

Visualize Your Data With Grafana

Percona Live 2017

Daniel Lee - Software Engineer at Grafana Labs

Daniel Lee

- Software Engineer at Grafana Labs
- Stockholm, Sweden
- @danlimerick on Twitter

What is Grafana?



The Grafana Project

- First release on January, 2014.
- Apache License
- 17800 Stars on GitHub
- > 3000 forks

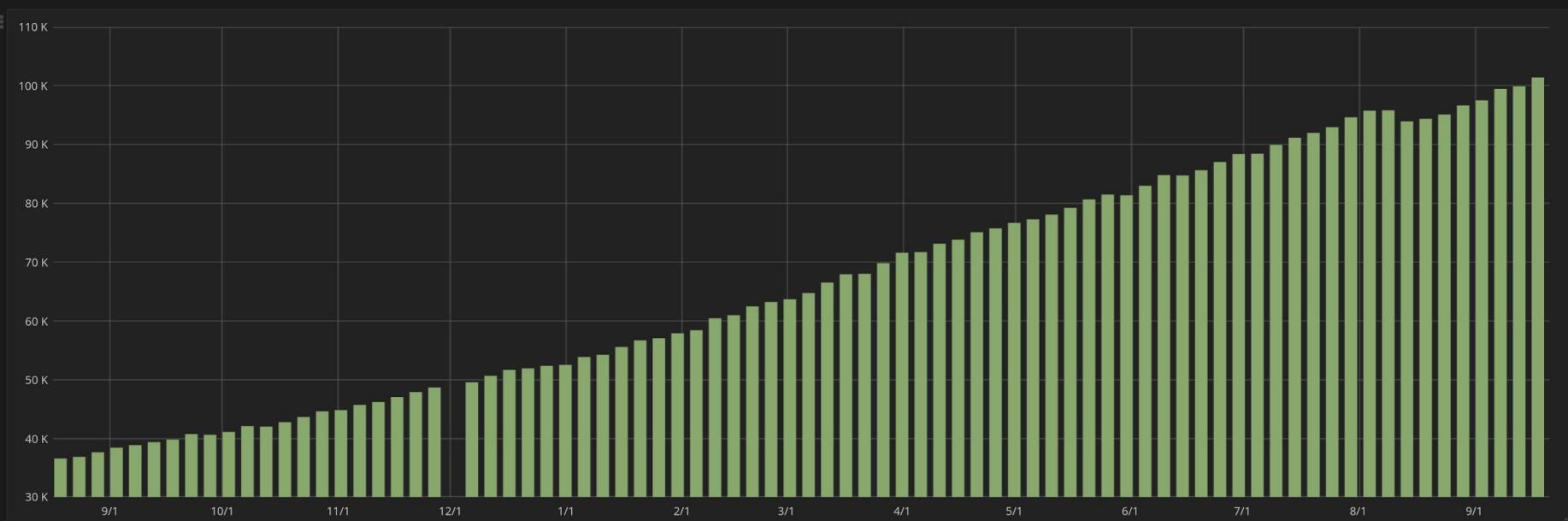


Stats Installs



Zoom Out

Last 400 days



Grafana Installations - the last 400 days

 **Grafana** **Labs**

Agenda

1. Introduction to Grafana
2. Introduction to Monitoring
3. Monitoring MySQL
4. Application Metrics
5. The new MySQL data source for Grafana

Timeseries Definition

A time series is a sequence of values in time order.

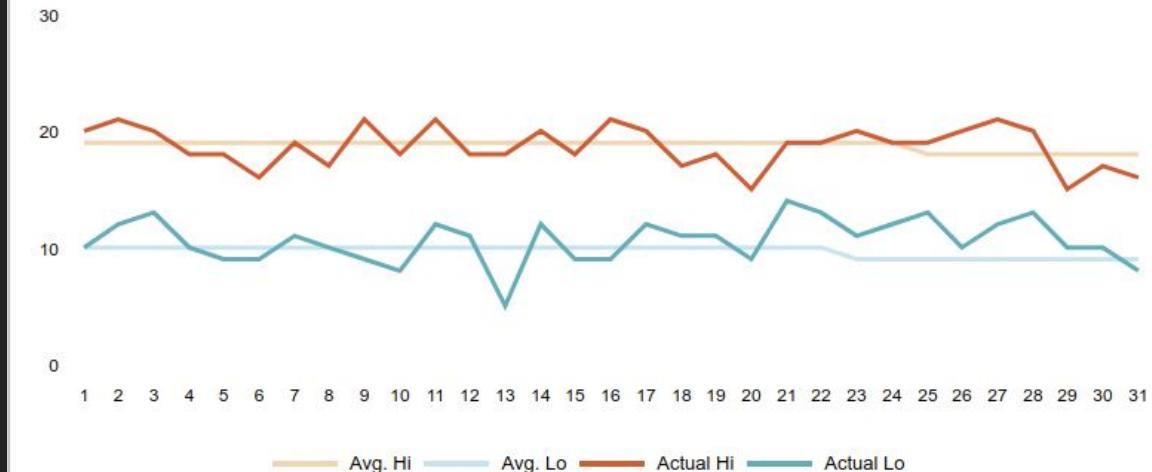
Most commonly the sequence is taken at evenly spaced points in time.

Timeseries Are Everywhere

Today and tonight, 14 September 2017

Time	Forecast	Temp.	Precip.	Wind
Thursday 11:00		13°	0 mm	Moderate breeze, 7 m/s from northwest
Thursday 12:00		14°	0 mm	Moderate breeze, 7 m/s from northwest
Thursday 13:00		14°	0 mm	Moderate breeze, 7 m/s from northwest
Thursday 14:00		15°	0 mm	Moderate breeze, 7 m/s from northwest
Thursday 15:00		15°	0.2 mm	Fresh breeze, 8 m/s from west-northwest
Thursday 16:00		14°	0 mm	Fresh breeze, 8 m/s from west-northwest
Thursday 17:00		14°	0 mm	Fresh breeze, 8 m/s from west-northwest
Thursday 18:00		13°	0 mm	Moderate breeze, 7 m/s from west-northwest
Thursday 19:00		12°	0 mm	Moderate breeze, 6 m/s from west-northwest
Thursday 20:00		11°	0 mm	Gentle breeze, 5 m/s from west-northwest

