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# CloudStack Infrastructure Monitoring using Grafana Stack

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# About Me

- CloudStack Committer
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- Involved with CloudStack/Forks since 2013 by providing technical support to various customers
- Open-source enthusiast
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# Agenda

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- CloudStack Monitoring Challenges
- Various Infrastructure Monitoring tools overview
- Grafana Stack Overview
- Architecture & Data Flow
- Grafana Dashboards and Demo
- Lessons Learned & Best Practices
- Conclusion
- QA/ References

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# Why Infrastructure Monitoring Matters

# Dynamic and Distributed Infrastructure

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Modern environments are multi-zone and multi-hypervisor.

Workloads scale up and down continuously.

Failures can propagate quickly without early detection.

# Visibility Enables Reliability

MONITORING PROVIDES REAL-TIME INSIGHT INTO PERFORMANCE AND UTILIZATION.

EARLY DETECTION REDUCES MTTR AND IMPROVES SERVICE UPTIME.

CORRELATED METRICS AND LOGS HELP IDENTIFY ISSUES FASTER.

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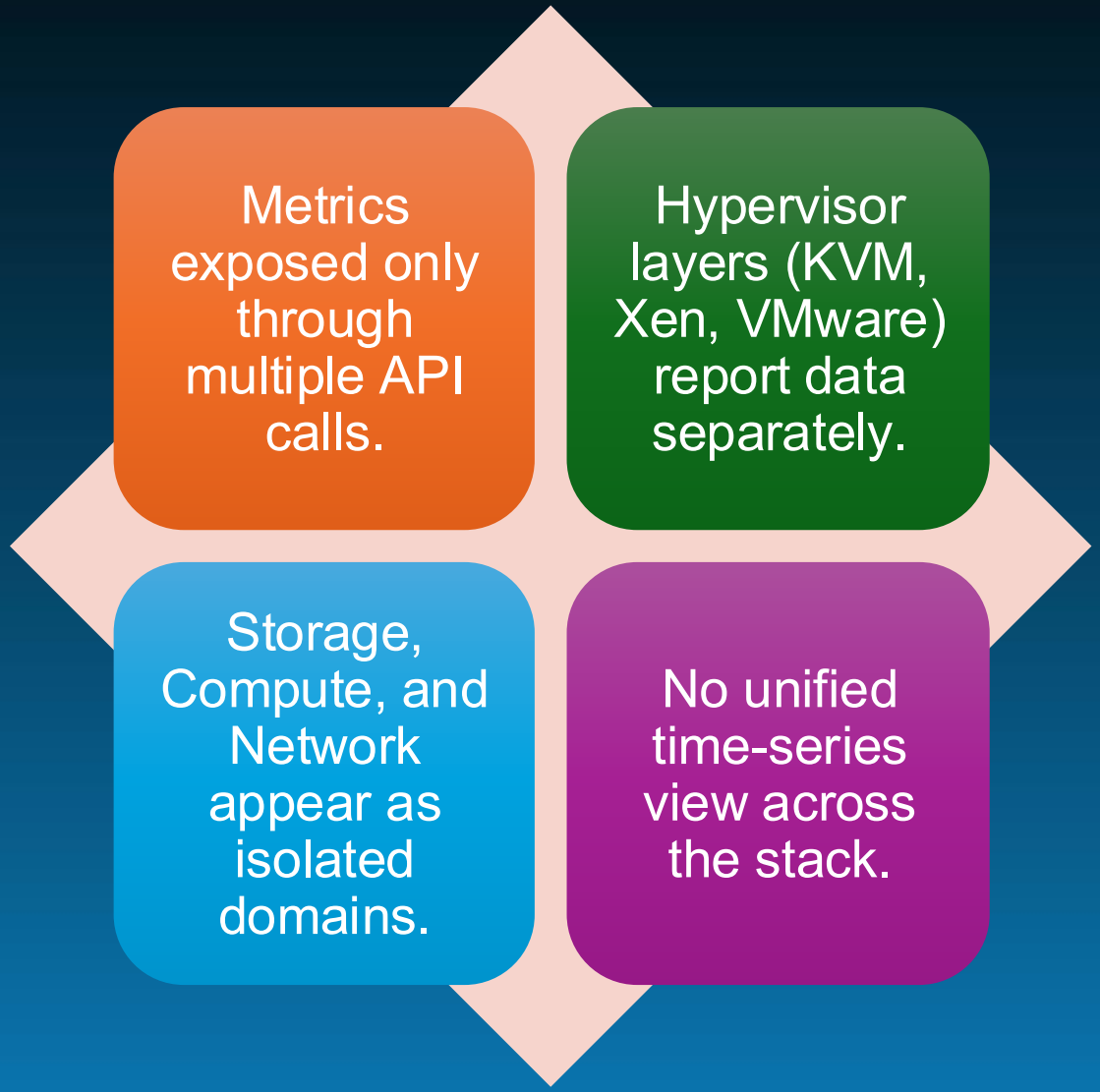
# CloudStack Monitoring Challenges

