

Hands-on Lab: Monitoring and Optimizing Your Databases in MySQL

Estimated time needed: 45 minutes

In this lab, you'll learn how to monitor and optimize your database in MySQL with the help of phpMyAdmin.

Objectives

After completing this lab, you will be able to:

1. Maintain the health and performance of your database with phpMyAdmin
2. Identify the difference between an unoptimized and optimized database
3. Optimize your database with phpMyAdmin by applying best practices

Software Used in this Lab

In this lab, you will use [MySQL](#). MySQL is a Relational Database Management System (RDBMS) designed to efficiently store, manipulate, and retrieve data.



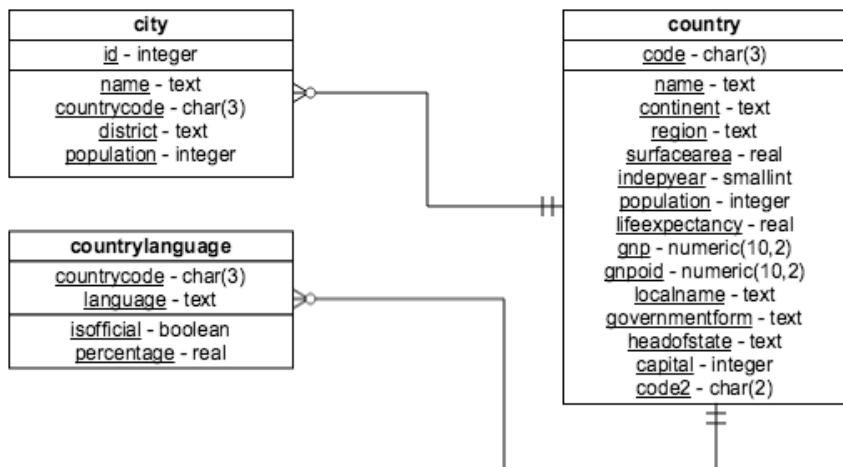
To complete this lab, you will utilize the MySQL relational database service available as part of the IBM Skills Network Labs (SN Labs) Cloud IDE. SN Labs is a virtual lab environment used in this course.

Database Used in this Lab

The World database used in this lab comes from the following source: <https://dev.mysql.com/doc/world-setup/en/> under [CC BY 4.0 License](#) with [Copyright 2021 - Statistics Finland](#).

You will use a modified version of the database for the lab, so to follow the lab instructions successfully please use the database provided with the lab, rather than the database from the original source.

The following ERD diagram shows the schema of the World database:



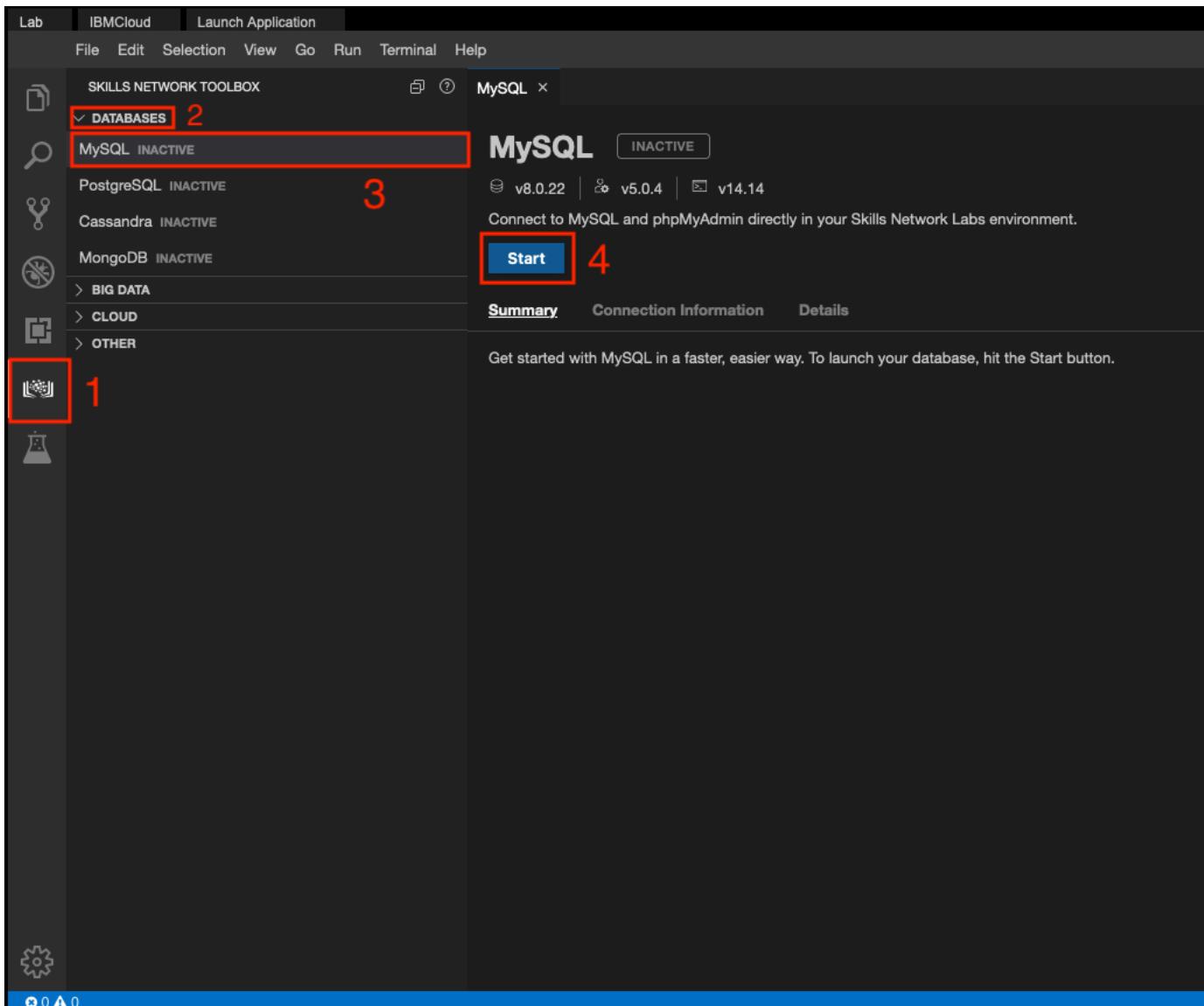
The first row is the table name, the second is the primary key, and the remaining items are any additional attributes.

