

Úvod do monitoringu pomocí Promethea

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Ondřej Šika

Jsem DevOps engineer, architekt,
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Založil jsem a řídím firmu SikaLabs s.r.o.

Dělám populární školení, kde své znalosti
předávám tak, abyste si mohli vše udělat
sami a bez zbytečných přešlapů a
slepých cest.



Moje DevOps školení

Dělám populární školení, kde své znalosti předávám tak, abyste si mohli vše udělat sami a bez zbytečných přešlapů a slepých cest.

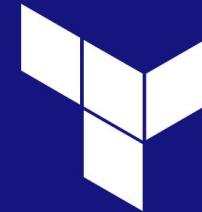
- Docker
- Kubernetes
- ArgoCD
- Prometheus

Otevřené termíny + u Vás ve firmě

Kubernetes



Terraform



Docker



Prometheus



Rancher



ArgoCD



Náš DevOps Stack

- Git, Gitlab, Github - Versioning & Collaboration
- Gitlab CI, ArgoCD - Continuous Integration, Continuous Deployment
- Docker, Kubernetes - Containers & Orchestration
- RKE2, AKS, EKS - Kubernetes Provisioning
- Terraform - Infrastructure management
- **Prometheus**, Alertmanager, Grafana - Observability stack
- Elastic Stack / Loki - Log Management
- AWS, Azure, DigitalOcean
- Proxmox, VMWare, OpenStack



Agenda



Prometheus



Co je Prometheus

An open-source monitoring system with a dimensional data model, flexible query language, efficient time series database and modern alerting approach.

