

Úvod do monitoringu pomocí Prometheus

Ondřej Šika

Freelance & SikaLabs s.r.o.

ondrej@sika.io

[@ondrejsika](https://twitter.com/ondrejsika)

[/in/ondrejsika](https://www.linkedin.com/in/ondrejsika)

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SikaLabs s.r.o.

hi@sikalabs.com

sikalabs.com



Ondřej Šika

Jsem DevOps engineer, architekt,
konzultant a školitel z Prahy.

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>



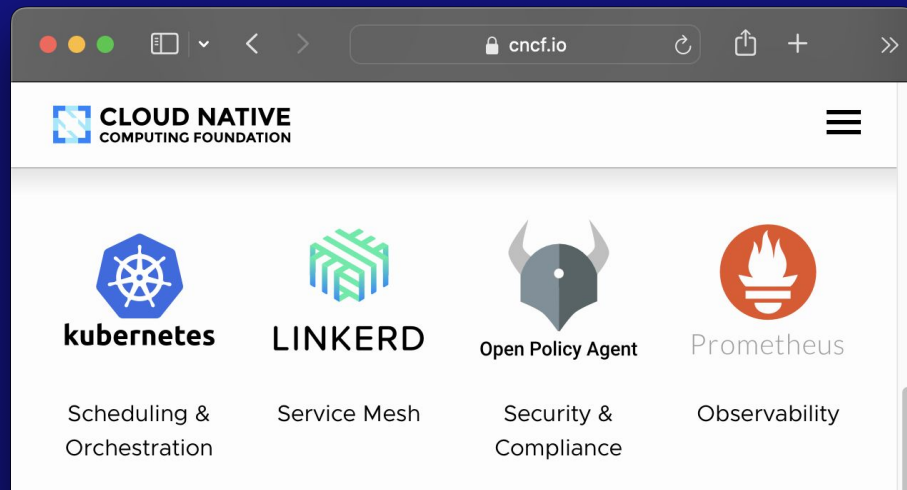
Klíčové vlastnosti Prometheus

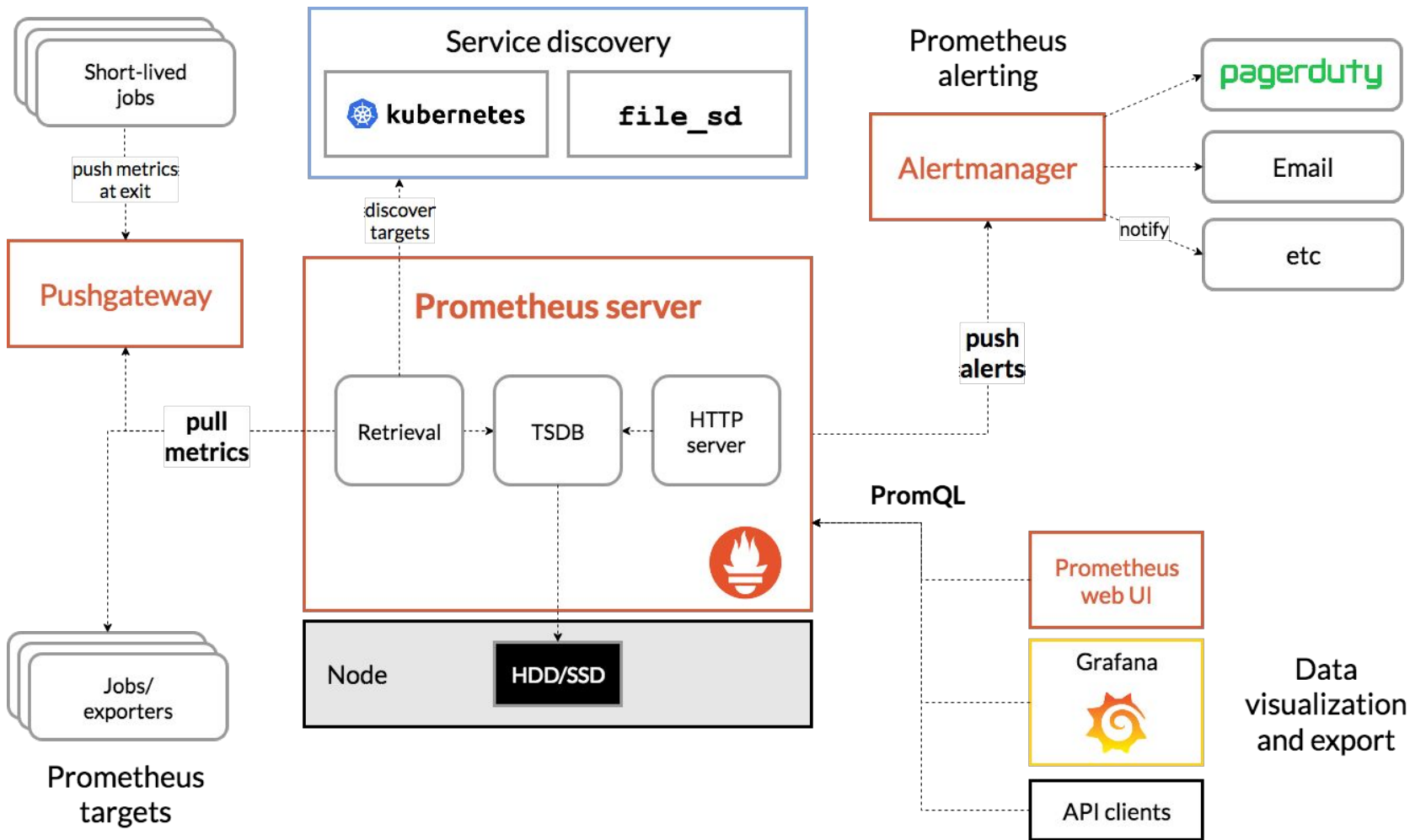
- Open Source
- Time Series Database
- Mocný dotazovací jazyk PromQL
- Built-in Alerting
- Service Discovery
- Integrace s Kubernetes