Exercise 1: Create Your Database

To begin, we'll create the **World** database and load the necessary data.

1. First, we'll launch MySQL. We can do that by navigating to the **Skills Network Toolbox**, selecting **Databases** and then **MySQL**.

Press **Start**. This will start a session of MySQL in SN Labs.



The **Inactive** label will change to **Starting**. This may take a few moments.

When it changes to **Active**, it means your session has started.

The screenshot shows the Skills Network Toolbox interface. On the left, there's a sidebar with icons for various tools like File, Edit, Selection, View, Go, Run, Terminal, Help, and a magnifying glass. Below these are sections for SKILLS NETWORK TOOLBOX, DATABASES, and a list of databases: MySQL (ACTIVE), PostgreSQL (INACTIVE), Cassandra (INACTIVE), and MongoDB (INACTIVE). Under MySQL, there are sub-sections for BIG DATA, CLOUD, and OTHER. On the right, the MySQL tab is active, displaying the MySQL logo and status as ACTIVE. It shows version information: v8.0.22, v5.0.4, and v14.14. A message says "Connect to MySQL and phpMyAdmin directly in your Skills Network Labs environment." Below this is a "Stop" button. At the bottom of the MySQL section, there are tabs for Summary, Connection Information, and Details. The Summary tab is selected. It contains a message: "Your database and phpMyAdmin server are now ready to use and available with the following login credentials. To navigate MySQL, please check out the Details section." It has fields for Username and Password, both of which are redacted. Below these fields is a message: "You can manage MySQL via:" followed by two buttons: "phpMyAdmin" and a copy icon. Further down, it says "Or to interact with the database in the terminal, select one of these options:" with two more buttons: "MySQL CLI" and "New Terminal".

2. In the menu bar, select **Terminal > New Terminal**. This will open the Terminal.

To download the zip file containing the **.sql** file for the **World** database, copy and paste the following into the Terminal:

```
1. 1
1. wget https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBM-DB0231EN-SkillsNetwork/datasets/World/world_mysql_script.sql
```

Copied!

3. Next, initiate a MySQL command-line session by clicking **MySQL CLI** from the MySQL tab. Doing this will allow us to create a table in MySQL via the command-line.

MySQL x

MySQL

ACTIVE

v8.0.22 | v5.0.4 | v14.14

Connect to MySQL and phpMyAdmin directly in your Skills Network Labs environment.

Stop

Summary **Connection Information** **Details**

Your database and phpMyAdmin server are now ready to use and available with the following login credentials. For more details on how to navigate MySQL, please check out the Documentation section.

Username: [REDACTED] 

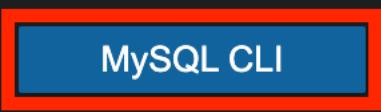
Password: [REDACTED] 

You can manage MySQL via:

phpMyAdmin 

Or to interact with the database in the terminal, select one of these options:

MySQL CLI **New Terminal**



4. In the Terminal, create a new database called **world**.

▼ Hint (Click Here)

Recall the statement that we used to create a new database in previous labs.