– <https://prometheus.io/docs/introduction/overview>



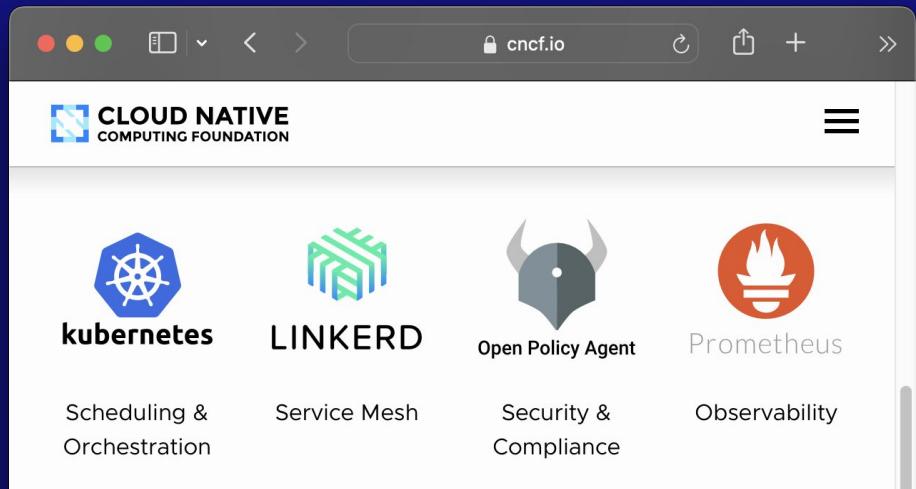
Klíčové vlastnosti Promethea

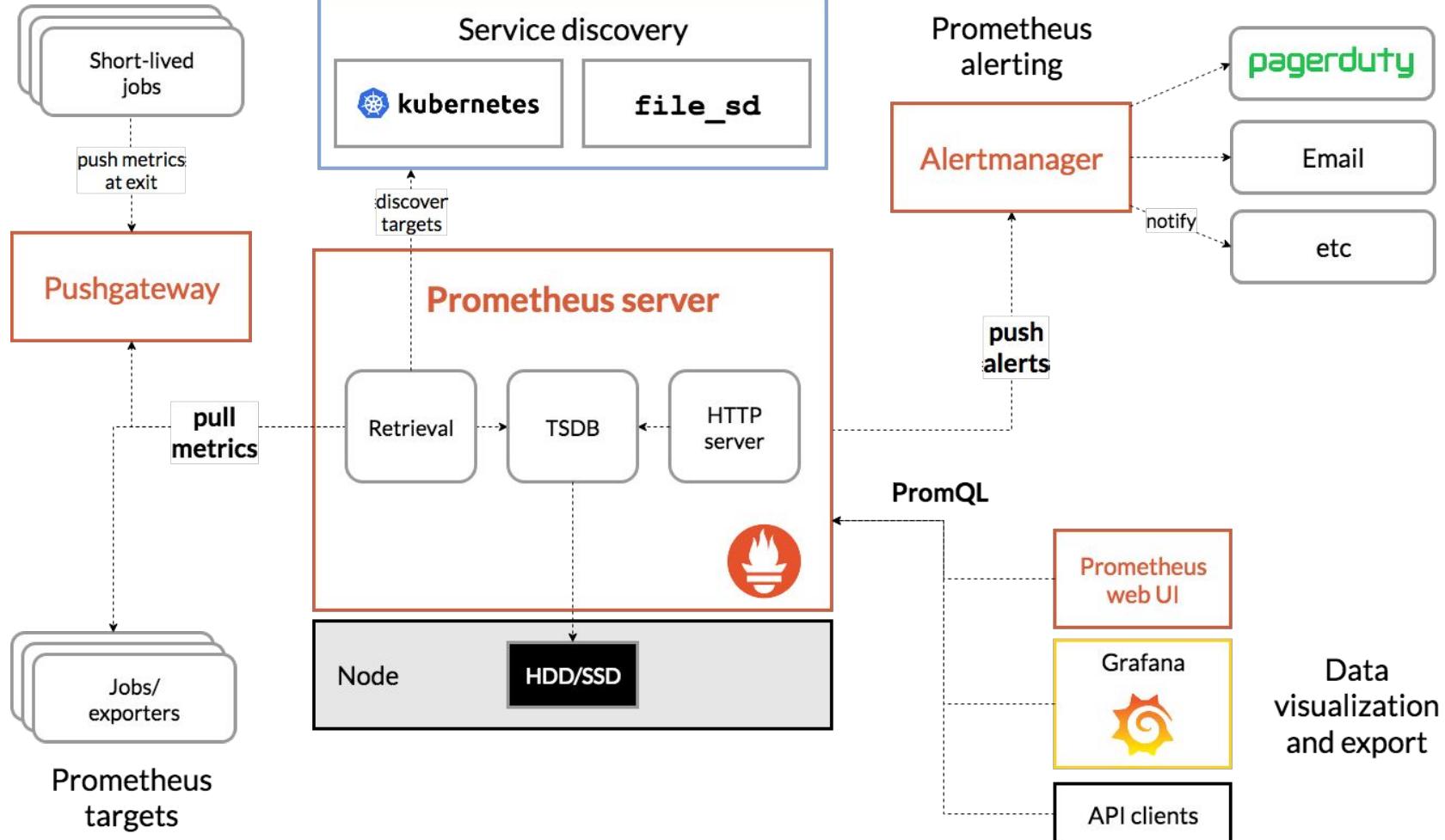
- Open Source
- Time Series Database
- Mocný dotazovací jazyk PromQL
- Built-in Alerting
- Service Discovery
- Integrace s Kubernetes
- Pull-Based Metrics Collection
- Velký ekosystém exportérů
- Vizualizace v Grafaně
- Self-Contained Single Binary



OpenSource pod CNCF

- Druhý graduated projekt pod CNCF
- Původně vyvinutý v SoundCloudu





Service Discovery

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Service Discovery

Prometheus podporuje jak statickou definici monitoring targetu, tak i dynamickou pomocí service discovery

Prometheus může načítat zdroje z

- Kubernetes
- Hashicorp Consul
- DNS
- Azure, AWS, ...





Targets

All scrape pools ▾

All

Unhealthy

Collapse All



Filter by endpoint or labels

serviceMonitor/default/metrics-example/0 (5/5 up)[show less](#)

Endpoint	State	Labels	Last Scrape	Scrape Duration
http://10.244.0.101:8001/metrics	UP	<code>container="metrics-example"</code> <code>endpoint="metrics"</code> <code>instance="10.244.0.101:8001"</code> <code>job="metrics-example" namespace="default"</code> <code>pod="metrics-example-855c56d596-5l4ld"</code> <code>service="metrics-example" ▾</code>	16.471s ago	3.434ms
http://10.244.0.117:8001/metrics	UP	<code>container="metrics-example"</code> <code>endpoint="metrics"</code> <code>instance="10.244.0.117:8001"</code> <code>job="metrics-example" namespace="default"</code> <code>pod="metrics-example-855c56d596-zhkj2"</code> <code>service="metrics-example" ▾</code>	3.734s ago	3.213ms