Temperature Graph August 2017



Logs Can Be Timeseries

```
t=2017-09-17T20:41:05+0000 lvl=info msg="Starting Grafana" logger=server version=4.5.1 commit=c114c46 compiled=2017-09-15T08:05:51+0000
t=2017-09-17T20:41:05+0000 lvl=info msg="Config loaded from" logger=settings file=/usr/share/grafana/conf/defaults.ini
t=2017-09-17T20:41:05+0000 lvl=info msg="Config loaded from" logger=settings file=/etc/grafana/grafana.ini
t=2017-09-17T20:41:05+0000 lvl=info msg="Config overridden from command line" logger=settings arg="default.paths.data=/var/lib/grafana"
t=2017-09-17T20:41:05+0000 lvl=info msg="Config overridden from command line" logger=settings arg="default.paths.logs=/var/log/grafana"
t=2017-09-17T20:41:05+0000 lvl=info msg="Config overridden from command line" logger=settings arg="default.paths.plugins=/var/lib/grafana/plugins"
t=2017-09-17T20:41:05+0000 lvl=info msg="Config overridden from command line" logger=settings arg="default.log.mode=console"
t=2017-09-17T20:41:05+0000 lvl=info msg="Path Home" logger=settings path=/usr/share/grafana
t=2017-09-17T20:41:05+0000 lvl=info msg="Path Data" logger=settings path=/var/lib/grafana
t=2017-09-17T20:41:05+0000 lvl=info msg="Path Logs" logger=settings path=/var/log/grafana
t=2017-09-17T20:41:05+0000 lvl=info msg="Path Plugins" logger=settings path=/var/lib/grafana/plugins
t=2017-09-17T20:41:05+0000 lvl=info msg="Initializing DB" logger=sqlstore dbtype=sqlite3
t=2017-09-17T20:41:05+0000 lvl=info msg="Starting DB migration" logger=migrator
t=2017-09-17T20:41:05+0000 lvl=info msg="Executing migration" logger=migrator id="copy data account to org"
t=2017-09-17T20:41:05+0000 lvl=info msg="Skipping migration condition not fulfilled" logger=migrator id="copy data account to org"
t=2017-09-17T20:41:05+0000 lvl=info msg="Executing migration" logger=migrator id="copy data account_user to org_user"
t=2017-09-17T20:41:05+0000 lvl=info msg="Skipping migration condition not fulfilled" logger=migrator id="copy data account_user to org_user"
t=2017-09-17T20:41:05+0000 lvl=info msg="Starting plugin search" logger=plugins
t=2017-09-17T20:41:05+0000 lvl=info msg="Registering plugin" logger=plugins name="Azure Monitor"
t=2017-09-17T20:41:05+0000 lvl=info msg="Registering plugin" logger=plugins name=Clock
t=2017-09-17T20:41:05+0000 lvl=info msg="Initializing Alerting" logger=alerting.engine
t=2017-09-17T20:41:05+0000 lvl=info msg="Initializing CleanUpService" logger=cleanup
t=2017-09-17T20:41:05+0000 lvl=info msg="Initializing Stream Manager"
t=2017-09-17T20:41:05+0000 lvl=info msg="Initializing HTTP Server" logger=http.server address=0.0.0.0:3000 protocol=http subUrl= socket=
```



matthewv
@matthewv

Follow

Nerding out tonight. Wrote a script to get my
@Battlefield stats into @InfluxDB so I could
graph in @grafana. #wip #bf1 #statsonstats



1:40 AM - 28 Jul 2017

Battlefield Stats

 Grafana Labs

Aggregations

- Aggregations over time
- Summarize functions
 - Sum, max, min, count, avg, percentiles
- Can visualize the data from different angles