▼ Solution (Click Here)

In the Terminal, we can create a new database **world** with the following:

```
1. 1
1. CREATE DATABASE world;
```

Copied!

```
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 3039
Server version: 8.0.22 MySQL Community Server - GPL

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> create database world;
Query OK, 1 row affected (0.01 sec)

mysql> █
```

5. Now, we'll want to use the newly created database, **world**. How can we go about doing that?

▼ Hint (Click Here)

Recall the statement that we used to choose a database to use in previous labs.

▼ Solution (Click Here)

To use the newly created **world** database, we can enter the following into the Terminal:

```
1. 1  
1. USE world;  
Copied!
```

6. In order to complete the database creation process, we'll want to execute the MySQL script containing the data that we downloaded. This file will create tables and insert data into those tables.

▼ Hint (Click Here)

Recall the command that we used to execute a SQL script file in previous labs.

The name of the SQL script file is **world_mysql_script.sql**, as can be seen in the Cloud IDE file explorer.

▼ Solution (Click Here)

To execute the SQL script file that we downloaded, we can use the following command:

```
1. 1  
1. SOURCE world_mysql_script.sql;  
Copied!
```

This may take about thirty seconds or so.

7. With our database created, we'll want to take a look at the tables inside it to get a general idea of the data we have. What tables do we have?

▼ Hint (Click Here)

Recall the command that we used to show tables in previous labs.

▼ Solution (Click Here)

We can show the tables in the database with the **SHOW TABLES** command:

```
1. 1  
1. SHOW TABLES;  
Copied!
```

```
mysql> SHOW TABLES;  
+-----+  
| Tables_in_world |  
+-----+  
| city           |  
| country        |  
| countrylanguage |  
+-----+  
3 rows in set (0.00 sec)  
  
mysql> ■
```

As you can see, there are a total of three tables in the **world** database: **city**, **country** and **countrylanguage**.

Exercise 2: Monitor Your Database

Database monitoring refers to the tasks related to reviewing the operational status of your database. Monitoring is critical in maintaining the health and performance of your database because it'll help you identify issues in a timely manner. In doing so, you'll be able to avoid problems such as database outages that affect your users.

With phpMyAdmin, we can take a look at how our database is doing and how we can improve it.

1. In the MySQL tab, select button next to **phpMyAdmin** to access the tool in a new tab.

MySQL ×

MySQL

ACTIVE

v8.0.22 | v5.0.4 | v14.14

Connect to MySQL and phpMyAdmin directly in your Skills Network Labs environment.

Stop

Summary **Connection Information** **Details**

Your database and phpMyAdmin server are now ready to use and available with the following details. To manage your MySQL, please check out the Details section.

Username: [REDACTED] 

Password: [REDACTED] 

You can manage MySQL via:

phpMyAdmin 

Or to interact with the database in the terminal, select one of these options:

MySQL CLI **New Terminal**

2. On the phpMyAdmin homepage, you'll notice a left sidebar and right panel.

On the left sidebar, you'll see all your databases, including the one we just created, **world**.

For now, we'll want to focus on the right panel to see more information about our servers and databases.

Select **Status**.

phpMyAdmin

Server: mysql:3306

Databases SQL Status

General settings

Server connection collation: utf8r

More settings

Appearance settings

Language English

Theme: pmahomme

New

information_schema

mysql

performance_schema

sys

world

3. There are several subpages on the **Status** page: **Server**, **Processes**, **Query Statistics**, **All Status Variables**, **Monitor** and **Advisor**. These subpages will give you an inside look at the current processes on your server.

The screenshot shows the MySQL Status page with the following sections:

- Network traffic since startup: 10.3 MiB**
- Traffic** (Received: 1.7 MiB, Sent: 8.7 MiB, Total: 10.3 MiB) and **Connections** (Max. concurrent connections: 4, Failed attempts: 203, Aborted: 0, Total: 1,325)
- Replication status**: This MySQL server works as master in replication process.