Sběr metrik



/metrics endpoint

- Prometheus stahuje metriky z /metrics endpointu pomocí HTTP
- Implementace v aplikaci může být pomocí Prometheus knihovny nebo i vlastní
- Mnoho aplikací má nativní podporu /metrics endpointu
- Můžete jednoduše integrovat do Vaší aplikace



Prometheus Exportery

- Prometheus používá exportery pro sběr metrik z míst, kde není nativní integrace
 - node_exporter - Metriky z VMs
 - blackbox_exporter - HTTP status, DNS status, ...
 - postgres_exporter



```
# HELP go_gc_duration_seconds A summary of the pause duration of garbage collection cycles.
# TYPE go_gc_duration_seconds summary
go_gc_duration_seconds{quantile="0"} 0.001666587
go_gc_duration_seconds{quantile="0.25"} 0.001666587
go_gc_duration_seconds{quantile="0.5"} 0.001666587
go_gc_duration_seconds{quantile="0.75"} 0.001666587
go_gc_duration_seconds{quantile="1"} 0.001666587
go_gc_duration_seconds_sum 0.001666587
go_gc_duration_seconds_count 1
# HELP go_goroutines Number of goroutines that currently exist.
# TYPE go_goroutines gauge
go_goroutines 9
# HELP go_info Information about the Go environment.
# TYPE go_info gauge
go_info{version="go1.21.6"} 1
# HELP go_memstats_alloc_bytes Number of bytes allocated and still in use.
# TYPE go_memstats_alloc_bytes gauge
go_memstats_alloc_bytes 3.03848e+06
# HELP go_memstats_alloc_bytes_total Total number of bytes allocated, even if freed.
# TYPE go_memstats_alloc_bytes_total counter
```

PromQL

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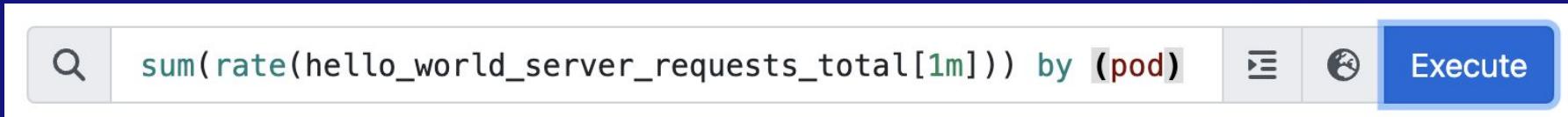
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PromQL

- Prometheus má velmi mocný dotazovací jazyk
- Vlastnosti PromQL
 - Query Time Series Data
 - Label-Based Selection
 - Rich Set of Operators, Aggregation Functions
 - Rate Calculation, Range Vectors
 - Join Operations, Offset Modifiers





- Use local time Enable query history Enable autocomplete Enable highlighting
 Enable linter

`sum(rate(hello_world_server_requests_total[1m])) by (pod)`

Execute

Table

Graph

Load time: 32ms Resolution: 3s Result series: 5



15m



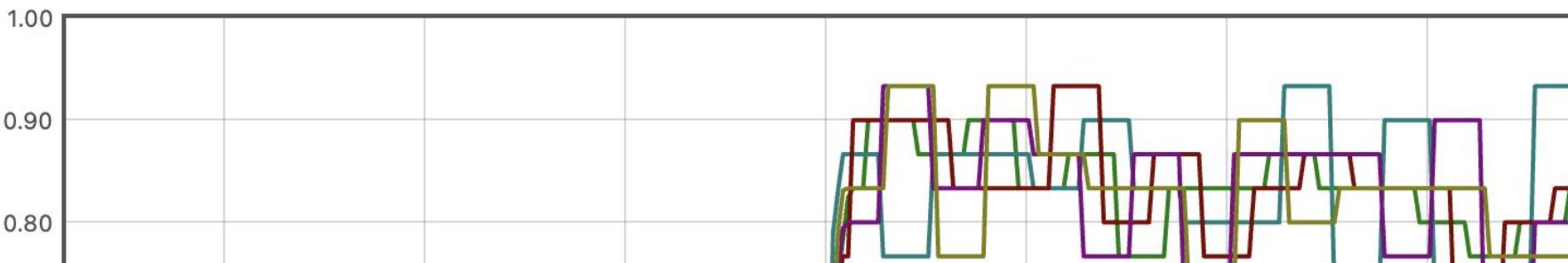
End time



Res. (s)



