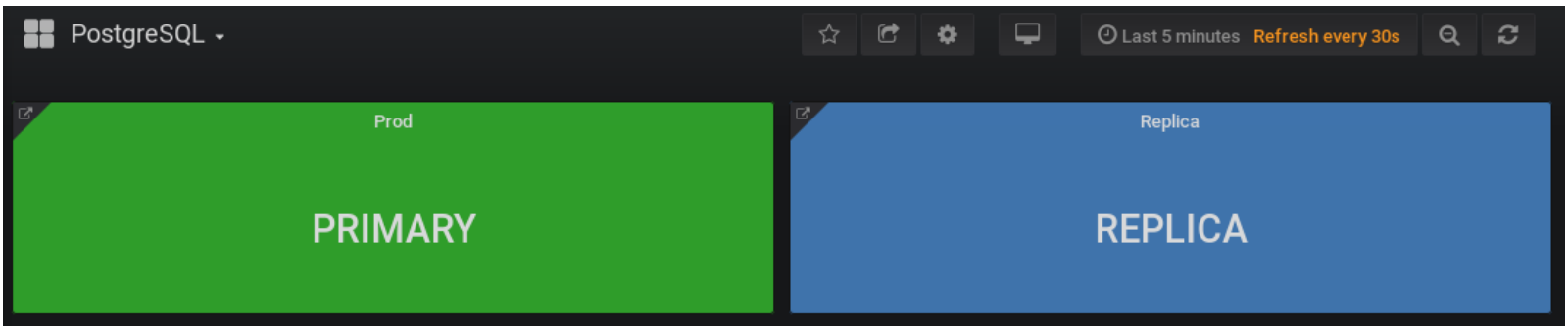
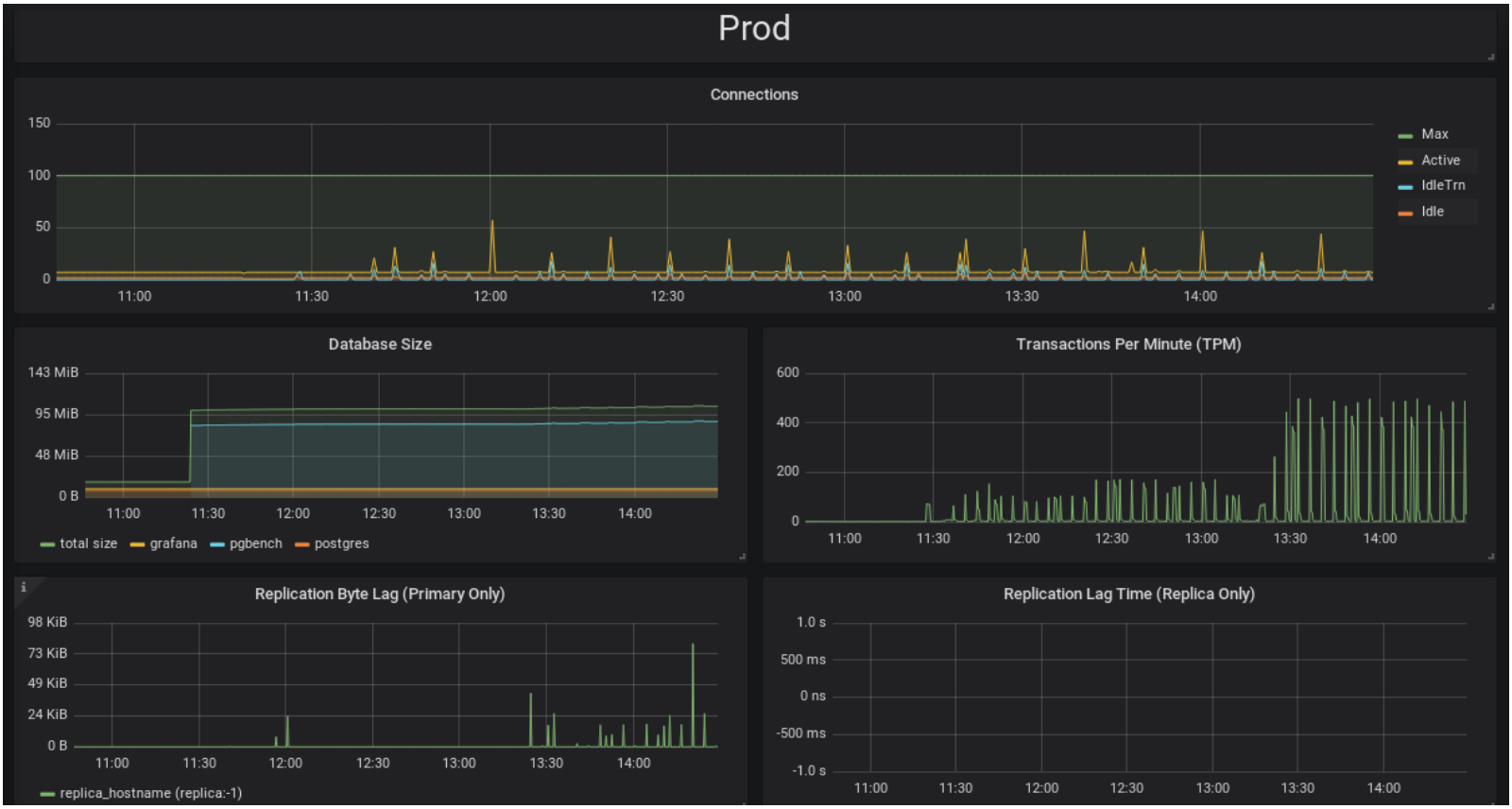
Setting up Exporters

Contents

pgMonitor

pgMonitor is your all-in-one tool to easily create an environment to visualize the health and performance of your PostgreSQL cluster.





pgMonitor combines a suite of tools to facilitate the collection and visualization of important metrics that you need be aware of in your PostgreSQL database and your host environment, including:

- Connection counts: how busy is your system being accessed and if connections are hanging
- Database size: how much disk your cluster is using
- Replication lag: know if your replicas are falling behind in loading data from your primary
- Transaction wraparound: don't let your PostgreSQL database stop working
- Bloat: how much extra space are your tables and indexes using
- System metrics: CPU, Memory, I/O, uptime

pgMonitor is also highly configurable, and advanced users can design their own metrics, visualizations, and add in other features such as alerting.