Replication status

Master status

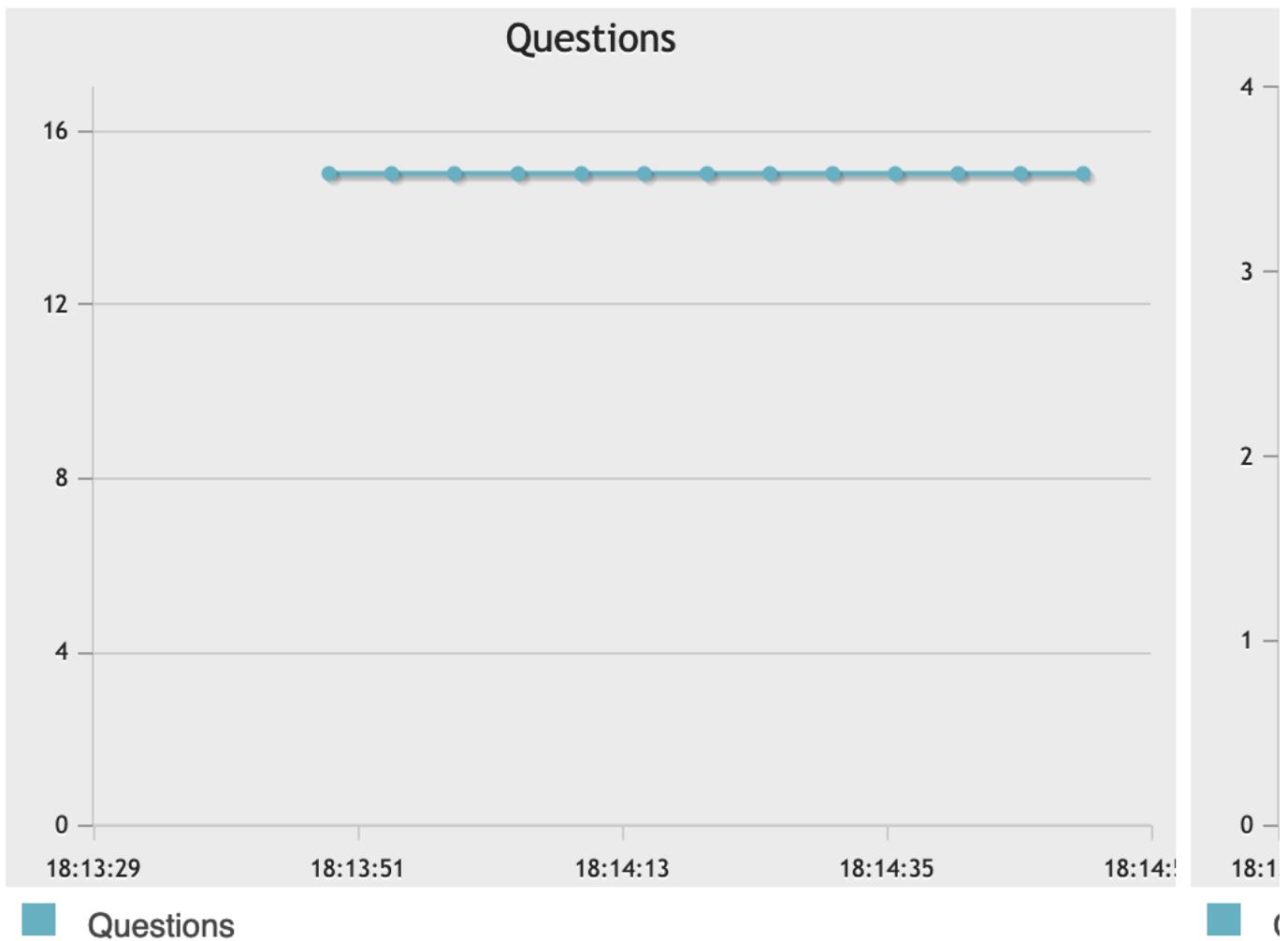
Variable	Value
File	binlog.000002
Position	1690985
Binlog_Do_DB	
Binlog_Ignore_DB	

Feel free to explore the rest of the subpages to gain a better understanding of the current status of your server.

If you'd like a refresher on the information provided by each subpage, you can revisit the previous reading, [Monitoring and Optimizing Your Databases in MySQL](#).