Show Exemplars



Alerting

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Alerting

- Prometheus sleduje předdefinované queries a vyhodnocuje alerty
- Alerty posílá pouze do Alert Manageru

▼ ExampleRateAlert (0 active)

```
name: ExampleRateAlert
expr: rate(hello_world_server_requests_total[10m]) > 10
labels:
  severity: warn
  team: infra
annotations:
  message: High request rate
```

 Inactive (121) Pending (0) Firing (3)

Filter by name or labels

 Show annotations

/etc/prometheus/rules/prometheus-prometheus-stack-prometheus-rulefiles-0/default-metrics-example-70149cf2-5f7d-43c0-9cd8-f8b81d3485e1.yaml > metrics-example.rules

firing (10)

ExampleAlert (10 active)

```
name: ExampleAlert
expr: hello_world_server_requests_total > 10
labels:
  severity: none
  team: devs
annotations:
  message: Alert on: hello_world_server_requests_total > 10
```

Labels	State	Active Since	Value
alertname=ExampleAlert,container=metrics-example,endpoint=metrics,instance=10.244.0.207:8001,job=metrics-example,namespace=default,path=/metrics,pod=metrics-example-855c56d596-pvb6j,service=metrics-example,severity=none,team=devs	FIRING	2024-06-07T10:16:11.661753224Z	176
alertname=ExampleAlert,container=metrics-example,endpoint=metrics,instance=10.244.0.117:8001,job=metrics-example,namespace=default,path=/metrics,pod=metrics-example-855c56d596-zhkj2,service=metrics-example,severity=none,team=devs	FIRING	2024-06-07T10:16:41.661753224Z	175
alertname=ExampleAlert,container=metrics-example,endpoint=metrics,instance=10.244.1.42:8001,job=metrics-example,namespace=default,path=/metrics,pod=metrics-example-855c56d596-kgn65,service=metrics-example,severity=none,team=devs	FIRING	2024-06-07T10:17:11.661753224Z	174
alertname=ExampleAlert,container=metrics-example,endpoint=metrics,instance=10.244.0.101:8001,job=metrics-example,namespace=default,path=/metrics,pod=metrics-example-855c56d596-5l4ld,service=metrics-example,severity=none,team=devs	FIRING	2024-06-07T10:17:11.661753224Z	174
alertname=ExampleAlert,container=metrics-example,endpoint=metrics,instance=10.244.0.117:8001,job=metrics-example	FIRING	2024-06-	452

Alert Manager



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Alert Manager

- Posílání notifikací
- Routing alertu
 - komu co poslat
- Silencery
- Notifikacni kanaly
 - Email
 - Slack, Teams,
 - PagerDuty
 - ...

The screenshot shows the Alertmanager interface with the following details:

- Header:** Alertmanager, Alerts, Silences, Status, Settings, Help, New Silence
- Filter/Group:** Filter (selected), Group, Receiver: All, Silenced, Inhibited
- Search Bar:** Custom matcher, e.g. env="production" (+, Silence)
- Buttons:** +, Expand all groups
- Alert List:**
 - + null alertname="Watchdog" + 1 alert
 - + mail alertname="AlertmanagerFailedToSendAlerts" + namespace="prometheus-stack" + 1 alert
 - + mail alertname="ExampleAlert" + namespace="default" + 5 alerts
 - + null alertname="Infolnhibitor" + namespace="default" + 5 alerts

Alert Manager

- Posílání notifikací
- Routing alertu
 - komu co poslat
- Silencery
- Notifikacni kanaly
 - Email
 - Slack, Teams,
 - PagerDuty
 - ...