Running pgMonitor will give you confidence in understanding how well your PostgreSQL cluster is performing, and will provide you the information to make calculated adjustments to your environment.

Contents

Purpose

pgMonitor is an open-source monitoring solution for PostgreSQL and the systems that it runs on. pgMonitor came from the need to provide a way to easily create a visual environment to monitor all the metrics a database administrator needs to proactively ensure the health of the system.

pgMonitor combines multiple open-source software packages and necessary configuration to create a robust PostgreSQL monitoring environment. These include:

- Prometheus - an open-source metrics collector that is highly customizable.
- Grafana - an open-source data visualizer that allows you to generate many different kinds of charts and graphs.
- PostgreSQL Exporter - an open-source data export to Prometheus that supports collecting metrics from any PostgreSQL server version 9.1 and above.

Supported Platforms

Operating Systems

- Prometheus/Alertmanager & Grafana: CentOS/RHEL 7 or greater
- Exporters (node & postgres): CentOS/RHEL 6 or greater

PostgreSQL

- pgMonitor plans to support all PostgreSQL versions that are actively supported by the PostgreSQL community. Once a major version of PostgreSQL reaches its end-of-life (EOL), pgMonitor will cease supporting that major version.
- 11, 10, 9.6, 9.5, 9.4

Known issues

- PostgreSQL 10+ SCRAM-SHA-256 encrypted password are not yet supported by underlying go library used by postgres_exporter.

Installation

Installation instructions for each package are provided in that packages subfolder. Each step in the installation process is listed here, with a link to additional to further installation instructions for each package.

1. **Prometheus**
2. **exporter**
3. **Grafana**

Roadmap

- Additional monitoring metrics out-of-the-box
- Improved visualizations
- Project build testing

Version History

For the full history of pgMonitor, please see the CHANGELOG.

Sponsors

Crunchy Data is pleased to sponsor pgMonitor and many other open-source projects to help promote support the PostgreSQL community and software ecosystem.

Legal Notices

The exporters below can be set up on any Linux-based system, but the instructions below use RHEL/CentOS 7.

Installation

Upgrading

1.x -> 2.x

- See CHANGLOG.md file for full details on what has changed in this major version upgrade.
- Many of the metric names in node_exporter v0.16.0 have had their names changed. All of the ones that pgmonitor uses in alerting and grafana related to CPU, Memory and Disk have been renamed. All files provided by pgmonitor 2.x have been updated to account for these changes so please either use these new files or see what has changed an incorporate them into your environment.
- The symlink for the postgres_exporter sysconfig file is no longer being used. The symlink is removed as part of the upgrade, so the default postgres_exporter service that previously used this may have to be updated. See the `Enable Services` section below for the correct systemctl command to create the new service name. The old service can then be disabled/removed.
- The `ccp_is_ready` check has been removed and pgmonitor now uses the `pg_up` check built into postgres_exporter. Prometheus alerting and grafana dashboards have been updated to account for this.
- A new metric `ccp_is_in_recovery` is used to help determine the primary/replica state of a given database in the grafana dashboards. The query for this can be found in queries_common.sql

Installation on RHEL/CentOS 7

With RPM Packages There are RPM packages available to Crunchy Data customers through the Crunchy Customer Portal.

If you install the below available packages with RPM, you can continue reading at the Setup section.

Package Name	Description
node_exporter	Base package for node_exporter
postgres_exporter	Base package for postgres_exporter
pgmonitor-pg##-extras	Crunchy optimized configurations for postgres_exporter. Note that each major version of PostgreSQL
pgmonitor-pg-common	Package containing postgres_exporter items common for all versions of postgres
pgmonitor-node_exporter-extras	Crunchy optimized configurations for node_exporter
pg_bloat_check	Package for pg_bloat_check script

Available Packages

Without Packages For non-package installations, the exporters & pg_bloat_check can be downloaded from their respective repositories:

Library	
node_exporter	https://github.com/prometheus/node_exporter/releases
postgres_exporter	https://github.com/wrouesnel/postgres_exporter/releases

Library	
pg_bloat_check	https://github.com/keithf4/pg_bloat_check

User and Configuration Directory Installation You will need to create a user named `ccp_monitoring` which you can do with the following command:

```
sudo useradd -m -d /var/lib/ccp_monitoring ccp_monitoring
```

Configuration File Installation All executables are expected to be in the `/usr/bin` directory. A base node_exporter systemd file is expected to be in place already. An example one can be found here:

https://github.com/lest/prometheus-rpm/tree/master/node_exporter

The files contained in this repository are assumed to be installed in the following locations with the following names. In the instructions below, you should replace a double-hash (`##`) with the two-digit major version of PostgreSQL you are running (ex: 95, 96, 10, etc.).

node_exporter The node_exporter data directory should be `/var/lib/ccp_monitoring/node_exporter` and owned by the `ccp_monitoring` user. You can set it up with:

```
sudo mkdir /var/lib/ccp_monitoring/node_exporter
sudo chmod 0700 /var/lib/ccp_monitoring/node_exporter
sudo chown ccp_monitoring /var/lib/ccp_monitoring/node_exporter
```