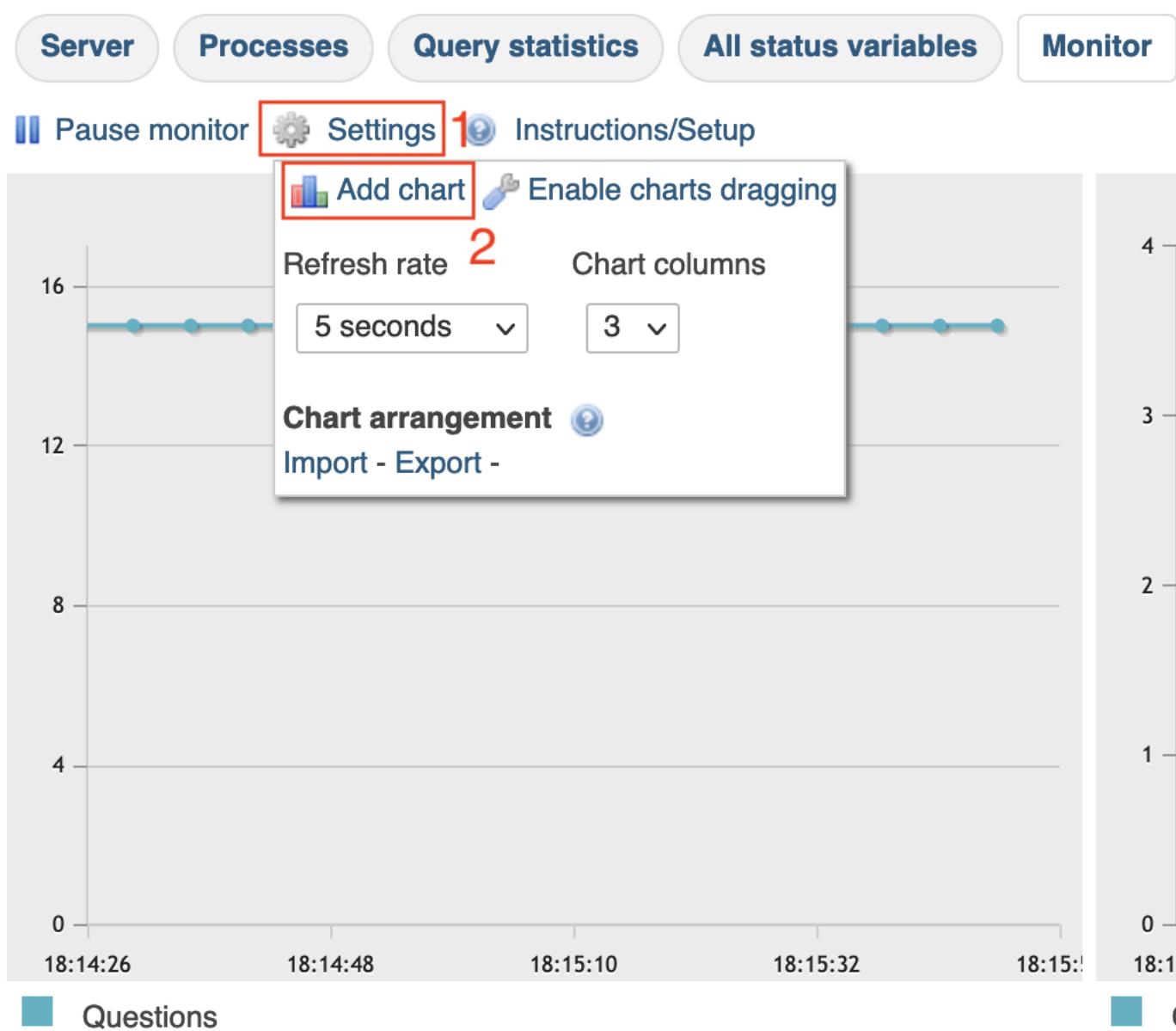
In this lab, we'll be taking a look at the **Monitor** subpage.

4. From the available sections, click **Monitor**.

[Server](#)[Processes](#)[Query statistics](#)[All status variables](#)[Monitor](#)[II Pause monitor](#) [Settings](#) [Instructions/Setup](#)

When you first arrive at this page, you may only have three charts: **Questions**, **Connections / Processes** and **Traffic**. We can add a few more graphs to help track important metrics.

