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
Grafana Installations - the last 400 days
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

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

Temperature Graph August 2017

Grafana Labs
Logs Can Be Timeseries

```
2017-09-17T20:41:05+0000 lvl=info msg="Starting Grafana" logger=server version=4.5.1 commit=114c46 compiled=2017-09-15T08:05:51+0000
2017-09-17T20:41:05+0000 lvl=info msg="Config loaded from" logger=settings file=/usr/share/grafana/conf/defaults.ini
2017-09-17T20:41:05+0000 lvl=info msg="Config loaded from" logger=settings file=/etc/grafana/grafana.ini
2017-09-17T20:41:05+0000 lvl=info msg="Config overridden from command line" logger=settings arg="default.paths.data=/var/lib/grafana"
2017-09-17T20:41:05+0000 lvl=info msg="Config overridden from command line" logger=settings arg="default.paths.logs=/var/log/grafana"
2017-09-17T20:41:05+0000 lvl=info msg="Config overridden from command line" logger=settings arg="default.paths.plugins=/var/lib/grafana/plugins"
2017-09-17T20:41:05+0000 lvl=info msg="Config overridden from command line" logger=settings arg="default.log.mode=console"
2017-09-17T20:41:05+0000 lvl=info msg="Path Home" logger=settings path=/usr/share/grafana
2017-09-17T20:41:05+0000 lvl=info msg="Path Data" logger=settings path=/var/lib/grafana
2017-09-17T20:41:05+0000 lvl=info msg="Path Logs" logger=settings path=/var/log/grafana
2017-09-17T20:41:05+0000 lvl=info msg="Path Plugins" logger=settings path=/var/lib/grafana/plugins
2017-09-17T20:41:05+0000 lvl=info msg="Initializing DB" logger=sqldriver dbtype=sqlite3
2017-09-17T20:41:05+0000 lvl=info msg="Starting DB migration" logger=migrator
2017-09-17T20:41:05+0000 lvl=info msg="Executing migration" logger=migrator id="copy data account to org"
2017-09-17T20:41:05+0000 lvl=info msg="Skipping migration condition not fulfilled" logger=migrator id="copy data account to org"
2017-09-17T20:41:05+0000 lvl=info msg="Executing migration" logger=migrator id="copy data account_user to org_user"
2017-09-17T20:41:05+0000 lvl=info msg="Skipping migration condition not fulfilled" logger=migrator id="copy data account_user to org_user"
2017-09-17T20:41:05+0000 lvl=info msg="Starting plugin search" logger=plugins
2017-09-17T20:41:05+0000 lvl=info msg="Registering plugin" logger=plugins name="Azure Monitor"
2017-09-17T20:41:05+0000 lvl=info msg="Registering plugin" logger=plugins name="Clock"
2017-09-17T20:41:05+0000 lvl=info msg="Initializing Alerting" logger=alerting.engine
2017-09-17T20:41:05+0000 lvl=info msg="Initializing CleanupService" logger=cleanup
2017-09-17T20:41:05+0000 lvl=info msg="Initializing Stream Manager" logger=streammanager
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=
```
Nerding out tonight. Wrote a script to get my @Battlefield stats into @InfluxDB so I could graph in @grafana. #wip #bf1 #statsonstats
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

Sign ups: 272
Logins: 178
Sign outs: 274

Logins: 178
Google hits: 51
Memory: 102 B
Logouts: 204
Google hits: 51
Logouts: 204

Memory / CPU:

Logins:

Memory / CPU:
~40 Published Data Sources

- CloudWatch by Grafana Labs
- Elasticsearch by Grafana Labs
- Graphite by Grafana Labs
- InfluxDB by Grafana Labs
- OpenTSDB by Grafana Labs
- Prometheus by Grafana Labs
- Ambari Metrics by Prajwal Rao
- AppDynamics by diopes7
- Blueflood by rackerlabs
- ClickHouse by Vertamedia
- Cloudera Manager by Foursquare
- Crate by Crate.IO
- DalmatinerDB by dalmatinerdb
- DataDog by Grafana Labs

And many more...
Query Editors - Graphite
Query Editors - InfluxDB
Alerting

Graph

Alert Config

Notifications (1)