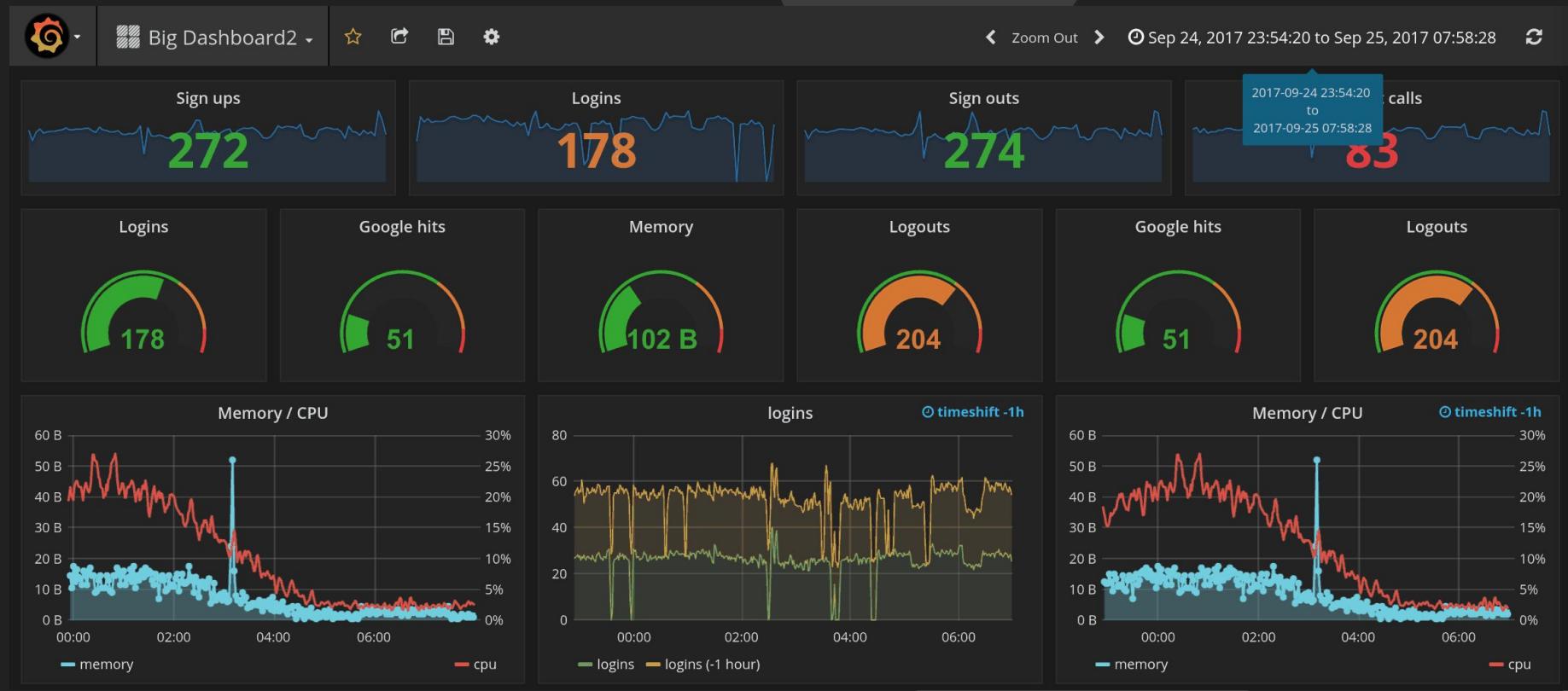
Timeseries Value Types

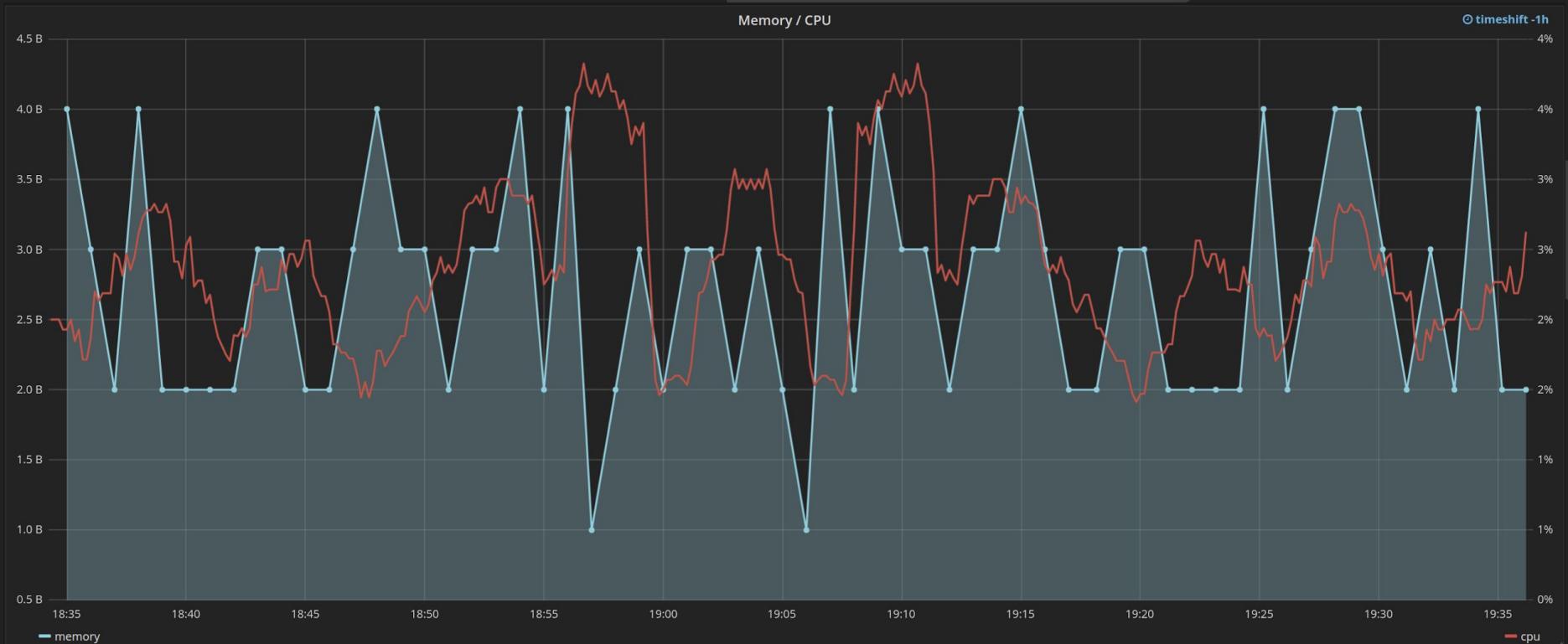
- Gauges
- Counters
- Timers

Timeseries Databases

- Not really relational data
- More efficient at storing timeseries data
- Better at querying timeseries data

Grafana Dashboards





Graph Panel



 Grafana Labs

Graph Panel - Display Options

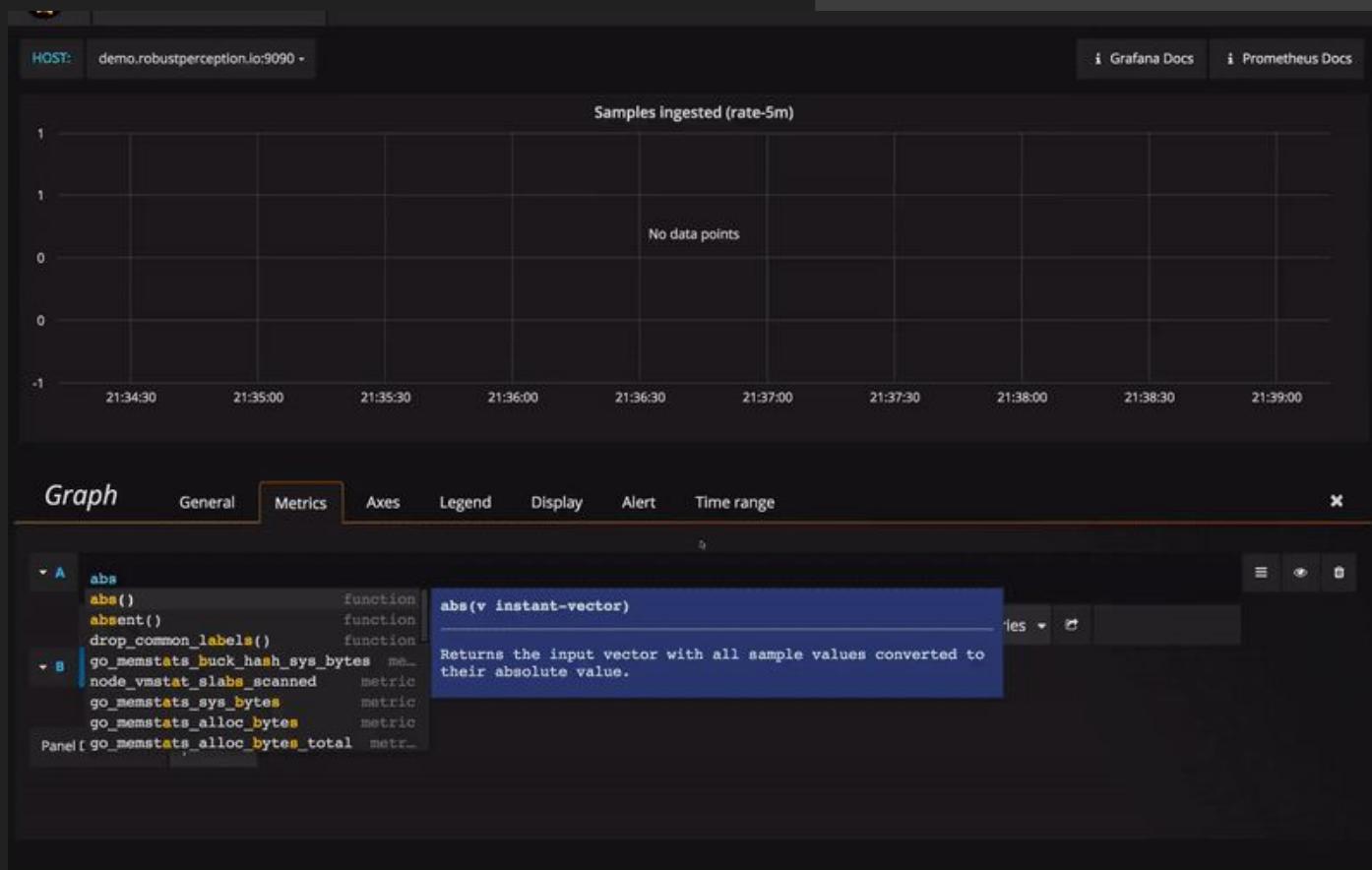


~40 Published Data Sources

	CloudWatch by Grafana Labs
	Elasticsearch by Grafana Labs Elasticsearch Data Source for Grafana
	Graphite by Grafana Labs
	InfluxDB by Grafana Labs
	OpenTSDB by Grafana Labs
	Prometheus by Grafana Labs
	Ambari Metrics by Prajwal Rao