The screenshot shows the Alertmanager interface. At the top, there is a notification card for an alert titled "Ogilvy-Alertmanager APP 09:35". The alert is [RESOLVED] KubeContainerWaiting for (container="table-manager", pod="loki-table-manager-7cf5f8dbd8-k5x95", prometheus="prometheus-stack/prometheus-stack-kube-prom-prometheus", severity="warning"). It includes a description: "pod/loki-table-manager-7cf5f8dbd8-k5x95 in namespace loki on container table-manager has been in waiting state for longer than 1 hour." Below the notification is the main Alertmanager UI. It features a navigation bar with links for Alertmanager, Alerts, Silences, Status, Settings, and Help. A "New Silence" button is located in the top right corner. The main area contains a "Filter" section with tabs for "Filter" and "Group". There is also a "Receiver: All" dropdown and buttons for "Silenced" and "Inhibited". Below the filter is a search bar with placeholder text "Custom matcher, e.g. env='production'" and a "Silence" button. The main content area displays a list of active alerts grouped by their alertname. The groups are:

- + null alertname="Watchdog" + 1 alert
- + mail alertname="AlertmanagerFailedToSendAlerts" + namespace="prometheus-stack" + 1 alert
- + mail alertname="ExampleAlert" + namespace="default" + 5 alerts
- + null alertname="Infolnhibitor" + namespace="default" + 5 alerts

AlertManager

▼ ExampleRateAlert (0 active)

```
name: ExampleRateAlert
expr: rate(hello_world_server_requests_total[10m]) > 10
labels:
  severity: warn
  team: infra
annotations:
  message: High request rate
```



Grafana



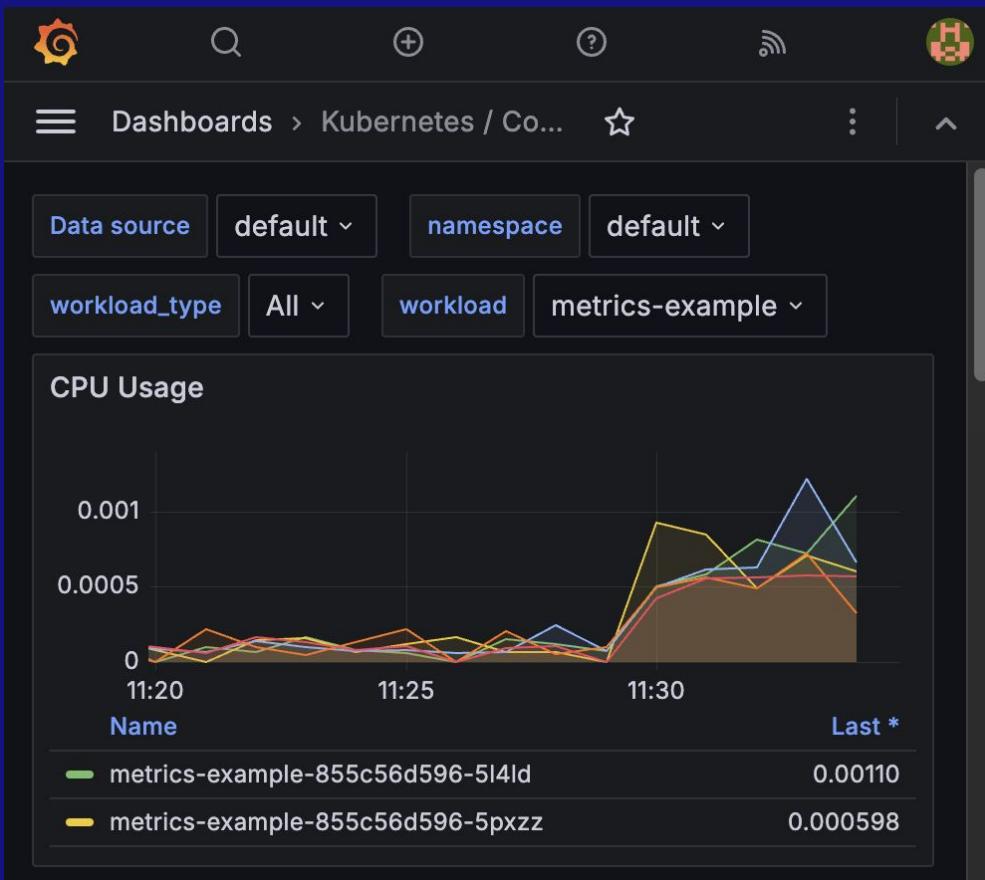
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Grafana

- Nástroj na vizualizaci dat
- Integrace s Prometheem
- Defaultní Kubernetes dashboardy pomocí kube-prometheus-stack
- Možnost vlastních dashboardů





Search or jump to...