State history

Delete

Alert Config

Name: Site Logins Too Low
Evaluate every: 10s

Conditions

WHEN avg 0 OF query(A, 5m, now) IS BELOW 20

If no data points or all values are null SET STATE TO No Data
<table>
<thead>
<tr>
<th>Time</th>
<th>backend_01</th>
<th>backend_02</th>
<th>backend_03</th>
<th>backend_04</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-01-20</td>
<td>241 °F</td>
<td>246 °F</td>
<td>248 °F</td>
<td>254 °F</td>
</tr>
<tr>
<td>2017-01-20</td>
<td>260 °F</td>
<td>265 °F</td>
<td>270 °F</td>
<td>238 °F</td>
</tr>
<tr>
<td>2017-01-20</td>
<td>243 °F</td>
<td>255 °F</td>
<td>253 °F</td>
<td>243 °F</td>
</tr>
<tr>
<td>2017-01-20</td>
<td>259 °F</td>
<td>280 °F</td>
<td>254 °F</td>
<td>280 °F</td>
</tr>
<tr>
<td>2017-01-20</td>
<td>230 °F</td>
<td>223 °F</td>
<td>247 °F</td>
<td>236 °F</td>
</tr>
<tr>
<td>2017-01-20</td>
<td>319 °F</td>
<td>308 °F</td>
<td>337 °F</td>
<td>349 °F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metric</th>
<th>Min</th>
<th>Max</th>
<th>Avg</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>backend_04</td>
<td>199 eV</td>
<td>349 eV</td>
<td>273 eV</td>
<td>254 eV</td>
</tr>
<tr>
<td>backend_02</td>
<td>216 eV</td>
<td>346 eV</td>
<td>273 eV</td>
<td>246 eV</td>
</tr>
<tr>
<td>backend_03</td>
<td>220 eV</td>
<td>341 eV</td>
<td>272 eV</td>
<td>248 eV</td>
</tr>
<tr>
<td>backend_01</td>
<td>196 eV</td>
<td>336 eV</td>
<td>271 eV</td>
<td>241 eV</td>
</tr>
</tbody>
</table>
Graph

Table

<table>
<thead>
<tr>
<th>Metric</th>
<th>Avg</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>backend_04</td>
<td>270.98</td>
<td>146.06 K</td>
</tr>
<tr>
<td>backend_03</td>
<td>272.67</td>
<td>146.70 K</td>
</tr>
<tr>
<td>backend_02</td>
<td>269.20</td>
<td>144.83 K</td>
</tr>
<tr>
<td>backend_01</td>
<td>257.22</td>
<td>138.13 K</td>
</tr>
</tbody>
</table>

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.

- **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
Ready Made Dashboards

Dashboards
Official & community built dashboards

Filter by:
- Data Source
- Panel Type
- Category
- Collector
- Search within this list

Dashboard Mysql Zabbix by haman
Example dashboard of database Mysql
Downloads: 62

Dashboard Mysql Zabbix by André Bello
Example dashboard of database Mysql
Downloads: 1153

MYSQL (Multiple) by Malcolm Badley
InfluxDB dashboards for telegraf metrics
Downloads: 20

MYSQL (Multiple) by Malcolm Badley
InfluxDB dashboards for telegraf metrics
Downloads: 38

MySQL Dashboards for Graphite by matejz
Percona MySQL dashboards that work with graphite
Downloads: 1271

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

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 24x7x55x, 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:

```sql
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
Alert Condition for Connections

Graph Configuration:
- **Alert Config**
  - Name: Connections.alert
  - Evaluate every: 60s
- **State history**
  - Conditions:
    - 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

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

Demo Fail Backup - Query

```
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
```

```
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(1506384499)
GROUP BY date_format(timestamp, '%Y%m%d%H')
ORDER BY date_format(timestamp, '%Y%m%d%H') ASC
```
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**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Name</th>
<th>Type</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interval</td>
<td>Query</td>
<td>optional display name</td>
</tr>
</tbody>
</table>

**Query Options**

- **Data source**: mysql
- **Query**: `select 'minute' AS _text, '%Y%m%d%H%M' 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**: `/.*\.*\.* `/n
- **Sort**: Disabled
Demo Fail Backup - Graph
Demo Fail Backup - Timeshifted 1 Week
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
New Dashboard Layout Engine
Q&A

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