# Fragmented Metrics



# Scalability & Retention

PER-ZONE AND PER-CLUSTER MONITORING NEEDS CUSTOM EXPORTERS.

CLOUDSTACK FOCUSES ON REAL-TIME OPERATIONS, NOT LONG-TERM TRENDS.

NO NATIVE MECHANISM FOR HISTORICAL PERFORMANCE STORAGE OR ANALYSIS.

# Hard to Visualize

LOGS AND DB STATS ARE TEXT-BASED.

NO BUILT-IN CORRELATION BETWEEN LOGS AND METRICS.

TROUBLESHOOTING REQUIRES MULTIPLE TOOLS AND MANUAL INTERPRETATION.

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# Various Infrastructure Monitoring tools overview








# Why I chose the Grafana Stack

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**Lightweight & Modular Architecture**

Massive Plugin & Datasource Ecosystem

**Unified Observability**

# Grafana Stack Overview

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- Open-source platform for metrics, logs, and traces.
- Unifies observability with a single pane of glass.
- Correlates data across layers, from hypervisor to API calls.

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# Key Capabilities

- Integrates with major open-source monitoring systems and external data sources.
- Supports MySQL, Elastic, Kubernetes.
- Provides alerting based on SLOs and SLIs.
- Sends alerts to Slack, PagerDuty, and Email.
- Offers RBAC with Ops/Admin/Viewer roles.
- Includes HTTPS, API keys, and SSO/LDAP support.

# Grafana Integrations

**Prometheus**

Collects CloudStack and hypervisor metrics.