The following pgmonitor configuration files should be placed according to the following mapping:

pgmonitor Configuration File	System Location
node/crunchy-node-exporter-service-el7.conf	`/etc/systemd/system/node_exporter.service.d/crunchy-node-exporter-service-el7`
node/sysconfig.node_exporter	`/etc/sysconfig/node_exporter`

postgres_exporter The following pgmonitor configuration files should be placed according to the following mapping:

pgmonitor Configuration File	System Location
crontab.txt	`/etc/postgres_exporter/##/crontab.txt`
postgres/crunchy_postgres_exporter@.service	`/usr/lib/systemd/system/crunchy_postgres_exporter@.service`
postgres/sysconfig.postgres_exporter_pg##	`/etc/sysconfig/postgres_exporter_pg##`
postgres/setup_pg##.sql	`/etc/postgres_exporter/##/setup_pg##.sql`
postgres/queries_pg##.yml	`/etc/postgres_exporter/##/queries_pg##.yml`
postgres/queries_common.yml	`/etc/postgres_exporter/##/queries_common.yml`
postgres/queries_per_db.yml	`/etc/postgres_exporter/##/queries_per_db.yml`
postgres/queries_bloat.yml	`/etc/postgres_exporter/##/queries_bloat.yml`
postgres/queries_backrest.yml	`/etc/postgres_exporter/##/queries_backrest.yml`
postgres/pgbackrest-info.sh	`/usr/bin/pgbackrest-info.sh`

Setup

Setup on RHEL/CentOS 7

Service Configuration The following files contain defaults that should enable the exporters to run effectively on your system for the purposes of using pgmonitor. You should take some time to review them.

If you need to modify them, see the notes in the files for more details and recommendations: - `/etc/systemd/system/node_exporter.servic` - `/etc/sysconfig/node_exporter` - `/etc/sysconfig/postgres_exporter_pg##`

Note that `/etc/sysconfig/postgres_exporter_pg##` is the default sysconfig file for monitoring the database running on the default port

5432 and connects to the "postgres" database. If you've installed the pgmonitor setup to a different database, modify this file accordingly or make a new one. If you make a new one, ensure the service name you enable references this file (see the Enable Services section below).

Database Configuration

General Configuration First, make sure you have installed the PostgreSQL contrib modules. You can install them with the following command:

```
sudo yum install postgresql##-contrib
```

Where ## corresponds to your current PostgreSQL version. For PostgreSQL 10 this would be:

```
sudo yum install postgresql10-contrib
```

You will need to modify your `postgresql.conf` configuration file to tell PostgreSQL to load shared libraries. In the default setup, this file can be found at `/var/lib/pgsql/10/data/postgresql.conf`.

Modify your `postgresql.conf` configuration file to add the following shared libraries

```
shared_preload_libraries = 'pg_stat_statements,auto_explain'
```

You will need to restart your PostgreSQL instance for the change to take effect. Neither of the above extensions are used outside of the postgres database itself, but we find they are extremely useful to have loaded and available in the database when further diagnosis of issues is required.

For each database you are planning to monitor, you will need to run the following command as a PostgreSQL superuser:

```
CREATE EXTENSION pg_stat_statements;
```

If you want the `pg_stat_statements` extension to be available in all newly created databases, you can run the following command as a PostgreSQL superuser:

```
psql -d template1 -c "CREATE EXTENSION pg_stat_statements;"
```

Query File	Description
setup_pg##.sql	Creates **Monitoring Setup** role with necessary grants. Creates any extra monitoring functions required.
queries_bloat.yml	postgres_exporter query file to allow bloat monitoring.
queries_common.yml	postgres_exporter query file with minimal recommended queries that are common across all PG versions.
queries_per_db.yml	postgres_exporter query file with queries that gather per databse stats. WARNING: If your database has many ta
queries_pg##.yml	postgres_exporter query file for queries that are specific to the given version of PostgreSQL.
queries_backrest.yml	postgres_exporter query file for monitoring pgbackrest backup status

Install the setup_pg##.sql script to all databases you will be monitoring in the cluster. The queries common to all postgres versions are contained in `queries_common.yml`. Major version specific queries are contained in a relevantly named file. Queries for more specialized monitoring are contained in additional files. postgres_exporter only takes a single query file as an argument for custom queries, so cat together the queries necessary into a single file.

For example, to use just the common queries for PostgreSQL 9.6 do the following. Note the location of the final queries file is based on the major version installed. The exporter service will look in the relevant version folder in the `/etc/postgres_exporter` directory:

```
cd /etc/postgres_exporter/96
cat queries_common.yml queries_per_db.yml queries_pg96.yml > queries.yml
psql -f /etc/postgres_exporter/96/setup_pg96.sql
```

As another example, to include queries for PostgreSQL 10 as well as pgbackrest and bloat do the following:

```
cd /etc/postgres_exporter/10
cat queries_common.yml queries_per_db.yml queries_pg10.yml queries_bloat.yml queries_backrest.yml
   > queries.yml
psql -f /etc/postgres_exporter/10/setup_pg10.sql
```

For replica servers, the setup is the same except that the setup_pg##.sql file does not need to be run since writes cannot be done there and it was already run on the master.

Access Control: GRANT statements

The `ccp_monitoring` database role (created by running the "setup_pg##.sql" file above) must be allowed to connect to all databases in the cluster. To do this, run the following command to generate the necessary GRANT statements:

```
SELECT 'GRANT CONNECT ON DATABASE "' || datname || '" TO ccp_monitoring;'
FROM pg_database
WHERE datallowconn = true;
```

This should generate one or more statements similar to the following:

```
GRANT CONNECT ON DATABASE "postgres" TO ccp_monitoring;
```

Bloat setup

Run script on the specific database(s) you will be monitoring bloat for in the cluster. See special note in crontab.txt concerning a superuser requirement for using this script

```
psql -d postgres -c "CREATE EXTENSION pgstattuple;"
/usr/bin/pg_bloat_check.py -c "host=localhost dbname=postgres user=postgres" --create_stats_table
psql -d postgres -c "GRANT SELECT,INSERT,UPDATE,DELETE,TRUNCATE ON bloat_indexes, bloat_stats,
   bloat_tables TO ccp_monitoring;"
```

The `/etc/postgres_exporter/##/crontab.txt` file is meant to be a guide for how you setup the `ccp_monitoring` *crontab*. You should modify crontab entries to schedule your bloat check for off-peak hours. This script is meant to be run at most, once a week. Once a month is usually good enough for most databases as long as the results are acted upon quickly.