⌘+k



Home > Dashboards > Kubernetes / Compute Resources / Workload



Add

Share



Last 30 minutes UTC



10s



Data source

default

namespace

default

workload_type

All

workload

metrics-example

CPU Usage

0.0015

0.001

0.0005

0

11:20

11:25

11:30

11:35

11:40

11:45

Name

Last *

metrics-example-855c56d596-5l4ld	0.000558
metrics-example-855c56d596-5pxzz	0.000749
metrics-example-855c56d596-kgn65	0.00123
metrics-example-855c56d596-pvb6j	0.000487
metrics-example-855c56d596-zhk2	0.000446

CPU Quota

Pod	CPU Usage	CPU Requests	CPU Requests %	CPU Limits	CPU Limits %
metrics-example-855c56...	0.000526	0.0100	5.26%	0.0200	2.63%
metrics-example-855c56...	0.000733	0.0100	7.33%	0.0200	3.66%
metrics-example-855c56...	0.000534	0.0100	5.34%	0.0200	2.67%
metrics-example-855c56...	0.000591	0.0100	5.91%	0.0200	2.95%
metrics-example-855c56...	0.000434	0.0100	4.34%	0.0200	2.17%



Q Search or jump to...



+ - | ? ⚡

☰ Home > Dashboards > Example Dashboard ☆

6

Add >

Share

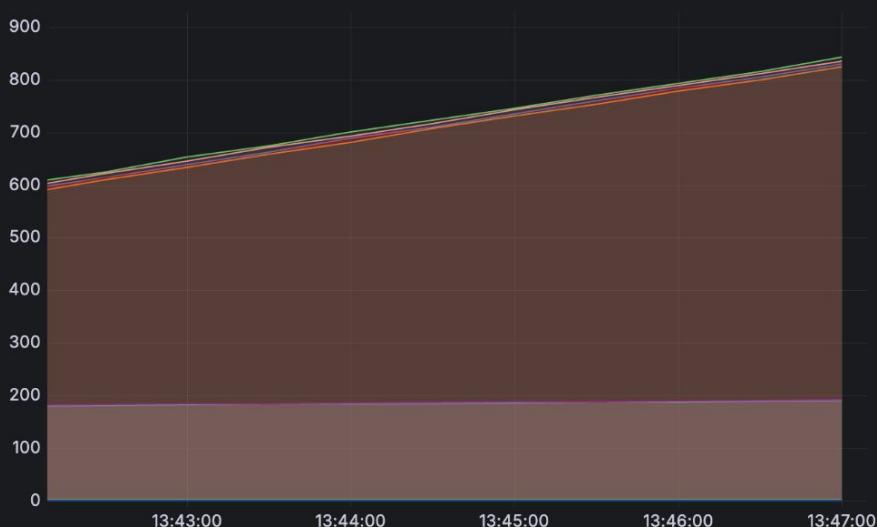
① Last 5 minutes

1

5

8

Example Requests



Example Requests Rate

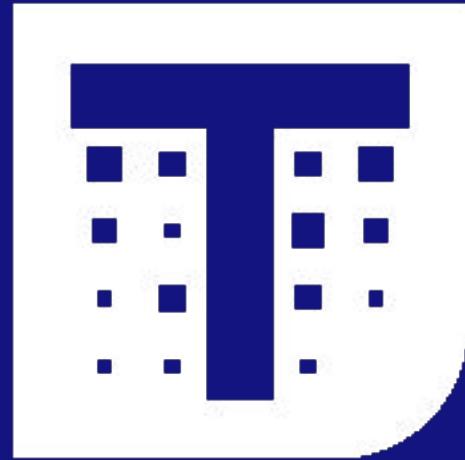


Thanos

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Thanos

Thanos is a set of components that can be composed into a highly available metric system with unlimited storage capacity, which can be added seamlessly on top of existing Prometheus deployments.