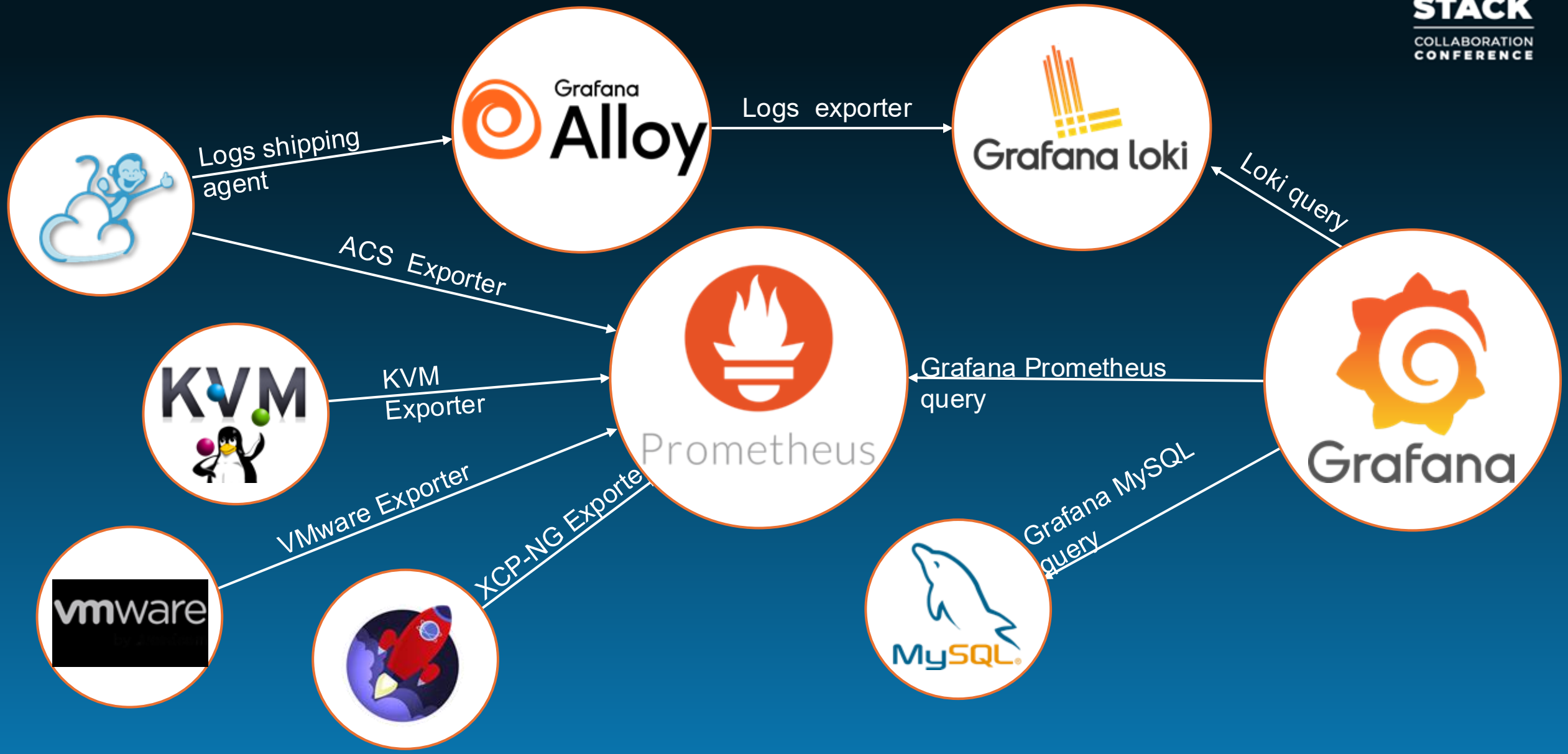
**Alloy**

Gathers logs and telemetry from hosts and system VMs.

**Loki**

Centralizes logs and correlates them with metrics.

# Architecture & Data Flow



# Grafana Dashboard CloudStack Prometheus Metrics

**CloudStack Global Settings**

prometheus.exporter.enable = true

prometheus.exporter.allowed.ips = <Prometheus-IP>


**Prometheus Configuration**

```
- job_name: 'cloudstack'
    scrape_interval: 60s
    scrape_timeout: 15s
    metrics_path: /metrics
    static_configs:
      - targets: ['<Cloudstack-IP>:9595']
```


**Sample metric**

cloudstack_hosts_total{zone="ref-trl-4857-k-M7-kiran-chavala",filter="online"}
1

# Grafana Dashboard CloudStack Prometheus Metrics

# Grafana Dashboard KVM Prometheus Metrics


**Install the libvirt plugin on the kvm hosts**

https://github.com/inovex/prometheus-libvirt-exporter/releases


**Prometheus Configuration**

```
- job_name: ‘kvm'
    scrape_interval: 60s
    scrape_timeout:
    metrics_path: /metrics
    static_configs:
      - targets:
['<kvmhost1>:9177’,’<kvmhost2>:9177’]
```


**Sample metric**

libvirt_domain_vcpu_current{domain=”i-2-12-VM"} 2

# Grafana Dashboard KVM Prometheus Metrics

# Grafana Dashboard VMware Prometheus Metrics


**Install the VMware Prometheus exporter**

https://github.com/pryorda/vmware_exporter
https://github.com/grafana/vmware_exporter


**Prometheus Configuration**

```
- job_name: 'vmware_vcenter'
  metrics_path: '/metrics'
  scrape_timeout: 15s
  static_configs:
   - targets:
    - 'localhost:9272’
```