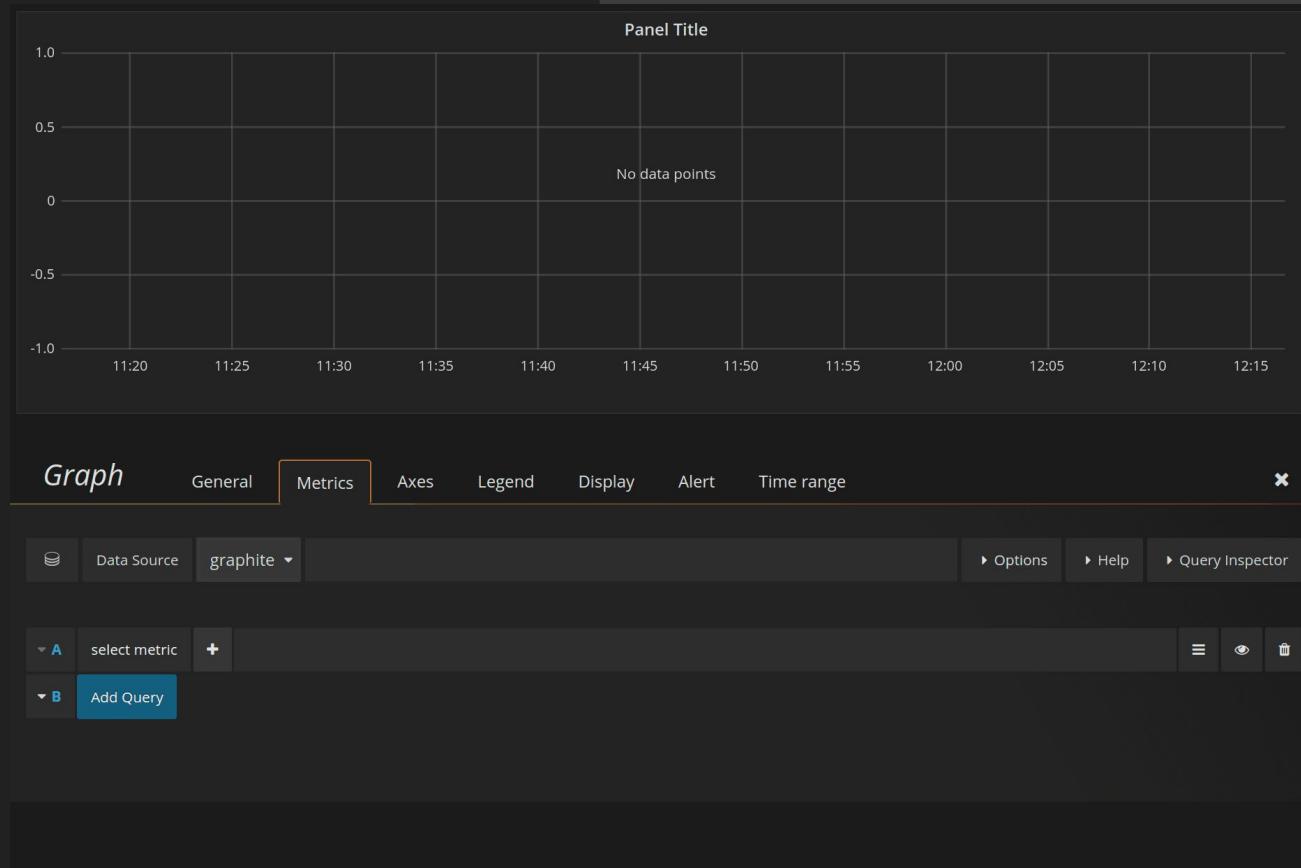
	AppDynamics by dlopes7 Appdynamics datasource
	Blueflood by rackerlabs blueflood datasource
	ClickHouse by Vertamedia ClickHouse datasource for Grafana
	Cloudera Manager by Foursquare Cloudera Manager datasource
	Crate by Crate.IO Crate SQL Database datasource
	DalmatinerDB by dalmatinerdb DalmatinerDB Datasource
	DataDog by Grafana Labs DataDog datasource

And many more...



Query Editors - Prometheus

 **Grafana Labs**



Query Editors - Graphite

 **Grafana** Labs

Graph

General

Metrics

Axes

Legend

Display

Alert

Time range



Data Source

InfluxDB ▾

▶ Options

▶ Help

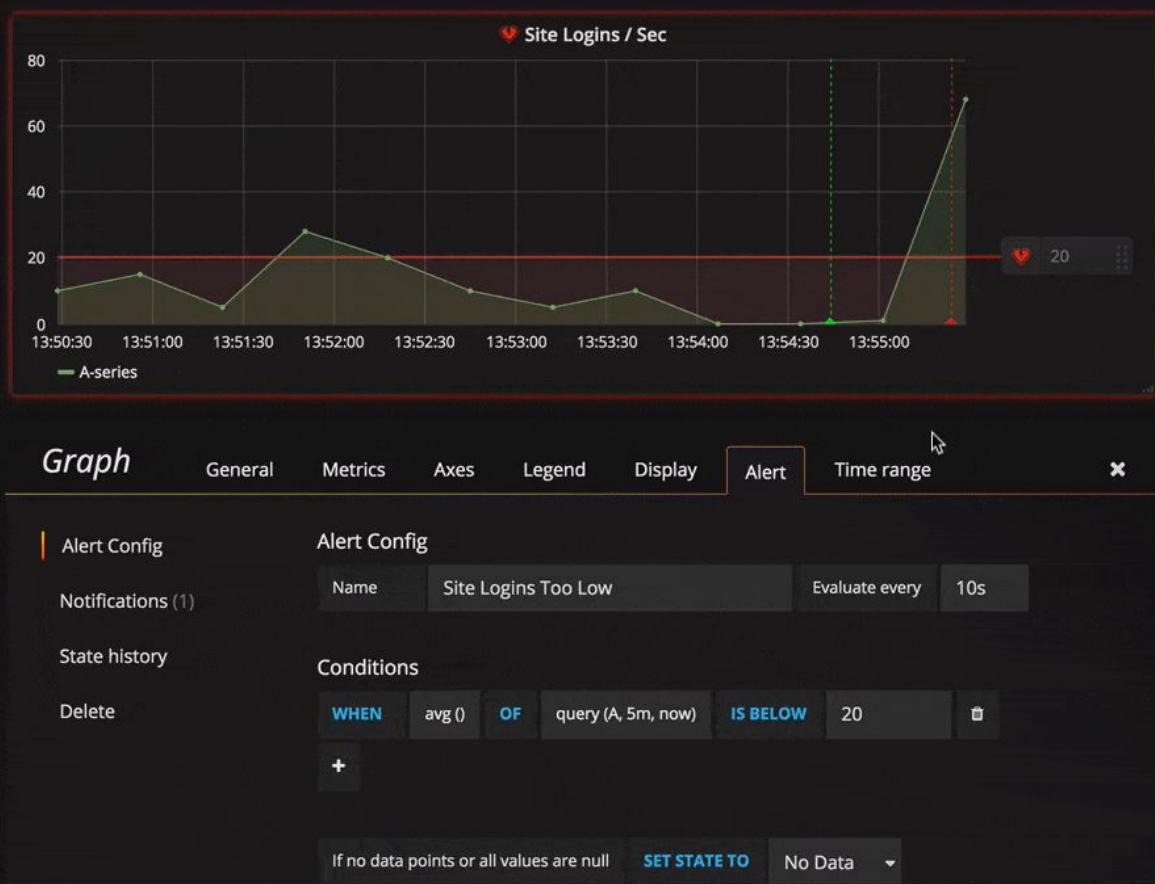
▶ Query Inspector

A	FROM	default	logins.count	WHERE	datacenter	=~	/^\$datacenter\$/	AND	hostname	=~	/^\$host\$/	+		☰	👁	✖
	SELECT	field (value)	mean ()	+												
	GROUP BY	time (auto)	tag (hostname)	+												
	FORMAT AS	Time series														
	ALIAS BY	\$tag_hostname														

▼ B Add Query

Query Editors - InfluxDB

 Grafana Labs



Alerting



Time series to columns

Time ▾	backend_01	backend_02	backend_03	backend_04
2017-01-20 12:07:10	241 °F	246 °F	248 °F	254 °F
2017-01-20 12:07:00	260 °F	265 °F	270 °F	238 °F
2017-01-20 12:06:50	243 °F	255 °F	253 °F	243 °F
2017-01-20 12:06:40	259 °F	280 °F	254 °F	280 °F
2017-01-20 12:06:30	230 °F	223 °F	247 °F	236 °F
2017-01-20 12:06:20	319 °F	308 °F	337 °F	349 °F
2017-01-20	250 °F	262 °F	270 °F	232 °F