- Pull-Based Metrics Collection
- Velký ekosystém exportérů
- Vizualizace v Grafaně
- Self-Contained Single Binary



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

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/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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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



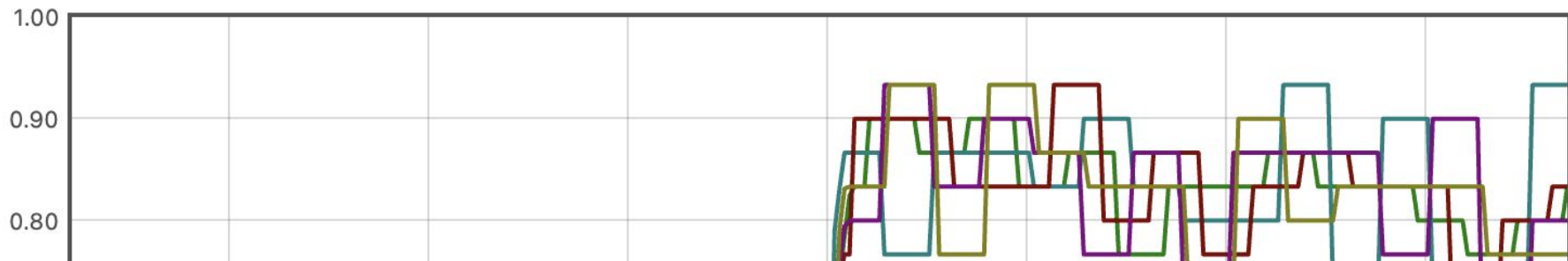
End time



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

Alert Manager



Alert Manager

- Posílání notifikací
- Routing alertu
 - komu co poslat
- Silencery
- Notifikační kanály
 - Email
 - Slack, Teams,
 - PagerDuty
 - ...