**Sample metric**

vmware_host_cpu_max{host_name=”esxihost1"} 28728.0

# Grafana Dashboard VMware Prometheus Metrics

# Grafana Dashboard XCP-ng Prometheus Metrics

**Install the XCP-ng Prometheus exporter**

https://github.com/MikeDombo/xen-exporter


**Prometheus Configuration**

```
- job_name: 'xcpng'
    scrape_interval: 60s
    scrape_timeout: 15s
    metrics_path: /metrics
    static_configs:
      - targets: ['localhost:9100']
```


**Sample metric**

```
xen_host_cpu{cpu="2", host_uuid="5c4b0287-7d2f-4740-897f-
55e65630fc74", host="ref-trl-9870-k-mol8-kiran-chavala-xs1"} 0.17158
```

# Grafana Dashboard XCP-ng Prometheus Metrics

# Grafana Dashboard for CloudStack Logs



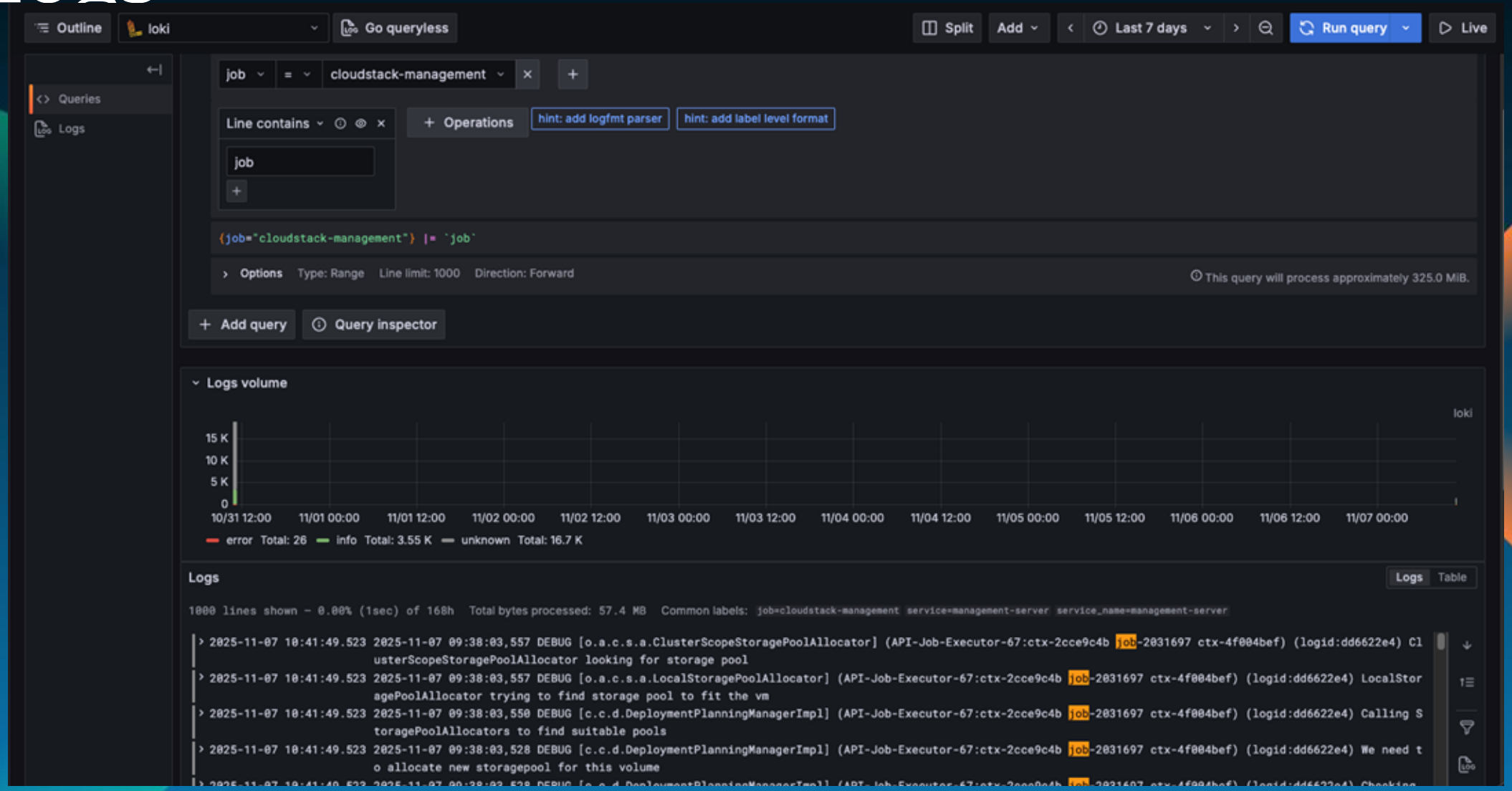

**Install Grafana Alloy in CloudStack Management Server and configure it**

```
- local.file_match "cloudstack_management_logs" {
  path_targets = [
    {
      __path__ = "/var/log/cloudstack/management/management-server.log",
      job      = "cloudstack-management",
      service  = "management-server",
    },

loki.source.file "management_logs" {
  targets       = local.file_match.cloudstack_management_logs.targets
  tail_from_end = true
  forward_to    = [loki.write.default.receiver]
}

loki.write "default" {
  endpoint {
    url = "http://loki-server:3100/loki/api/v1/push"
  }
}
```