The script requires being run by a database superuser by default since it must be able to run a scan on every table. If you'd like to not run it as a superuser, you will have to create a new role that has read permissions on all tables in all schemas that are to be monitored for bloat. You can then change the user in the connection string option to the script.

```
sudo systemctl enable node_exporter
sudo systemctl start node_exporter
sudo systemctl status node_exporter
```

To most easily allow the possibility of multiple postgres exporters, running multiple major versions of PostgreSQL, and to avoid maintaining many similar service files, a systemd template service file is used. The name of the sysconfig EnvironmentFile to be used by the service is passed as the value after the "@" and before ".service" in the service name. The default exporter's EnvironmentFile is named "postgres_exporter_pg##" and tied to the major version of postgres that it was installed for. Be sure to replace the ## in the below commands first!

```
sudo systemctl enable crunchy_postgres_exporter@postgres_exporter_pg##.service
sudo systemctl start crunchy_postgres_exporter@postgres_exporter_pg##
sudo systemctl status crunchy_postgres_exporter@postgres_exporter_pg##
```

Running multiple postgres exporters (RHEL / CentOS 7)

Certain metrics are not cluster-wide, so in that case multiple exporters must be run to collect all relevant metrics. The queries_per_db.yml file contains these queries and the secondary exporter(s) can use this file to collect those metrics and avoid duplicating cluster-wide metrics. Note that some other metrics are per database as well (bloat). You can then define multiple targets for that job in Prometheus so that all the metrics are collected together. Note that the "setup_*.sql" file does not need to be run on these additional databases.

```
cd /etc/postgres_exporter/96
cat queries_per_db.yml queries_bloat.yml > queries_mydb.yml
```

You'll need to create a new sysconfig environment file for the second exporter service. You can just copy the existing ones and modify the relevant lines, mainly being the port, database name, and query file

```
cp /etc/sysconfig/postgres_exporter_pg## /etc/sysconfig/postgres_exporter_mydb

OPT="--web.listen-address=0.0.0.0:9188
   --extend.query-path=/etc/postgres_exporter/96/queries_mydb.yml"
DATA_SOURCE_NAME="postgresql://ccp_monitoring@localhost:5432/mydb?sslmode=disable"
```

Since a systemd template is used for the postgres_exporter services, all you need to do is pass the sysconfig file name as part of the new service name.

```
sudo systemctl enable crunchy_postgres_exporter@postgres_exporter_mydb.service
sudo systemctl start cruncy_postgres_exporter@postgres_exporter_mydb
sudo systemctl status crunchy_postgres_exporter@postgres_exporter_mydb
```

Lastly, update the Prometheus auto.d target file to include the new exporter in the same one you already had running for this system

Note for packaging (RHEL/CENTOS 7)

The service override file(s) must be placed in the relevant drop-in folder to override the default service files.

```
/etc/systemd/system/node_exporter.service.d/\*.conf
```

After a daemon-reload, systemd should automatically find these files and the crunchy services should work as intended.

Installation / Setup on RHEL/CentOS 6

The node_exporter and postgres_exporter services on RHEL6 require the "daemonize" package that is part of the EPEL repository. This can be turned on by running:

```
sudo yum install epel-release
```

All setup for the exporters is the same on RHEL6 as it was for 7 with the exception of the base service files. Whereas RHEL7 uses systemd, RHEL6 uses init.d. The Crunchy RHEL6 packages will create the base service files for you

```
/etc/init.d/crunchy-node-exporter
/etc/init.d/crunchy-postgres-exporter
```

Note that these service files are managed by the package and any changes you make to them could be overwritten by future updates. If you need to customize the service files for RHEL6, it's recommended making a copy and editing/using those.

Or if you are setting this up manually, the repository file locations and expected directories are:

```
node/crunchy-node-exporter-el6.service -> /etc/init.d/crunchy-postgres-exporter
postgres/crunchy-postgres-exporter-el6.service -> /etc/init.d/crunchy-postgres-exporter

/var/run/postgres_exporter/
/var/log/postgres_exporter/ (owned by postgres_exporter service user)

/var/run/node_exporter/
/var/log/node_exporter/ (owned by node_exporter service user)
```

The same /etc/sysconfig files that are used in RHEL7 above are also used in RHEL6, so follow guidance above concerning them and the notes that are contained in the files themselves.

Once the files are in place, set the service to start on boot, then manually start it

```
sudo chkconfig crunchy-node-exporter on
sudo service crunchy-node-exporter start
sudo service crunchy-node-exporter status

sudo chkconfig crunchy-postgres-exporter on
sudo service crunchy-postgres-exporter start
sudo service crunchy-postgres-exporter status
```

Running multiple postgres exporters (RHEL / CentOS 6)

If you need to run multiple postgres_exporter services, follow the same instructions as RHEL / CentOS 7 for making a new queries_XX.yml file to only gather database specific metrics. Then follow the steps below:

```
- Make a copy of the /etc/sysconfig file with a new name
- Update --web.listen-address in the new sysconfig file to use a new port number
- Update --extend.query-path in the new sysconfig file to point to the new query file generated
- Update the DATA_SOURCE_NAME in the new sysconfig file to point to the name of the database to be
   monitored
- Make a copy of the /etc/init.d/crunchy-postgres-exporter with a new name
- Update the SYSCONFIG variable in the new init.d file to match the new sysconfig file
- Update the Prometheus auto.d target file to include the new exporter in the same one you already
   had running for this system
```

Remaining steps to initialize service at boot and start it up should be the same as above for the default service.