The screenshot displays the Alertmanager web interface. At the top, there are navigation tabs for Alerts, Silences, Status, Settings, and Help, along with a 'New Silence' button. Below the navigation, there is a filter section with a 'Filter' tab and a 'Group' tab. The 'Receiver' is set to 'All', and there are checkboxes for 'Silenced' and 'Inhibited'. A search bar with a '+' button and a 'Silence' button is present. Below the search bar, there is a text input field for a custom matcher, with the example 'env="production"'. The main content area shows a list of alert groups. Each group is represented by a '+' icon, a receiver name, a filter expression, and the number of alerts. 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="Infoinhibitor" + namespace="default" + 5 alerts

Alert Manager

- Posílání notifikací
- Routing alertu
 - komu co poslat
- Silencery
- Notifikační kanály
 - Email
 - Slack, Teams,
 - PagerDuty
 - ...

```
Ogilvy-Alertmanager APP 09:35
[RESOLVED] KubeContainerWaiting for (container="table-manager", pod="loki-table-
manager-7cf5f8dbd8-k5x95", prometheus="prometheus-stack/prometheus-stack-
kube-prom-prometheus", severity="warning")
Alert: - warning
Description: pod/loki-table-manager-7cf5f8dbd8-k5x95 in namespace loki on
container table-manager has been in waiting state for longer than 1 hour.
```

The screenshot shows the Alertmanager web interface. At the top, there are navigation tabs: "Alertmanager", "Alerts", "Silences", "Status", "Settings", and "Help". A "New Silence" button is located in the top right corner. Below the navigation is a filter section with a "Filter" tab and a "Group" tab. The "Receiver" is set to "All", and there are checkboxes for "Silenced" and "Inhibited". A search bar is present with a "+" button and a "Silence" button. Below the search bar, there is a text input field with the placeholder "Custom matcher, e.g. env='production'". The main content area shows a list of alert groups. Each group is represented by a row with a group name, a filter expression, a "+" button, and the number of alerts. The groups are: 1. "null" with filter "alertname='Watchdog'" and 1 alert. 2. "mail" with filter "alertname='AlertmanagerFailedToSendAlerts'" and "namespace='prometheus-stack'" and 1 alert. 3. "mail" with filter "alertname='ExampleAlert'" and "namespace='default'" and 5 alerts. 4. "null" with filter "alertname='InfoInhibitor'" and "namespace='default'" and 5 alerts. There is also a "+ Expand all groups" link at the top of the list.