**Add LOKI as a data source in Grafana**

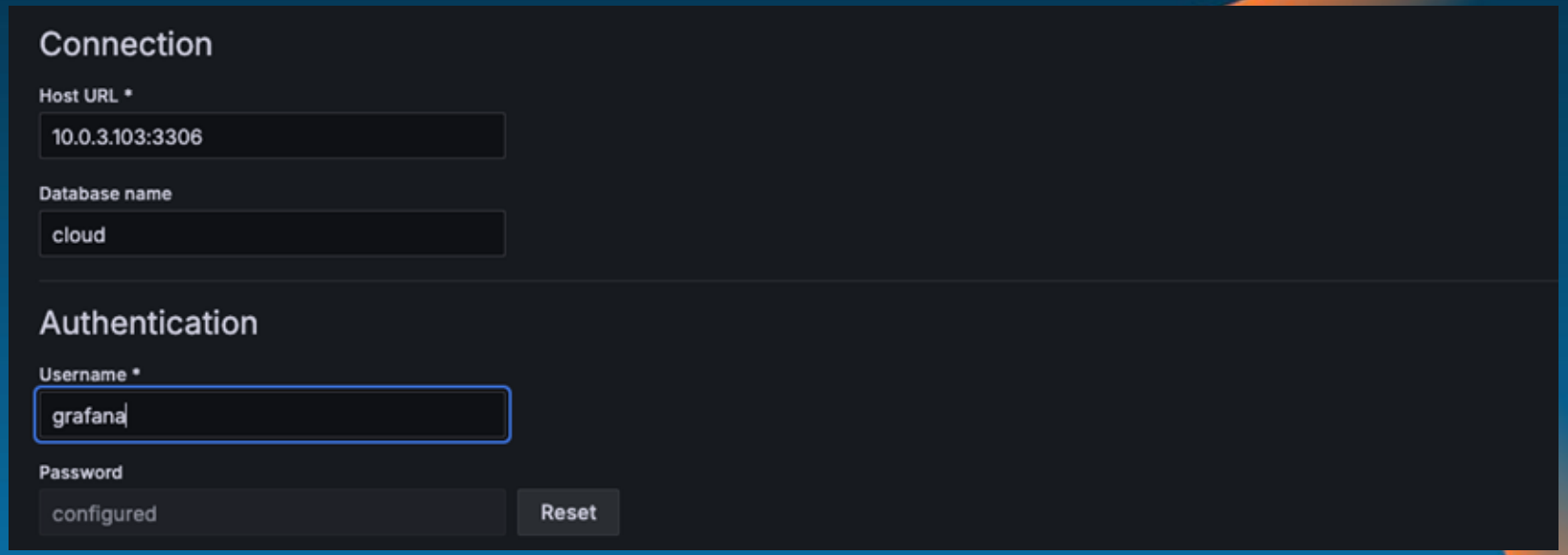
Query the CloudStack Logs

# Grafana Dashboard for CloudStack Logs