– <https://github.com/thanos-io/thanos>

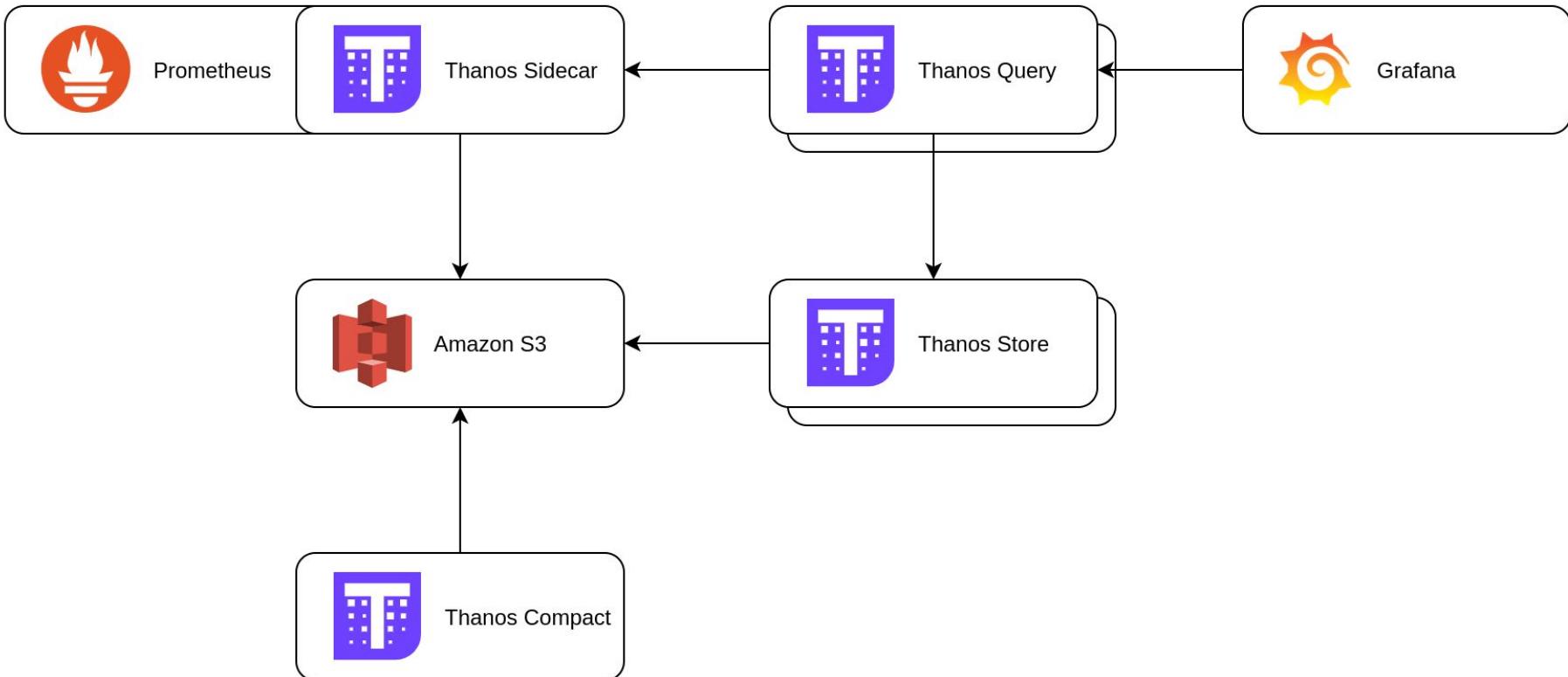
- Prometheus
- Dlouhodobá storage metrik (v S3)
- Downsampling
- Multi-tenancy
- Query Deduplication



Thanos

- Prometheus kompatibilní
- Dlouhodobá storage metrik (v S3)
- Downsampling
- Agregace dat z více Prometheus instancí
- Dotazy nad více instancemi Prometheus zároveň





Shrnutí

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Shrnutí

- Prometheus je moderní monitoringový nástroj
- Opensource pod CNCF
- Kubernetes native
- Jednoduchá správa a deklarativní konfigurace
- Snadná integrace v aplikacích
- Rozsáhlý ekosystém exportérů a nativní podpory



Díky za pozornost



Otázky?



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