Prometheus can be set up on any Linux-based system, but the instructions below use RHEL/CentOS 7.

Installation

Upgrading

When upgrading from pgmonitor 1.x to 2.x, note that the alerting rules for node_exporter metrics have had many of their names changed. If you've changed the provided alerting rules file, installing the new package should create a file called `/etc/prometheus/crunchy-alert-rules.yml.rpmnew` and not overwrite your current file. You should be able to copy the new rules as needed from there.

Installation on RHEL/CentOS 7

With RPM Packages There are RPM packages available to Crunchy Data customers through the Crunchy Customer Portal.

If you install the below available packages with RPM, you can continue reading at the Setup section.

Package Name	Description
alertmanager	Base package for the Alertmanager
prometheus2	Base package for Prometheus 2.x
pgmonitor-alertmanager-extras	Custom Crunchy configurations for Alertmanager
pgmonitor-prometheus-extras	Custom Crunchy configurations for Prometheus

Available Packages

Without Crunchy Data Packages For installations without using packages provided by Crunchy Data, we recommend using the repository maintained at https://github.com/lest/prometheus-rpm. Instructions for setup and installation are contained there. Note this only sets up the base service. The additional files and steps for pgmonitor still need to be set up as instructed below.

Or you can also download Prometheus and Alertmanager from the original site at https://prometheus.io/download. Note that no base service setup is provided here, just the binaries.

Minimum Versions pgmonitor assumes to be using Prometheus 2.x. We recommend to always use the latest minor version of Prometheus.

User and Configuration Directory Installation You will need to create a user named `ccp_monitoring` which you can do with the following command:

```
sudo useradd ccp_monitoring
```

Create a folder in `/var/lib/` and set its permissions as such:

```
sudo mkdir /var/lib/ccp_monitoring
sudo chmod 0700 /var/lib/ccp_monitoring
sudo chown ccp_monitoring /var/lib/ccp_monitoring
```

Configuration File Installation The files contained in this repository are assumed to be installed in the following locations with the following names:

Prometheus

The Prometheus data directory should be `/var/lib/ccp_monitoring/prometheus` and owned by the `ccp_monitoring` user. You can set it up with:

```
sudo mkdir /var/lib/ccp_monitoring/prometheus
sudo chmod 0700 /var/lib/ccp_monitoring/prometheus
sudo chown ccp_monitoring /var/lib/ccp_monitoring/prometheus
```

The following pgmonitor configuration files should be placed according to the following mapping:

pgmonitor Configuration File	System Location
crunchy-prometheus-service-el7.conf	`/etc/systemd/system/prometheus.service.d/crunchy-prometheus-service-el7.conf`
sysconfig.prometheus	`/etc/sysconfig/prometheus`
crunchy-prometheus.yml	`/etc/prometheus/crunchy-prometheus.yml`
auto.d/ProductionDB.yml.example	`/etc/prometheus/auto.d/ProductionDB.yml.example`
crunchy-alertmanager.yml	`/etc/prometheus/crunchy-alertmanager.yml`
crunchy-alert-rules.yml	`/etc/prometheus/crunchy-alert-rules.yml`

Alertmanager

The Alertmanager data directory should be `/var/lib/ccp_monitoring/alertmanager` and owned by the `ccp_monitoring` user. You can set it up with:

```
sudo mkdir /var/lib/ccp_monitoring/alertmanager
sudo chmod 0700 /var/lib/ccp_monitoring/alertmanager
sudo chown ccp_monitoring /var/lib/ccp_monitoring/alertmanager
```

The following pgmonitor configuration files should be placed according to the following mapping:

pgmonitor Configuration File	System Location
crunchy-alertmanager-service-el7.conf	`/etc/systemd/system/alertmanager.service.d/crunchy-alertmanager-service-el7.conf`
sysconfig.alertmanager	`/etc/sysconfig/alertmanager`

Setup

Setup on RHEL/CentOS 7

Service Configuration The following files contain defaults that should enable Prometheus and Alertmanager to run effectively on your system for the purposes of using pgmonitor. You should take some time to review them.

If you need to modify them, see the notes in the files for more details and recommendations:

- /etc/systemd/system/prometheus.service.d/crunchy-prometheus-service-el7.conf
- /etc/systemd/system/alertmanager.service.d/crunchy-alertmanager-service-el7.conf

The below files contain startup properties for Prometheues and Alertmanager. Please review and modify these files as you see fit:

- /etc/sysconfig/prometheus
- /etc/sysconfig/alertmanager

The below files dictate how Prometheus and Alertmanager will behave at runtime for the purposes of using pgmonitor. Please review each file below and follow the instructions in order to set things up:

File	Instructions
/etc/prometheus/crunchy-prometheus.yml	Modify to set scrape interval if different from the default of 30s. Activate alert rules and
/etc/prometheus/crunchy-alertmanager.yml	Setup alert target (e.g., SMTP, SMS, etc.), receiver and route information. Default serv
/etc/prometheus/crunchy-alert-rules.yml	Update rules as needed. Default Prometheus config expects file to be named crunchy-a
/etc/prometheus/auto.d/*.yml	You will need at least one file with a final .yml extension. Copy the example file to crea

Enable Services To enable and start Prometheus as a service, execute the following commands:

```
sudo systemctl enable prometheus
sudo systemctl start prometheus
sudo systemctl status prometheus
```

To enable and start Alertmanager as a service, execute the following commands:

```
sudo systemctl enable alertmanager
sudo systemctl start alertmanager
sudo systemctl status alertmanager
```

Note for packaging (RHEL/CentOS 7)

The service override files must be placed in the relevant drop-in folder to override the default service files.

```
/etc/systemd/system/prometheus.service.d/crunchy-prometheus-service.conf
/etc/systemd/system/alertmanager.service.d/crunchy-alertmanager-service.conf
```

After a daemon-reload, systemd should automatically find these files and the crunchy services should work as intended.