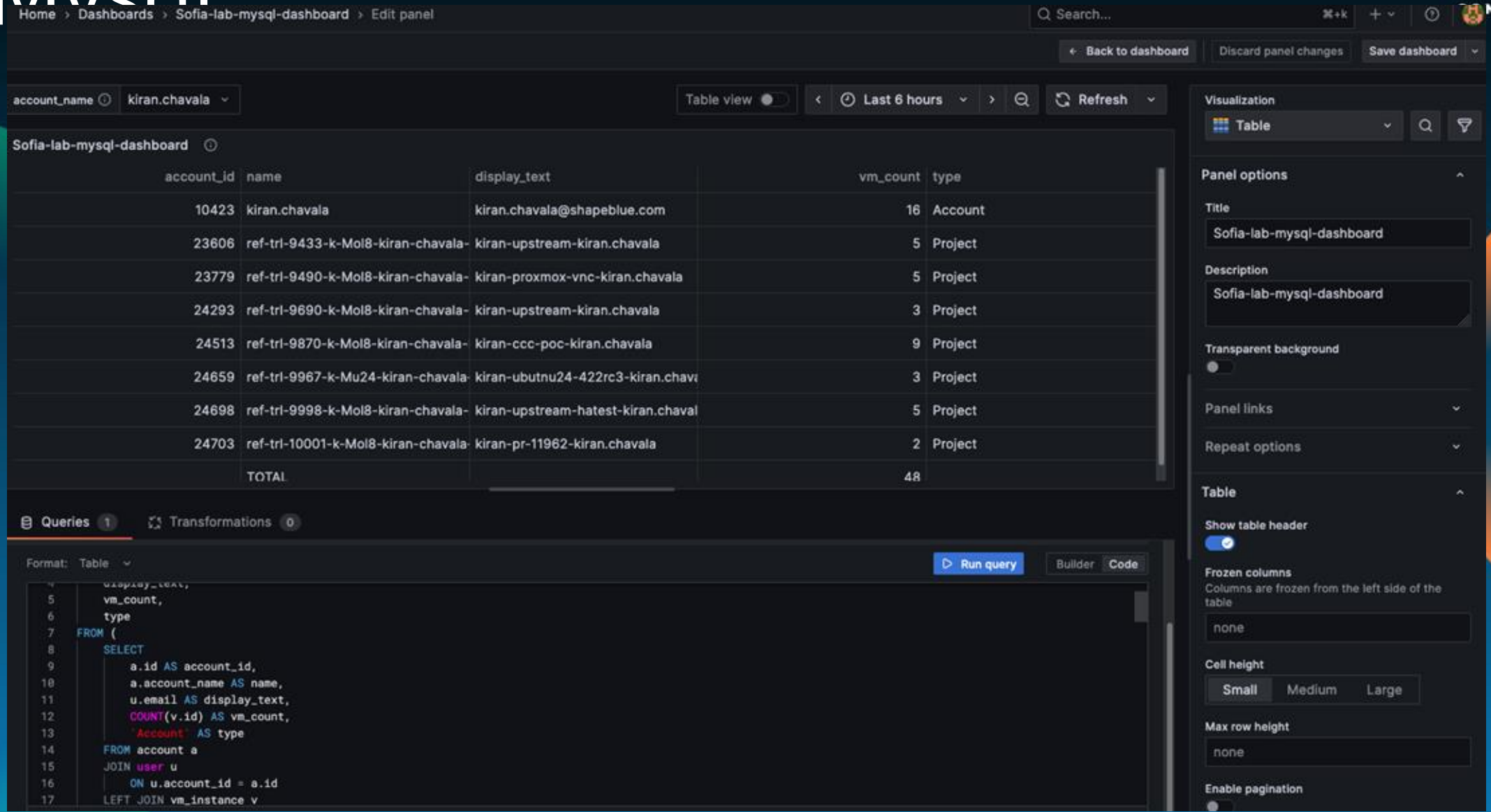


# Grafana Dashboard for MySQL


```
CREATE USER 'grafana' IDENTIFIED BY 'password';
GRANT SELECT ON cloud.* TO 'grafana';
```