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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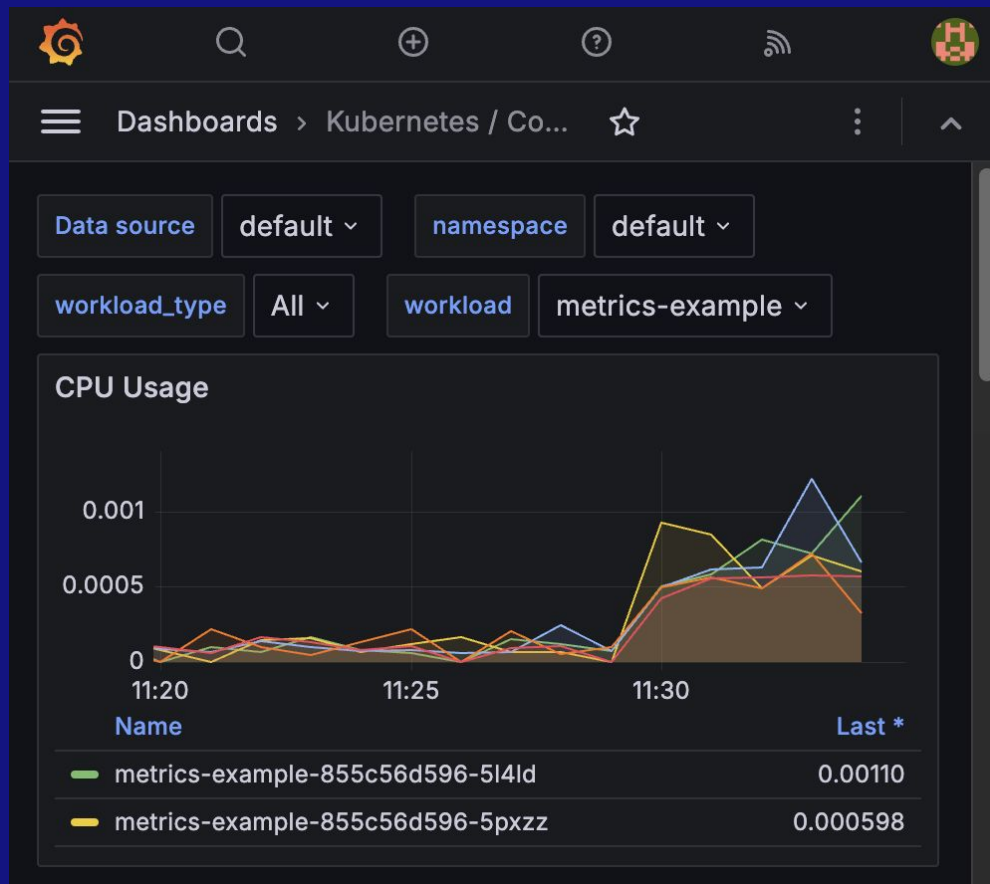
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Grafana

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





Q Search or jump to...

🔍 +k

+ v

?

📶



Home > Dashboards > Kubernetes / Compute Resources / Workload ☆



Add v

Share

🕒 Last 30 minutes UTC v

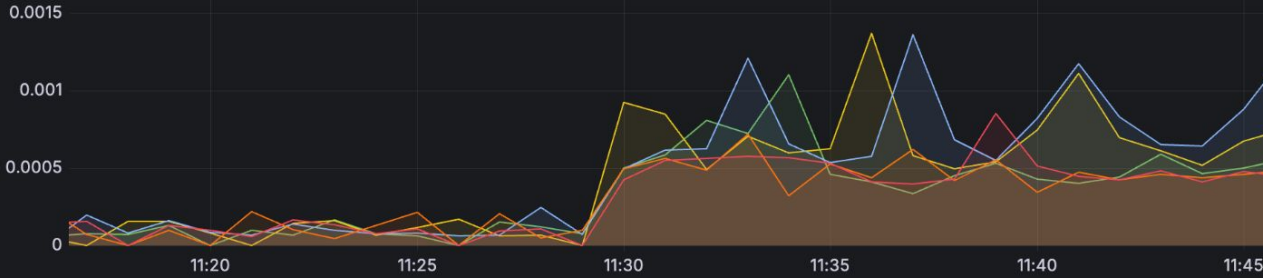


10s v



Data source default v namespace default v workload_type All v workload metrics-example v

CPU Usage



Name	Last *
metrics-example-855c56d596-5i4ld	0.000558
metrics-example-855c56d596-5pxzz	0.000749
metrics-example-855c56d596-kgn65	0.00123
metrics-example-855c56d596-pvb6j	0.000487
metrics-example-855c56d596-zhkj2	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%

