager

Alerts



Logs

Monitoring

Application-Level Errors

Errors handling

```
func divide(a, b float64) (float64, error) {  
    if b == 0 {  
        return 0, errors.New("division by zero")  
    }  
    return a / b, nil  
}
```

```
func main() {  
    result, err := divide(10, 2)  
    if err != nil {  
        // handle error (fire alert, ...)  
        return  
    }  
    fmt.Println("result:", result)  
}
```

Errors handling: error wrapping

```
var ErrUserNotFound = errors.New("user not found")
```

```
func getUser(id int) (User, error) {  
    user, err := db.FindUserByID(id)  
    if err != nil {  
        if errors.Is(err, db.ErrNotFound) {  
            return User{}, ErrUserNotFound  
        }  
        return User{}, err  
    }  
    return user, nil  
}
```

```
return User{}, fmt.Errorf("fetching user: %w", err)
```

"record not found"

"fetching user: record not found"

Code architecture

Use an archetype

Unified codebase

Unified starter

Microservice gateway communications

Packages / dependencies

Artifact repository / manager

CI/CD setup

Use common packages

logger

alerter

profiling

http requests

Error handling

Health-check

cmd

metrics

crypto

reflect

Sources

RUN / Troubleshooting

<https://www.ibm.com/think/topics/it-operations>

<https://www.maddyness.com/2019/12/23/startupers-build-et-run/>

<https://www.oracle.com/fr/security/troubleshooting-depannage-resolution-problemes/>

<https://www.ciscopress.com/articles/article.asp?p=102211&seqNum=3>

https://en.wikipedia.org/wiki/Five_why

<https://medium.com/@dzanna.molly/devops-troubleshooting-strategy-2b5b38a5f3b7>

<https://www.youtube.com/watch?v=6pRBWM-J-c8>

Special thanks to the
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Character drawings
by goupil.poil (instagram)

Icons from Flaticon

Freepik
Smashicons
WinWwin Winaldi
Good Ware

Vectors Market
Prosymbols Premium
dmitri13
Amethyst prime

Sources

Code Good practices

<https://preslav.me/2023/04/14/golang-error-handling-is-a-form-of-storytelling/>
<https://www.crowdstrike.com/en-us/cybersecurity-101/next-gen-siem/logging-levels/>
<https://aws.amazon.com/what-is/log-files/>
<https://play.grafana.org/>
https://prometheus.io/docs/prometheus/latest/configuration/alerting_rules/
<https://betterstack.com/community/guides/logging/logging-best-practices/>
<https://www.dataset.com/blog/the-10-commandments-of-logging/>
<https://www.digitalocean.com/community/tutorials/handling-errors-in-go>
https://www.jetbrains.com/guide/go/tutorials/handle_errors_in_go/best_practices/
<https://www.ibm.com/think/topics/application-monitoring-best-practices>
<https://www.keyprod.com/en/knowledge/production-monitoring>

Icons from Flaticon

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Freepik
Smashicons
WinWwin Winaldi
Good Ware

Vectors Market
Prosymbols Premium
dmitri13
Amethyst prime

Blog here!



Kimi, my cat



sebferrer



seb-ferrer



<https://blog.kimi.ovh>