1 2 3

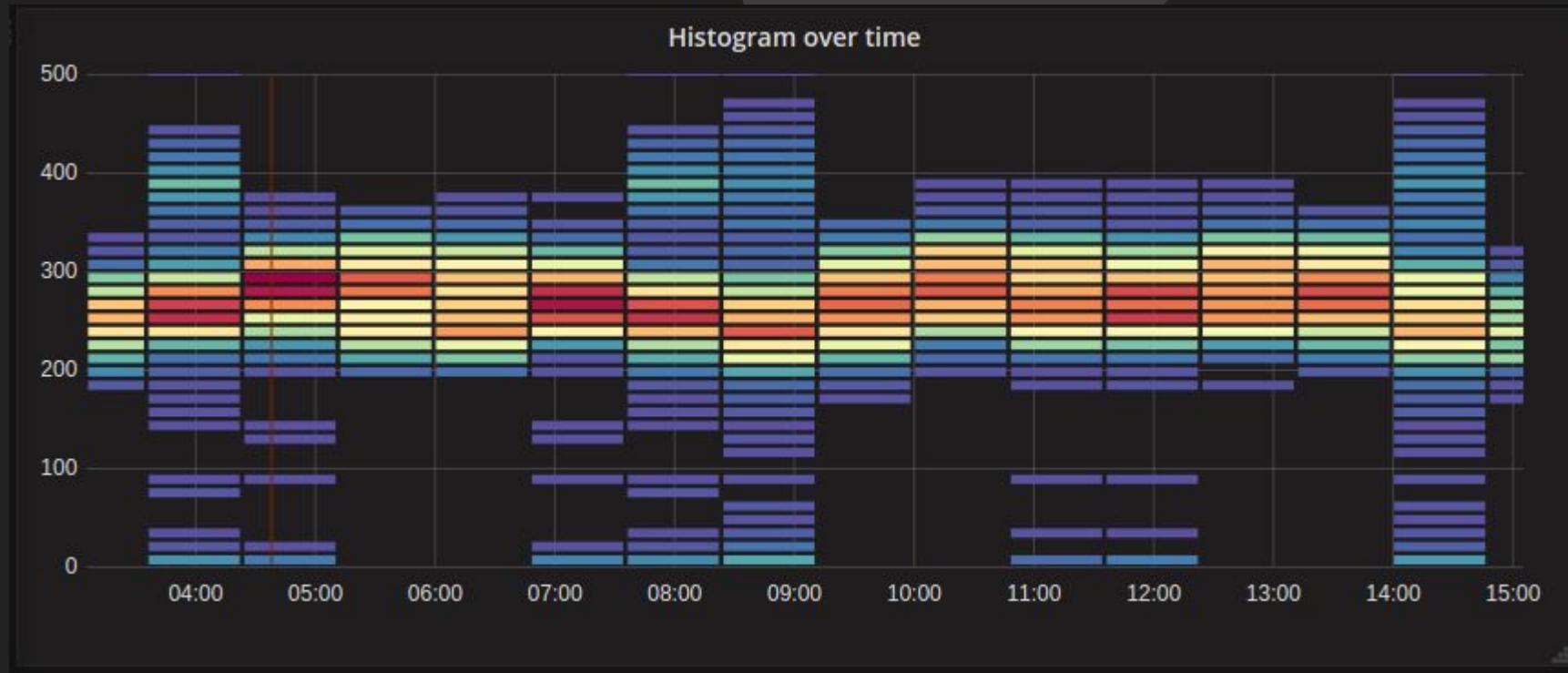
Time series aggregations

Metric	Min	Max ▾	Avg	Current
backend_04	199 eV	349 eV	273 eV	254 eV
backend_02	216 eV	346 eV	273 eV	246 eV
backend_03	220 eV	341 eV	272 eV	248 eV
backend_01	196 eV	336 eV	271 eV	241 eV

Row color mode

Time ▾	backend_01
2017-01-20 12:07:00	260.00
2017-01-20 12:06:50	243.00
	250.00

Histogram over time





server All ▾

Graph



Table

Metric	Avg	Total
backend_04	270.98	146.06 K
backend_03	272.67	146.70 K
backend_02	269.20	144.83 K
backend_01	257.22	138.13 K

Single stat

1065

Plugins

Official & community built plugins

Plugin Type:

- All
- Panel
- Data Source
- App

Premium Plugins:

- All Plugins
- Premium Only

 Data Source plugins allow you to extend Grafana to connect to different databases and online sources.