Setup on RHEL/CentOS 6

Detailed instructions coming soon.

There are RPM packages available to Crunchy Data customers through the Crunchy Customer Portal. Otherwise the Grafana RPM Package can be downloaded and installed from https://grafana.com/grafana/download. There is no difference between the Crunchy provided package and the one directly from Grafana.

Installation

Upgrading

If you'd like to take advantage of the new provisioning system in Grafana 5 provided by pgmonitor 2.x, we recommend either renaming or deleting your existing datasources and dashboards so there are no issues when the provisioned versions are imported.

When upgrading from pgmonitor 1.x to 2.x, note that many of the system related metric names from node_exporter have had their names changed. The new graphs provided for Grafana 5+ have taken these new names into account. Also, the top level PostgreSQL Overview dashboard no longer uses the ccp_is_ready metric, so you will have to include some new postgres_exporter metrics for that dashboard to work.

With RPM Packages

There are RPM packages available to Crunchy Data customers through the Crunchy Customer Portal.

If you install the below available packages with RPM, you can continue reading at the Setup section.

Package Name	Description
grafana	Base package for grafana
pgmonitor-grafana-extras	Crunchy configurations for datasource & dashboard provisioning

Available Packages

Without Packages Create the following directories on your grafana server if they don't exist:

```
mkdir -p /etc/grafana/provisioning/datasources
mkdir -p /etc/grafana/provisioning/dashboards
mkdir -p /etc/grafana/crunchy_dashboards
```

pgmonitor Configuration File	System Location
grafana/crunchy_grafana_datasource.yml	`/etc/grafana/provisioning/datasources/datasource.yml`
grafana/crunchy_grafana_dashboards.yml	`/etc/grafana/provisioning/dashboards/dashboards.yml`

Review the crunchy_grafana_datasource.yml file to ensure it is looking at your Prometheus database. The included file assumes Grafana and Prometheus are running on the same system. DO NOT CHANGE the datasource "name" if you will be using the dashboards provided in this repo. They assume that name and will not work otherwise. Any other options can be changed as needed. Save the crunchy_grafana_datasource.yml file and rename to /etc/grafana/provisioning/datasources/datasources.yml. Restart grafana and confirm through the web interface that the datasource was provisioned and working.

Review the crunchy_grafana_dashboards.yml file to ensure it's looking at where you stored the provided dashboards. By default it is looking in /etc/grafana/crunchy_dashboards. Save this file and rename to /etc/grafana/provisioning/dashboards/dashboards.yml. Restart grafana so it picks up the new config.

Save all of the .json dashboard files to the /etc/grafana/crunchy_dashboards folder.

Setup

Configuration Database

By default Grafana uses an SQLite database to store configuration and dashboard information. We recommend using a PostgreSQL database for better long term scalability. Before doing any further configuration, including changing the default admin password, set the grafana.ini to point to a postgresql instance that has a database created for it.

In psql run the following:

```
CREATE ROLE grafana WITH LOGIN;
CREATE DATABASE grafana;
ALTER DATABASE grafana OWNER TO grafana;
\password grafana
```

You may also need to adjust your pg_hba.conf to allow grafana to connect to your database.

In your grafana.ini, set the following options at a minimum with relevant values:

```
[database]

type = postgres
host = 127.0.0.1:5432
name = grafana
user = grafana
password = """mypassword"""
```

Now enable and start the grafana service

```
sudo systemctl enable grafana-server
sudo systemctl start grafana-server
sudo systemctl status grafana-server
```

Navigate to the web interface: https://<ip-address>:3000. Log in with admin/admin (be sure to change the admin password) and check settings to ensure the postgres options have been set and are working.

Datasource & Dashboard Provisioning

Grafana 5.x provides the ability to automatically provision datasources and dashboards via configuration files instead of having to manually import them either through the web interface or the API. Note that provisioned dashboards can no longer be directly edited and saved via the web interface. See the Grafana documentation for how to edit/save provisioned dashboards: http://docs.grafana.org/administration/provisioning/#making-changes-to-a-provisioned-dashboard. If you'd like to customize these dashboards, we recommend first adding them via provisioning then exporting and importing manually via the web interface.

The extras package takes care of putting all these files in place. If you did not use the crunchy package to install grafana, see the additional instructions above. Once that is done, the only additional setup that needs to be done is to set the "provisioning" option in the grafana.ini to point to the top level directory if it hasn't been done already. If you're upgrading from Grafana 4.x to 5.x, you will have to add the "provisioning" option to the [paths] section of the grafana.ini file. Once that is done, just restart grafana and all datasources and dashboards should appear.

```
[paths]
provisioning = /etc/grafana/provisioning
```