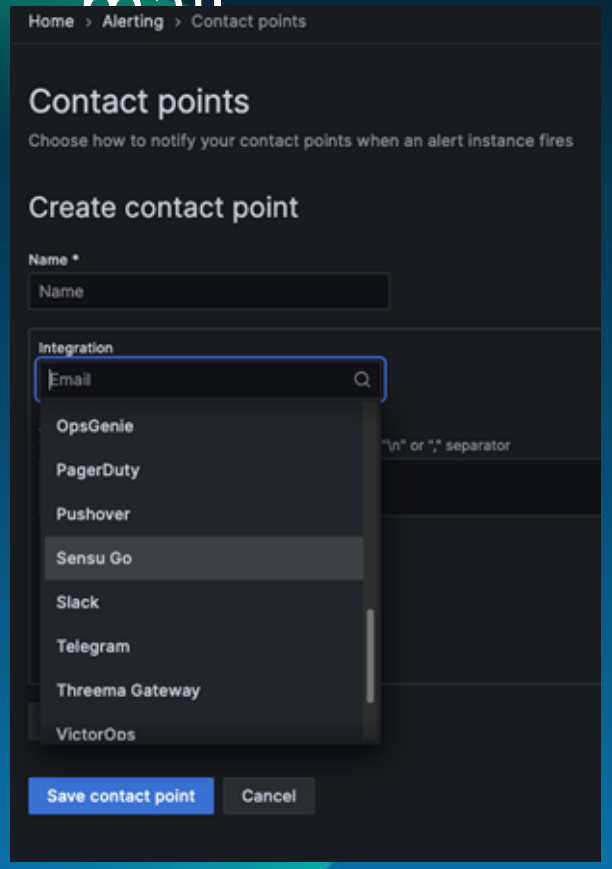



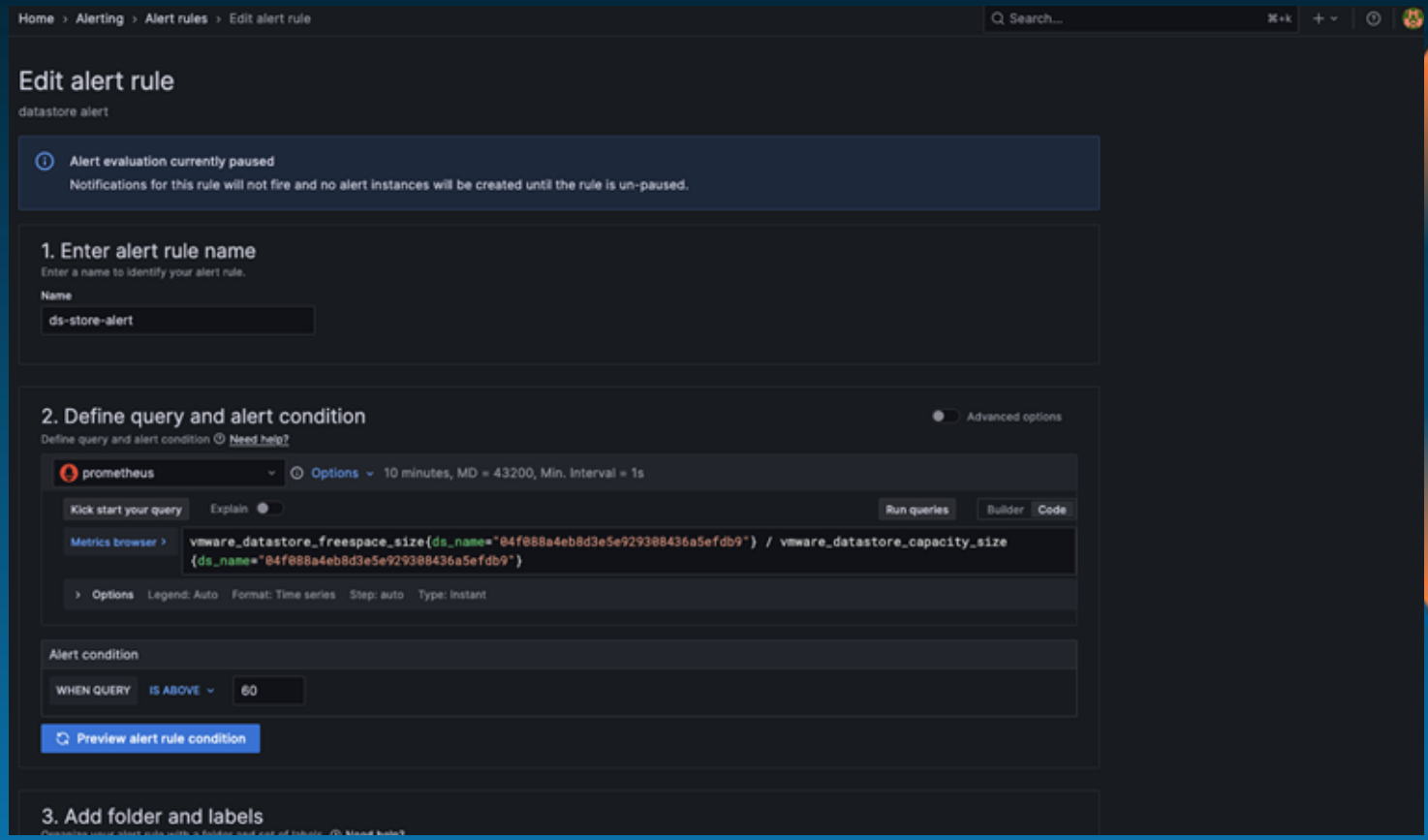
# Grafana Dashboard for CloudStack Mysql