Thanos



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>

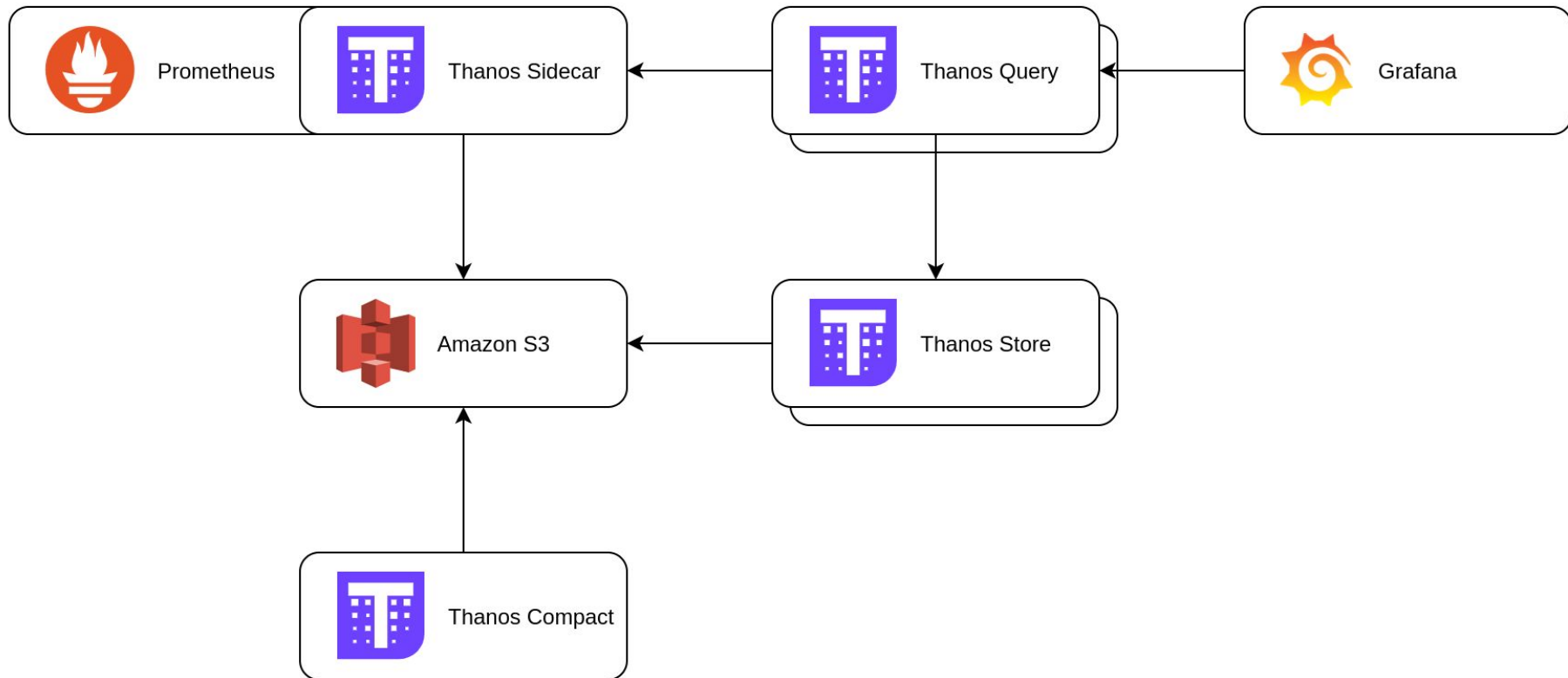
- Prometheus
- Dlouhodobá storage metrik (v S3)
- Downsampling
- Multi-tenancy
- Query Deduplication



Thanos

- Prometheus kompatibilní
- Dlouhodobá storage metrik (v S3)
- Downsampling
- Agregace dat z více Prometheus instancí
- Dotazy nad více instancemi Promethea 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 exporteru a nativní podpory



Díky za pozornost

SikaLabs s.r.o.

hi@sikalabs.com

sikalabs.com



Otázky?

SikaLabs s.r.o.

hi@sikalabs.com

sikalabs.com



Email

ondrej@sika.io

Twitter

@ondrejsika

LinkedIn

/in/ondrejsika

Slides

sika.link/slides

SikaLabs s.r.o.

hi@sikalabs.com

sikalabs.com