2.3

- Fixed bug in Prometheus alerts that was causing some of them to be stuck in PENDING mode indefinitely and never firing. This unfortunately removes the current alert value from the Grafana Prometheus Alerts dashboard.
- If you can't simply overwrite your current alerts configuration file with the one provided, remove the following option from every alert: `alert_value: '{{ $value }}'`
- Added feature to monitor pgbackrest backups (https://pgbackrest.org)
- Separate metrics exist to monitor for the latest full, incremental and/or differential backups. Note that a full will always count as both an incremnetal and diff and a diff will always count as an incremental.
- Another metric can monitor the runtime of the latest backup of each type per stanza.
- Run the setup_pg##.sql file again in the database that your exporter(s) connect to to install the new, required function: "monitor.pgbackrest_info()". It has security definer so execution privileges can be granted as needed, but it must be owned by a superuser.
- New metrics are located in the exporter/postgres/queries_backrest.yml file. Add the one(s) you want to the main queries file being used by your currently running exporter(s) and restart.
- Example alert rules for different backup scenarios have been added to the prometheus/crunchy-alert-rules.yml file. They are commented out to avoid false alarms until valid backup settings for your environment are in place.
- Added new feature to monitor for failing archive_command calls.
  - New metric "ccp_archive_command_status" is located in exporter/postgres/queries_common.yml. Add this to the main queries file being used by your currently running exporter(s) and restart.
  - A new alert rule "PGArchiveCommandStatus" has been added to the prometheus/crunchy-alert-rules.yml file.
- Added new feature to monitor for sequence exhaustion
  - Requires installation of a new function located in the setup_pg##.yml file for your relevant major version of PostgreSQL. Must be installed by a superuser.
  - New metric "ccp_sequence_exhaustion" located in exporter/postgres/queries_common.yml. Add this to the main queries file being used by your currently running exporter(s) and restart. A new alert rule "PGSequenceExhaustion" has been added to the prometheus/crunchy-alert-rules.yml file.
- The setup_pg##.sql file now has logic to avoid throwing errors when the ccp_monitoring role already exists. Also always attempts to drop the functions it manages first to account for when the function signature changes in ways that OR REPLACE doesn't handle. All this allows easier re-running of the script when new features are added or used in automation systems. Thanks to Jason O'Donnell for role logic.

2.2

- Fixed broken ccp_wal_activity check for PostgreSQL 9.4 & 9.5. Updated check is located in the relevant exporter/postgres/-queries_pg##.yml file
- Fixed broken service files for postgres_exporter on RHEL6 systems.
- Removed explicit "public" schema in ccp_bloat_check query so that it will properly use the search_path in case bloat tables were installed in another schema
- Removed query files for PostgreSQL versions no longer supported by pgmonitor (9.2 & 9.3)

2.1

- **IMPORTANT UPGRADE NOTE FOR CRUNCHY PACKAGE USERS**: In version 2.0, the Crunchy provided extras for node_exporter were split out from the pgmonitor-pg##-extras package. A dependency was kept between these packages to make upgrading easier. For 2.1, the dependency between these packages has been removed. When upgrading from 1.7 or earlier, if you have node_exporter and postgres_exporter running on the same systems, ensure that you install the separate pgmonitor-node_exporters_extras package after the update. See the README for the full package name(s).
- Minimum required versions of software used in pgmonitor have been updated to:
- Prometheus 2.5.0
- Prometheus Alertmanager 0.15.3
- postgres_exporter 0.4.7 (enables full PG11 support)
- Grafana 5.3.4.
- Fixed Grafana data source to use the "proxy" mode instead of "direct" with default install. Should fix connection issues encountered during default setup between Grafana & Prometheus.
- Renamed functions_pg##.sql file to setup_pg##.sql to better clarify what it's for (and because it's not just functions).
- Added ccp_wal_activity metric to help monitor WAL generation rate.
- For all PG versions, provides total current size of WAL directory. For PG10+, it also provides the size of WAL generated in the last 5 minutes
- Note that for PG96 and lower, a new security definer function must be added (can just run setup_pg##.sql again).
- New metric definition is located in the queries_pg##.yml file.
- No default rules have been added since this is very use-case dependent.
- Improved accuracy of "Idle In Transaction" monitoring times in PostgreSQL. Base the time measured on the state change of the session vs the total transaction runtime.
- Split setup_pg92-96.sql and queries_pg92-96.sql into individual files per major version.
- Added commented out example prometheus alert rule for checking if a postgres database has changed from replica to primary or vice versa. Must be set on a per system basis since you have to tell it if a system is supposed to be a primary or replica.
- Removed pg_stat_statements prometheus metric and security definer function from setup script. We highly recommend having pg_stat_statements installed on a database, and we still include its installation in the documentation, but we currently don't have any useful metric recommendations from it to collect in prometheus.
- Added some default filters for the bloat check cronjob to avoid unnecessary waste in the prometheus storage of bloat metrics.
- Update documentation.

2.0

- Recommended version of Prometheus is now 2.3.2. Recommended version of Alertmanager is 0.15.1. Recommended version of postgres_exporter is 0.4.6.
- Upgrade required version of node_exporter to minimum of 0.16.0. Note that many of the metrics that are used in Grafana and Prometheus alerting have had their names changed.
- This version adds these new metrics into Grafana graphs without removing the old metric names on most, but not all, graphs. This allows trending history to be kept. Note that line colors will change in graphs and legend names will be duplicated until the old metric data is expired out.
- Prometheus alerts have been set to use the new metric names since the alerts are based only on recent values.