 DATA SOURCE



CloudWatch

by Grafana Labs

 DATA SOURCE



Elasticsearch

by Grafana Labs

 DATA SOURCE



Graphite

by Grafana Labs

 DATA SOURCE



InfluxDB

by Grafana Labs

 DATA SOURCE



OpenTSDB

by Grafana Labs

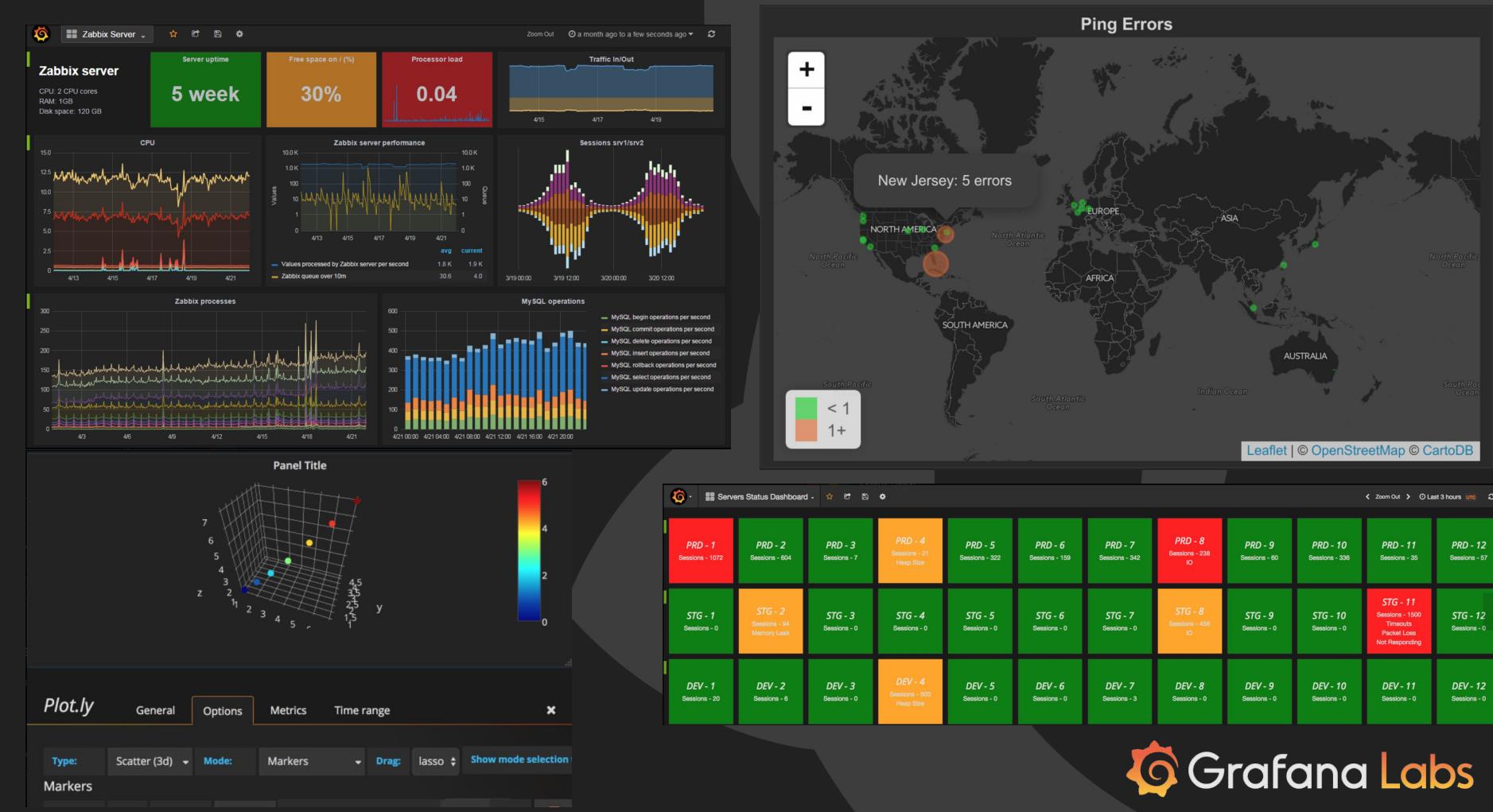
 DATA SOURCE



Prometheus

by Grafana Labs





Ready Made Dashboards

Dashboards

Official & community built dashboards

Filter by:

Data Source

All

Panel Type

All

Category

All

Collector

All

Search within this list

 mysql

Share your dashboards

Export any dashboard from Grafana 3.1 or greater and share your creations with the community.



Dashboard Mysql Zabbix by haman

Example dashboard of database Myssql

 ZABBIX  ICINGA

Downloads: 62



Dashboard Mysql Zabbix by André Bello

Example dashboard of database Myssql

 ZABBIX

Downloads: 1153



MYSQL (Multiple) by Malcolm Badley

InfluxDB dashboards for telegraf metrics

 INFLUXDB  TELEGRAF

Downloads: 20



MYSQL (Multiple) by Malcolm Badley

InfluxDB dashboards for telegraf metrics

 INFLUXDB  TELEGRAF

Downloads: 38



MySQL Dashboards for Graphite by matejz

Percona MySQL dashboards that work with graphite

 GRAPHITE  COLLECTD

Downloads: 1271

GrafanaCloud

The screenshot shows the GrafanaCloud website homepage. At the top, there's a navigation bar with links for Docs, Community, Events, GrafanaCon, Blog, Personal (with a dropdown menu), Grafana, GrafanaCloud, Services, Dashboards, Plugins, and Get Grafana. Below the navigation is a secondary navigation bar with tabs for Overview, Hosted Grafana (which is selected and highlighted in orange), Hosted Metrics, and worldPing.

Hosted Grafana

THE CORNERSTONE OF GRAFANA CLOUD

Hosted Grafana lets you move faster, and get the most out of the software you know and love. Because you should focus on your apps, not your ops.



We wrote Grafana, and we can host it for you, too.

Highly Available, Dedicated to You



Your own highly available, dedicated Grafana instance. Always stable, and always up to date. Stop mucking with VMs and EC2 instances, and leave this to us. Who better to run your Grafana than the core developers?

Proactive Monitoring



Who watches the watcher? We consider this stuff mission critical. Rest easy knowing that we're here 24x7x365, watching your query performance, ensuring your alerts always run, and generally keeping your users happy.

Support when you need it



Choosing a plan with Basic Support gives you a quick and easy way to get answers from the Grafana team. Plus, get access to premium plugins like Splunk, Datadog, New Relic and more, with new ones coming all the time.

Monitoring

“observe and check the progress or quality of (something) over a period of time; keep under systematic review.”

or

What's broken, and why?

Observability

- A culture of being data-driven/data-informed
- Whitebox monitoring
- Application metrics
- Something you have to build into your system

Whitebox Monitoring

1. Know when stuff fails
2. Be able to debug why it failed
3. Future trends
 - Detect future problems
 - capacity planning

Know when stuff fails

Monitor symptoms. Not causes.

- Throughput (Rate)
- number of errors (Errors)
- Performance (Duration)

Based on:

- Googles' Four Golden Signals
- R.E.D

Monitoring MySQL - Metrics to alert on

Depends on your context.

Some examples:

- Connections
- Query Latency/Run Time
- Query Errors
- Slow Queries

Monitoring MySQL - querying for metrics

- INFORMATION_SCHEMA
- PERFORMANCE_SCHEMA
- Counters:

```
select
    lower(variable_name) as variable_name,
    variable_value from global_status
where variable_name = 'slow_queries' or variable_name = 'max_used_connections'
```