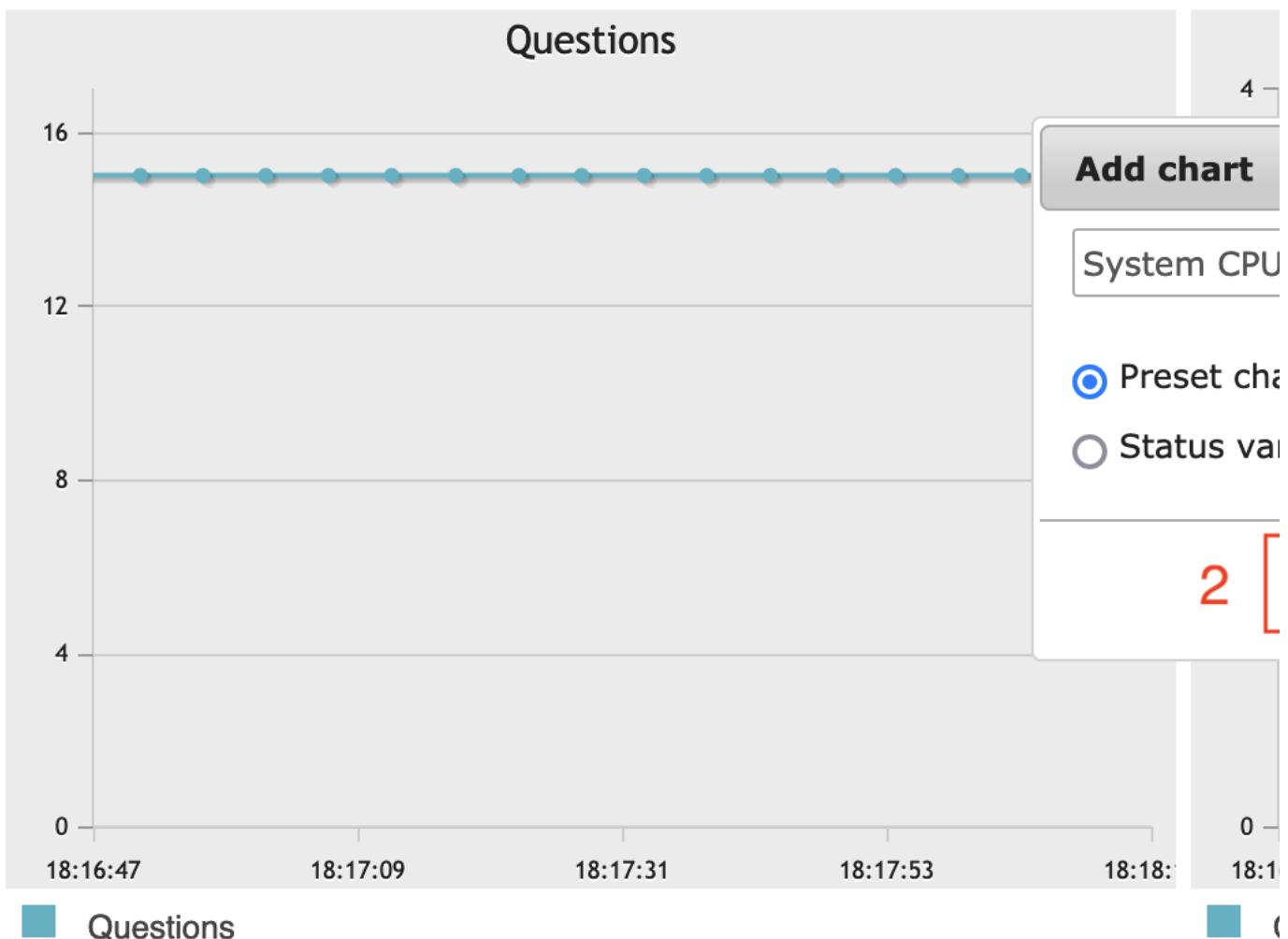
5. Select **Settings** then **Add chart**.



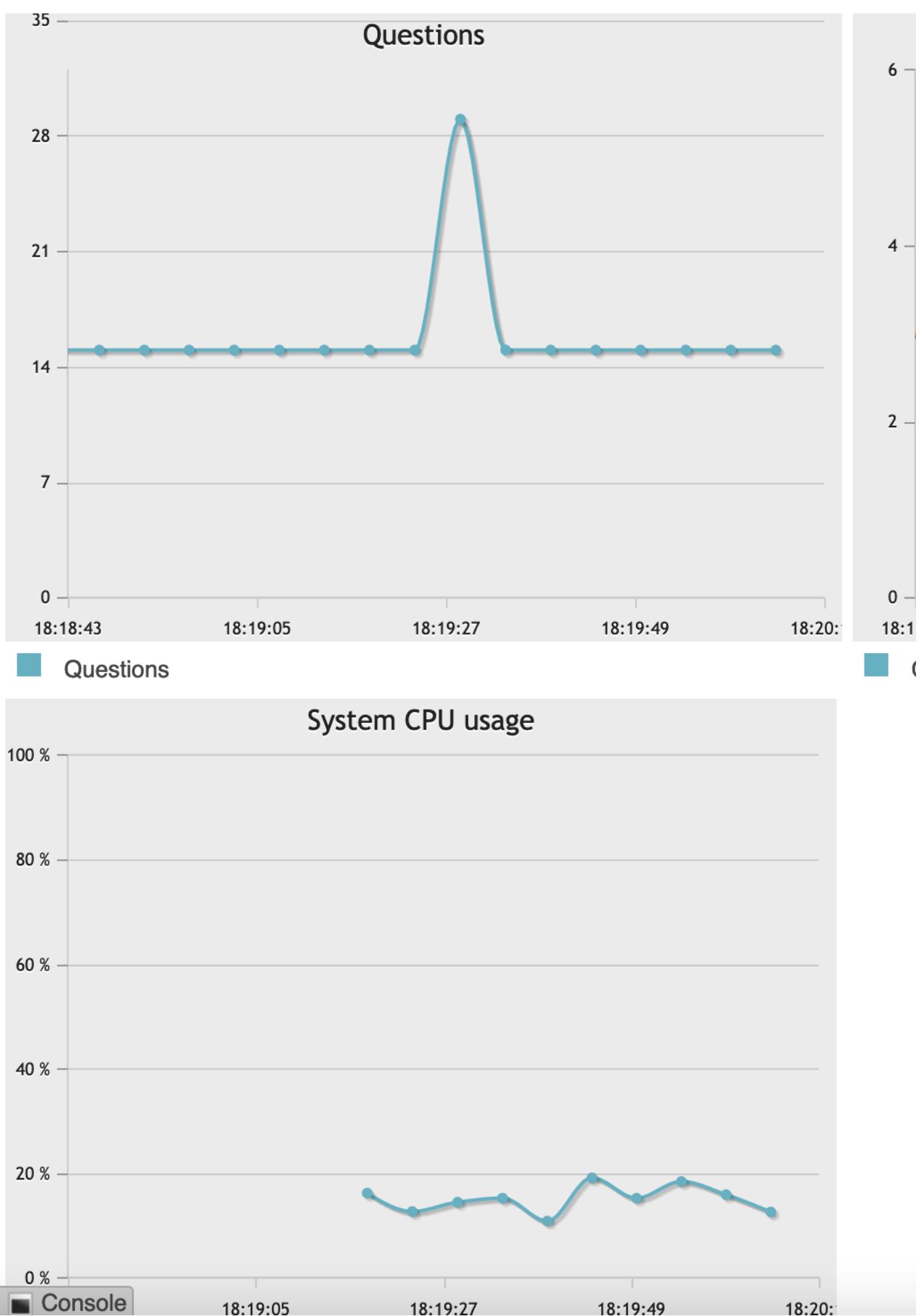
6. In the dialog box, you can choose a chart based on a status variable or select **Preset chart**. In this case, we'll be adding two preset charts.