# Grafana Alerts

- Send alerts to various touch points. E.g.: Slack, Pagerduty, e-mail



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# Lessons Learned & Best Practices

# Start Small

1

Begin with a minimal Prometheus + Grafana setup.

2

Add hypervisor exporters gradually (KVM, Xen, VMware).

3

Integrate Alloy and Loki only after validating core metrics.

# Use Consistent Naming

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1

Define a naming convention early.

2

Apply labels consistently (zone, cluster, host, vm_id).

3

Consistent labels simplify dashboards and alerting.

# Centralize Dashboards

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1

Keep shared dashboards in a central Grafana organization.

2

Standardize templates for prod/test using folders and variables.

3

Reuse the same dashboard logic across multiple sites.

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# Conclusion

# CloudStack is a Rich Data Source

- Generates valuable metrics across all layers.
- The challenge is visibility, not availability.
- With exporters and pipelines, it becomes a strong observability platform.

# Grafana Stack Delivers Unified Observability

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- Grafana + Prometheus + Loki + Alloy form a cohesive ecosystem.
- Vendor-neutral and open-source.
- Enables cross-layer insight: management, hypervisor, tenant workloads.

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# Unified Monitoring Improves Reliability

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DASHBOARDS ACCELERATE ROOT-CAUSE ANALYSIS.

PROACTIVE ALERTS REDUCE DOWNTIME AND BLIND SPOTS.

TEAMS CAN DETECT ANOMALIES AND FORECAST RESOURCE NEEDS IN REAL TIME.

# References

- **Official Resources**
  - Grafana Dashboards Library: community-built dashboards for CloudStack, VMware, and Xen.

- **Community Exporters**
  - CloudStack Monitoring GitHub: exporter configs, dashboards, setup guides.

    https://github.com/kiranchavala/cloudstack-monitoring

  - VMware Monitoring Blog: collecting VMware cluster metrics with Prometheus.

    https://michaelkotelnikov.medium.com/monitoring-vmware-clusters-using-prometheus-and-grafana-6223bb7936f9

- **Prebuilt Dashboards**
  - CloudStack & Libvirt Dashboard (Grafana ID: 23228).
  - Xen Hypervisor Dashboard (Grafana ID: 16588).

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# Q&A