Monitoring MySQL

1. Collect data
2. Write to a Timeseries database
3. Visualize in Grafana
4. Add alert rules

Collector/Timeseries DB Combinations

1. CollectD + Graphite
2. Telegraf + InfluxDB
3. Node Exporter + Prometheus
4. Lots of other combinations

Where to find out more

Prometheus

- mysqld_exporter
- Roman Vynars' presentations at PerconaLive and Promcon

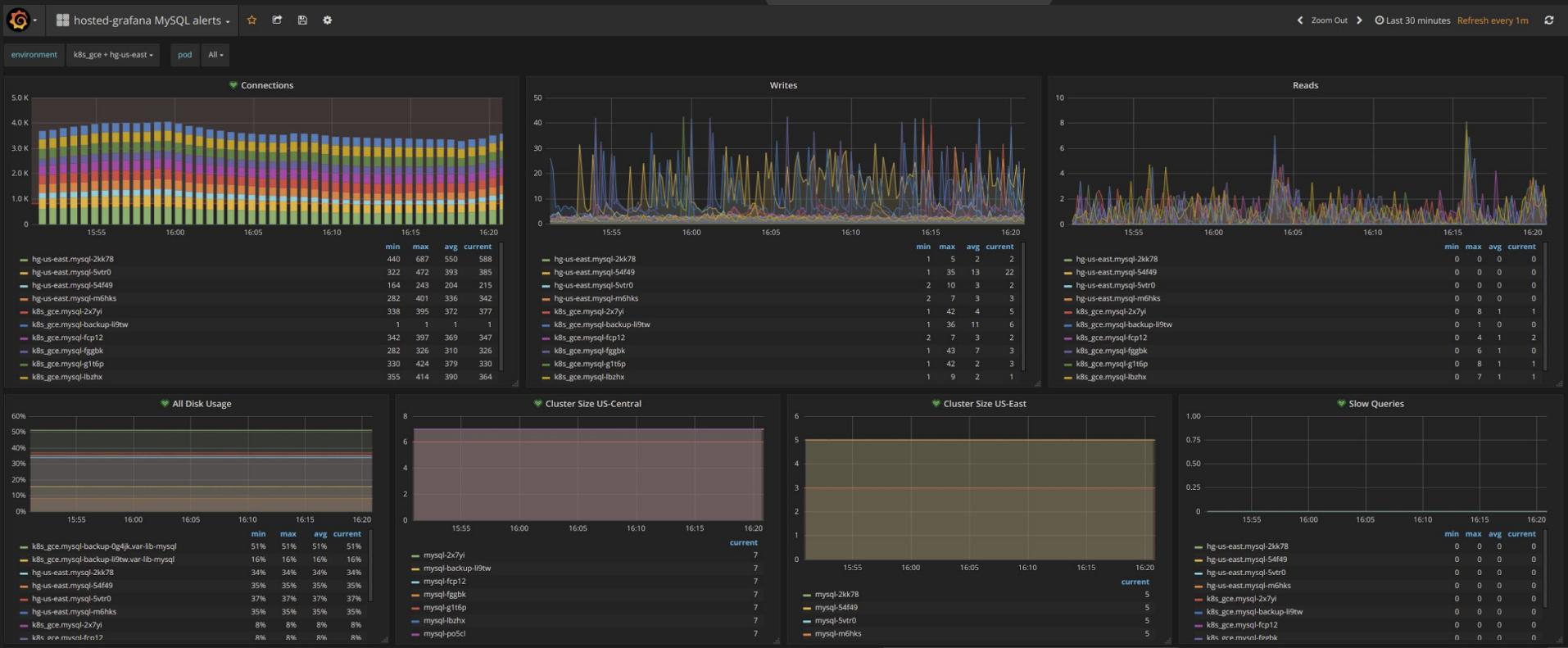
InfluxDB

- Telegraf MySQL Input plugin

CollectD

- MySQL plugin
- DBI plugin

An Example: Monitoring MySQL for GrafanaCloud



Alert Query for Connections

Graph General Metrics Axes Legend Display Alert Time range

A collectd {k8s_gce,hg-us-east} mysql * mysql cluster threads connected consolidateBy(max) sortByName(true) removeEmptySeries() aliasByNode(1, 3) +

B Add Query

Alert Condition for Connections

Graph General Metrics Axes Legend Display Alert Time range

Alert Config

Notifications (2)

Name: Connections alert Evaluate every: 60s

State history

Conditions

Delete WHEN: avg () OF: query (A, 5m, now) IS ABOVE: 800

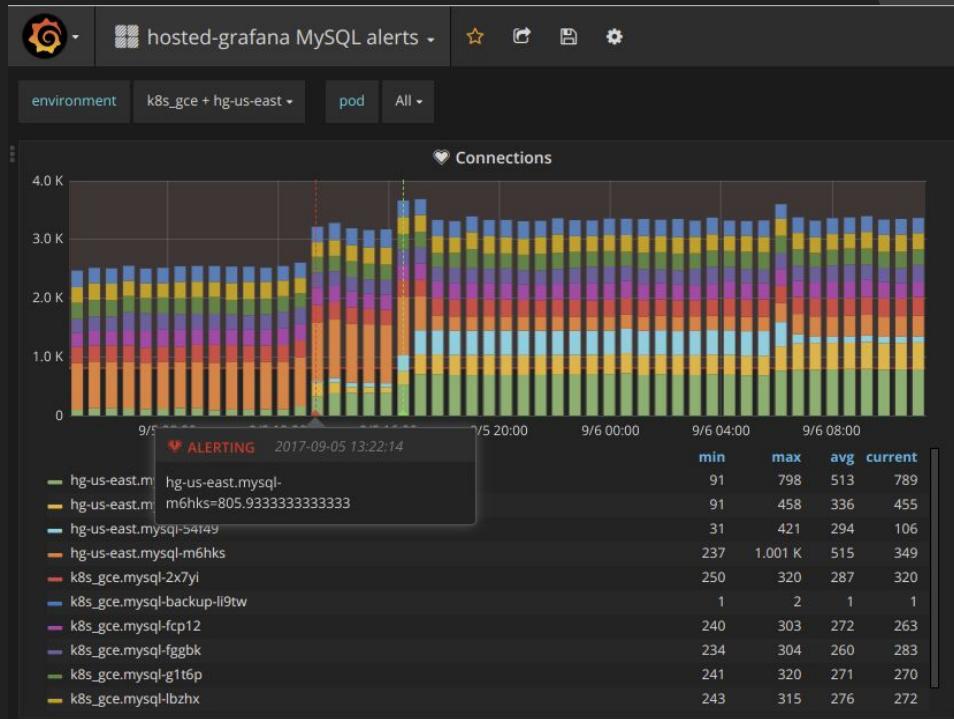
+ -

If no data or all values are null SET STATE TO: No Data

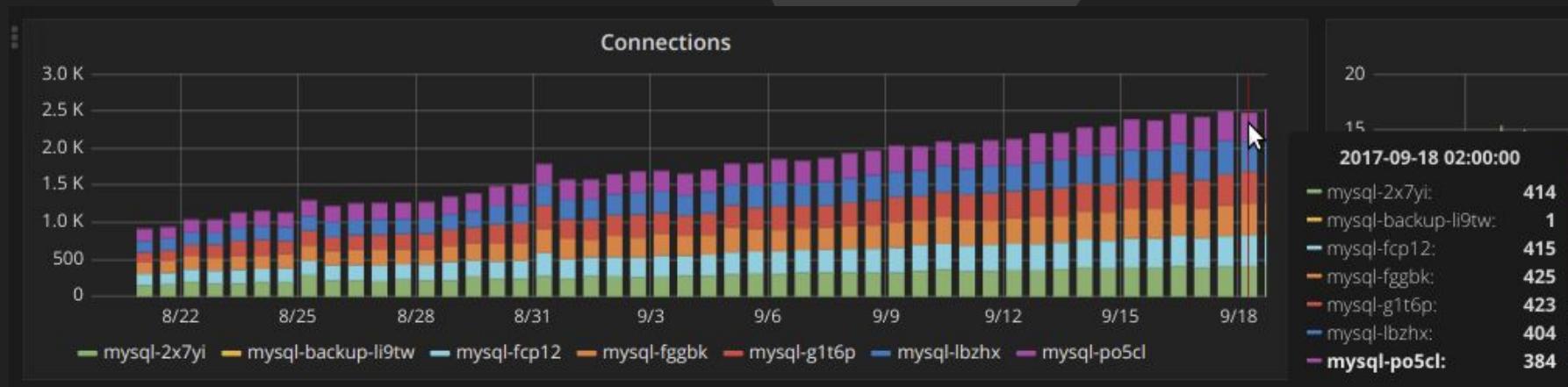
If execution error or timeout SET STATE TO: Keep Last State

Test Rule

Triggered Alert



Trends - Last 30 Days



Application Metrics

- Measure the user experience
- Communicate with Graphs and Metrics

The MySQL Data Source

Demo

Demo Fail Backup - Create Table

```
1 • CREATE TABLE `bid` (
2     `id` int(11) NOT NULL AUTO_INCREMENT,
3     `auction_id` int(11) NOT NULL,
4     `user_id` int(11) NOT NULL,
5     `amount` varchar(45) NOT NULL,
6     `timestamp` timestamp NOT NULL DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP,
7     PRIMARY KEY (`id`)
8 ) ENGINE=InnoDB AUTO_INCREMENT=1 DEFAULT CHARSET=latin1;
```

Demo Fail Backup - Query

Graph General Metrics Axes Legend Display Alert Time range X

Data Source: mysql ▾ Query Inspector

A

```
SELECT
    MIN(UNIX_TIMESTAMP(timestamp)) as time_sec,
    sum(amount) as value,
    'bids' as metric
FROM bid
WHERE $__timeFilter(timestamp)
GROUP BY date_format(timestamp, $interval)
ORDER BY date_format(timestamp, $interval) ASC
```