- IMPORTANT: A future pgmonitor update will remove these old metric names from Grafana graphs, so please ensure these changes are accounted for in your architecture.
- See full release notes for 0.16.0 - https://github.com/prometheus/node_exporter/releases/tag/v0.16.0
- The postgres_exporter service no longer uses a symlink in /etc/sysconfig to point to a default "postgres_exporter" file. This was causing issues with several upgrade scenarios. New installation instructions now have the service pointing directly to the relevant sysconfig file for the major PostgreSQL version.
- **IMPORTANT**: If you are using the default postgres_exporter service, you will need to update your service name so it uses the proper sysconfig file. See the README file for the new default service name in the "Enable Services" section and run the "enable" command found there. You should then also disable/remove the old service so it doesn't try to start again in the future.
- The additional Crunchy provided configurations for node_exporter have been split out from the pgmonitor-pg##-extras package to the pgmonitor-node_exporter-extras package. This was done to allow multiple versions of the pg##-extras package to be installed with different major versions of Postgres. There is still currently a dependency that the node extras packages must be installed with the pg##-extras so that upgrading doesn't break existing systems. This dependency will be revisited in the future.
- Removed the requirement for a shell script to monitor if the database is up and its status as either a primary or replica. Up status is now using the native "pg_up" metric from postgres_exporter and a new metric query was written for checking the recovery status of a system (ccp_is_in_recovery).
- The PostgreSQL.json overview dashboard that used this metric has been redesigned. Unfortunately it can no longer be colored RED for down systems, only go colorless and say "DOWN". This is a known limitation of handling null metric values in Grafana and part of a larger fix coming in future versions - https://github.com/grafana/grafana/issues/11418
- Upgrade required version of Grafana to minimum of 5.2.1.
- All provided dashboards require this minimum version to work.
- If you notice that links between the dashboards are broken after the upgrade, clear your browser's cache. The 301 redirects used between dashboards can get cached and they have changed in the new major version.
- See extensive release notes for major version changes in Grafana - https://community.grafana.com/t/release-notes-v-5-1-x
- Change Grafana datasource and dashboard installation to use provisioning vs manual setup via the web interface. Note this means that future updates to the provided datasources and dashboards must be done through config files as well. Or they can be saved as a new dashboard for more extensive customization.
- Change recommended configuration for Grafana to use PostgreSQL as database backend. Updated installation documentation.
- Added Prometheus Alerts Dashboard. Shows both active alerts and 1 week history in table format.
- Removed Gauges from PostgreSQLDetails Dashboard. "Current" value was not being shown properly and gauges were misleading in their values depending on the time range chosen. For a quick glance to see if there are any problems, be sure to set your alert thresholds properly and use the new Prometheus Alerts Dashboard.
- Added max_query_time metric to track long running queries in general. Also added an alert for that metric to crunchy prometheus alerts.
- Added "IO Time Per Device in Seconds" graph to Filesystems dashboard.
- Fixed Memory and Swap Graphs on PostgreSQLDetails dashboard to more accurately show used resources. History for these graphs before this upgrade is not being shown since it is no longer graphing the same data.
- Crontabs are no longer PostgreSQL major version dependent at this time. Consolidated down to a single crontab file for all versions.
- Removed unnecessary functions from functions_pg10.sql. All queries in queries_pg10.yml currently only require the pg_monitor system role to be granted and have been updated with this assumption.
- Changed default cron runtime of pg_bloat_check to once a week on early morning weekend.
- Change PostgreSQL overview dashboard to use background colors instead of gauges for better visibility.
- Fixed permission issues with /etc/postgres_exporter folder to allow ccp_monitoring system user better control.

1.7

- Fixed duplicate and incorrect replication byte lag queries. The one contained in queries_common.yml should not have been there. It should be in queries_pg92-96.yml, but there was also one already there. However, the one already in pg92-96 was incorrect since prior to PG10, it requires superuser/security definer to fully access replication statistics. Corrected the version specific file to have the correct query. Made the query in the pg10 file consistent. Ensure you update your generated queries.yml file with he new queries.
- Fixed the PostgreSQLDetails.json dashboard to use the correct replication byte lag metric (referencing above fix). The easiest way to fix this is to delete this dashboard and re-import it. Otherwise, if you've made customizations you don't want to lose, you can grab the correct metric query from the updated dashboard gauge and edit your existing dashboard to use it.
- The combination of the above two fixes corrects the pgmonitor setup being able to properly handle there being multiple replicas from a single primary. Previously this would cause postgres_exporter to throw duplicate metric errors.
- Fixed the query in queries_bloat.yml to be able to properly handle if there was a bloat amount larger than max int4 bytes. Ensure you update your generated queries.yml file with the new query.

1.6

- Fixed formatting bug in crunchy-prometheus.yml. Thanks to Doug Hunley for reporting the issue.

1.5

- Add support for disabling built in queries in postgres_exporter 0.4.5. Also explicitly ignore these metrics via a prometheus filter so they're not ingested even if new option isn't used. This means that v1.5 of pgmonitor now requires 0.4.5 of postgres_exporter by default.
- Improved exporter down alert to avoid unnecessary alerts for brief outages that resolve themselves quickly.
- Added new FilesystemDetails dashboard for grafana that is linked to from the Filesystem graph on PostgreSQLDetails.
- Top level PostgreSQL grafana dashboard now identifies whether a system is read/write or readonly to better distinguish primary/replica systems.
- Added instructions for non-packaged installation using pgmonitor configuration files.
- Revised and better formatted README documentation

1.4

- Fixed filesystem graphs in PostgreSQLDetails dashboard
- Cosmetic changes to PostgreSQLDetails dashboard
- Added instructions for importing dashboards via Grafana API

1.3

- Fixed error in PG10 queries file.
- Fixed disk usage alert for prometheus to work better when there are many jobs with similar mountpoints. Also fixed syntax error in warning alert.
- Moved connection stats query from common to version specific queries due to PG10 differences. Clarified naming of files for which versions they work for.
- Added dropdown for the Job to the lower level drill down dashboards in Grafana. Allows selecting of a specific system from the dashboard itself without having to click through on a higher level.
- Removed pg_stat_statements graph from PostgreSQLDetails dashboard. Needs refinement to make it more useful.

1.2

- Change service and sysconfig files to use single OPT environment variable instead of one variable per cmd option
- Fix error in PG10 monitoring functions file
- Initial version of Prometheus 2.0 job deletion script. Requires API call not available yet in 2.0.0 for full functionality

1.1

- Implement rpmnew/rpmsave feature instead of using .example files to prevent package overwriting user changes to configs

1.0

- Initial stable release