≡ eye trash

Format as: Time series ▾ Show Help ▾ Generated SQL ▾

B

```
SELECT
    MIN(UNIX_TIMESTAMP(timestamp)) as time_sec,
    sum(amount) as value,
    'bids' as metric
FROM bid
WHERE timestamp >= FROM_UNIXTIME(1506204000) AND timestamp <= FROM_UNIXTIME(1506332499)
GROUP BY date_format(timestamp, '%Y%m%d%H')
ORDER BY date_format(timestamp, '%Y%m%d%H') ASC
```

Add Query

Demo Fail Backup - Query Zoomed In

```
SELECT
    MIN(UNIX_TIMESTAMP(timestamp)) as time_sec,
    sum(amount) as value,
    'bids' as metric
FROM bid
WHERE $__timeFilter(timestamp)
GROUP BY date_format(timestamp, $interval)
ORDER BY date_format(timestamp, $interval) ASC
```

Demo Fail Backup - Template Variable

Templating

Variables

Edit

Help



Variable

Name	interval	Type	Query
Label	optional display name	Hide	

Query Options

Data source	mysql	Refresh	Never
Query	select 'minute' AS __text, '%Y%m%d%H%' as __value union select 'hour' AS __text, '%Y%m%d%H' as __value union select 'day' AS __text, '%Y%m%d' as __value union select 'month' AS __text, '%Y%m' as __value		
Regex	/.*/-(.*).*/		
Sort	Disabled		

Demo Fail Backup - Graph

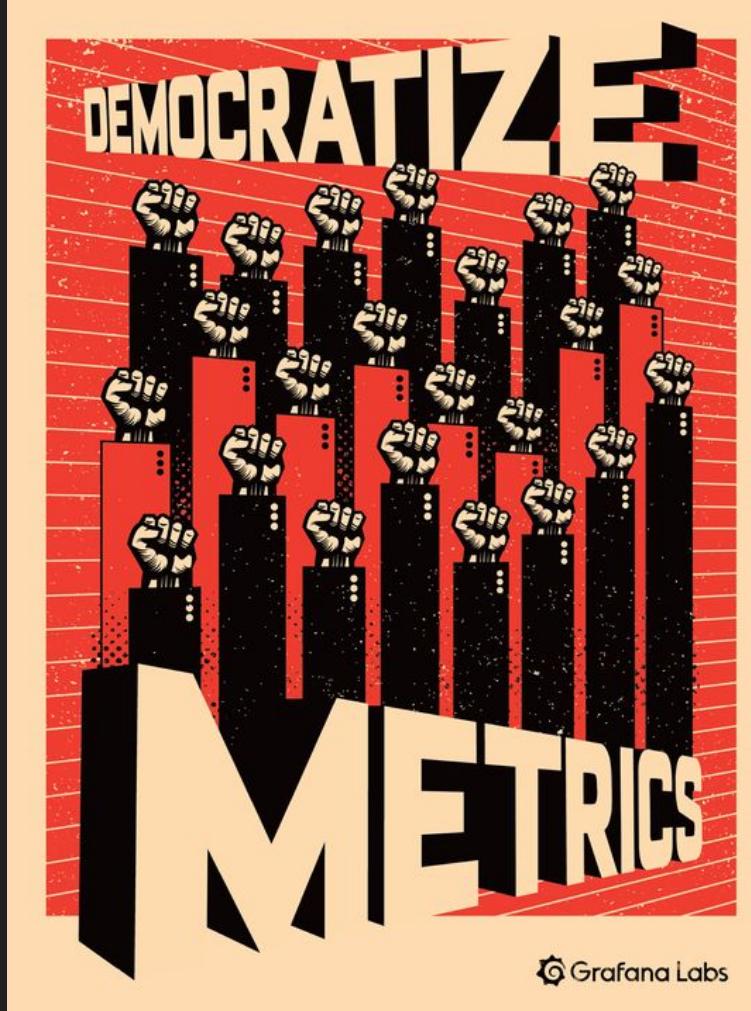
interval

hour ▾



Demo Fail Backup - Timeshifted 1 Week





 Grafana Labs

Recommended Talks

- GrafanaCon 2016: Brian Brazil, Monitoring What Matters
- PromCon 2016: Roman Vynar, Graphing MySQL Performance with Prometheus and Grafana
- Monitorama 2016: Torkel Ödegaard - Grafana Masterclass
- Grafana Screencasts by Torkel Ödegaard on docs.grafana.org

But wait there's more

Grafana 5.0 coming soon:

- Postgres Data Source
- Dashboard Folders
 - Dashboard permissions
- Elasticsearch Alerting
- Cloudwatch Alerting
- New Dashboard layout engine

Dashboard Folders

The screenshot shows the Grafana interface for managing dashboards. On the left, there's a sidebar with a gear icon and a search bar labeled "Find dashboards by name". The sidebar lists several dashboard folders and individual dashboards:

- FirstTestDashFolder
- MyDashboards
 - Big Dashboard
 - DashWithPerms
 - New dashboardNoPerms
- Plugins
 - Ajax Panel
 - Breadcrumbs
 - BrianGann Datatable Panel
 - Clickhouse
 - Clock
 - Linksmart HDS
 - Logstream
 - Zabbix
- SecondDashFolder

At the top of the main content area, there's a navigation bar with a downward arrow, "starred", and "tags". Below it, a row of colored tags is displayed: clock (orange), home (purple), mysql (blue), presentation (red), and startpage (teal). The main content area shows a list of dashboards with their names and a star icon for favoriting.



Big Dashboard2



Add Panel

Zoom Out

Sep 20, 2017 10:57:43 to Sep 22, 2017 11:57:36



Sign ups

1591

Logins

1070

Sign outs

1615

Support calls

489

Logins



Google hits



Memory



Logouts



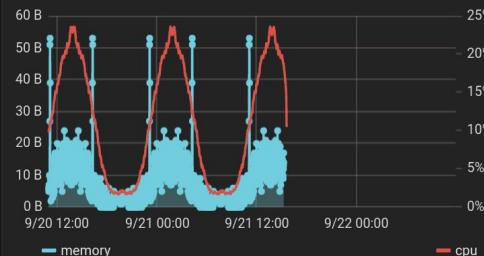
Google hits



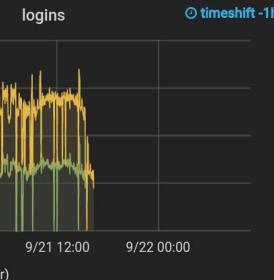
Logouts



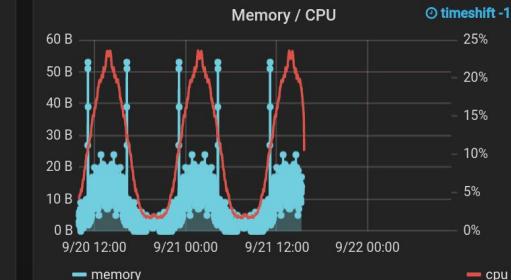
Memory / CPU



logins



Memory / CPU



New Dashboard Layout Engine

Grafana Labs

Q&A

- Get Grafana - grafana.com
- GrafanaCloud: <https://grafana.com/cloud/grafana>
- Play Site: <http://play.grafana.org>
- github.com/grafana/grafana
- @grafana
- @danlimerick