First, let's select **System CPU Usage**.

Press **Add chart to grid**.

[Server](#)[Processes](#)[Query statistics](#)[All status variables](#)[Monitor](#)[II Pause monitor](#) [Settings](#) [Instructions/Setup](#)

Now, you should see the **System CPU Usage** following chart.



Notice how there was a spike in your charts. Recall that **Questions** includes any queries run in the background by phpMyAdmin. In this case, the interaction was MySQL bringing up the **System CPU Usage** chart.

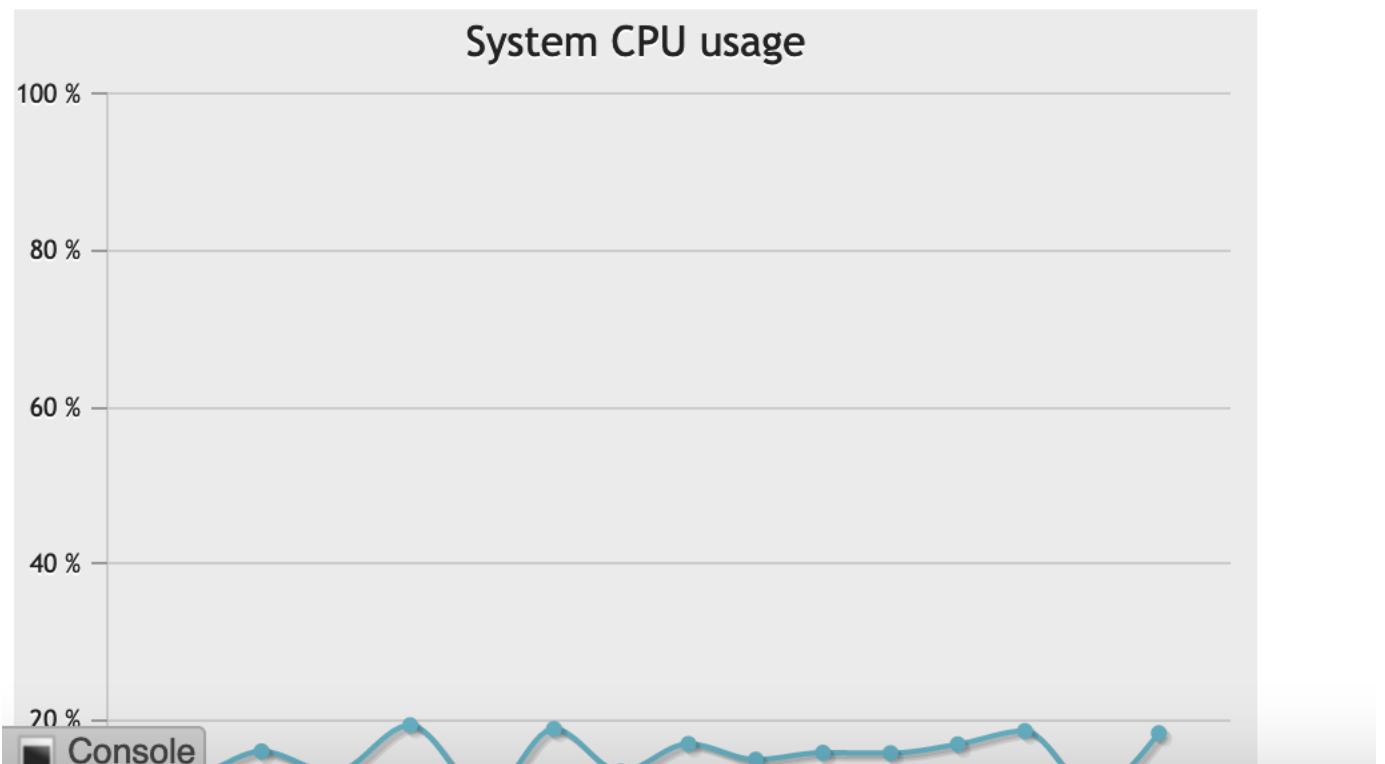
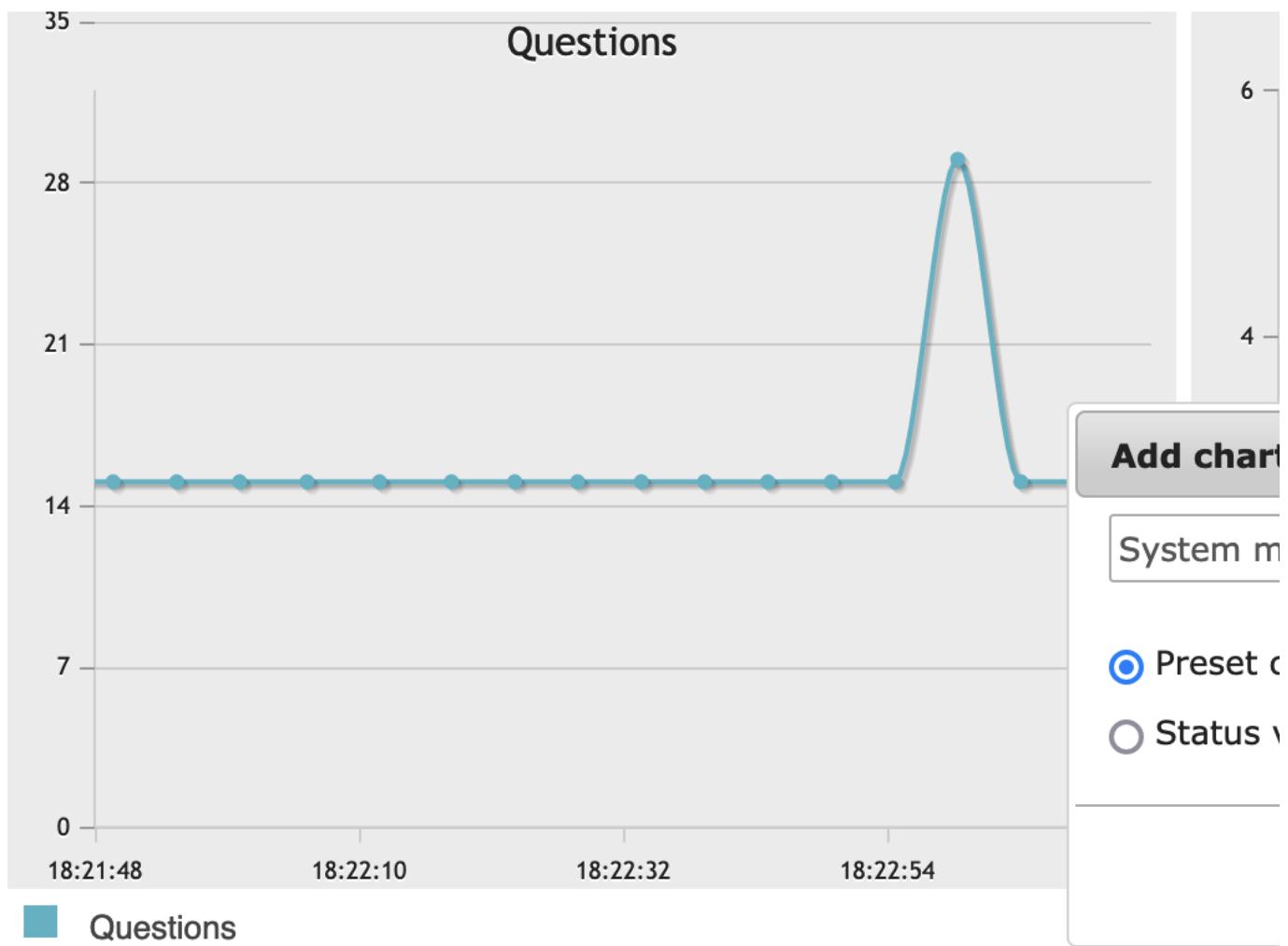
7. Repeat this process to add the **System memory** chart.

▼ Hint (Click Here)

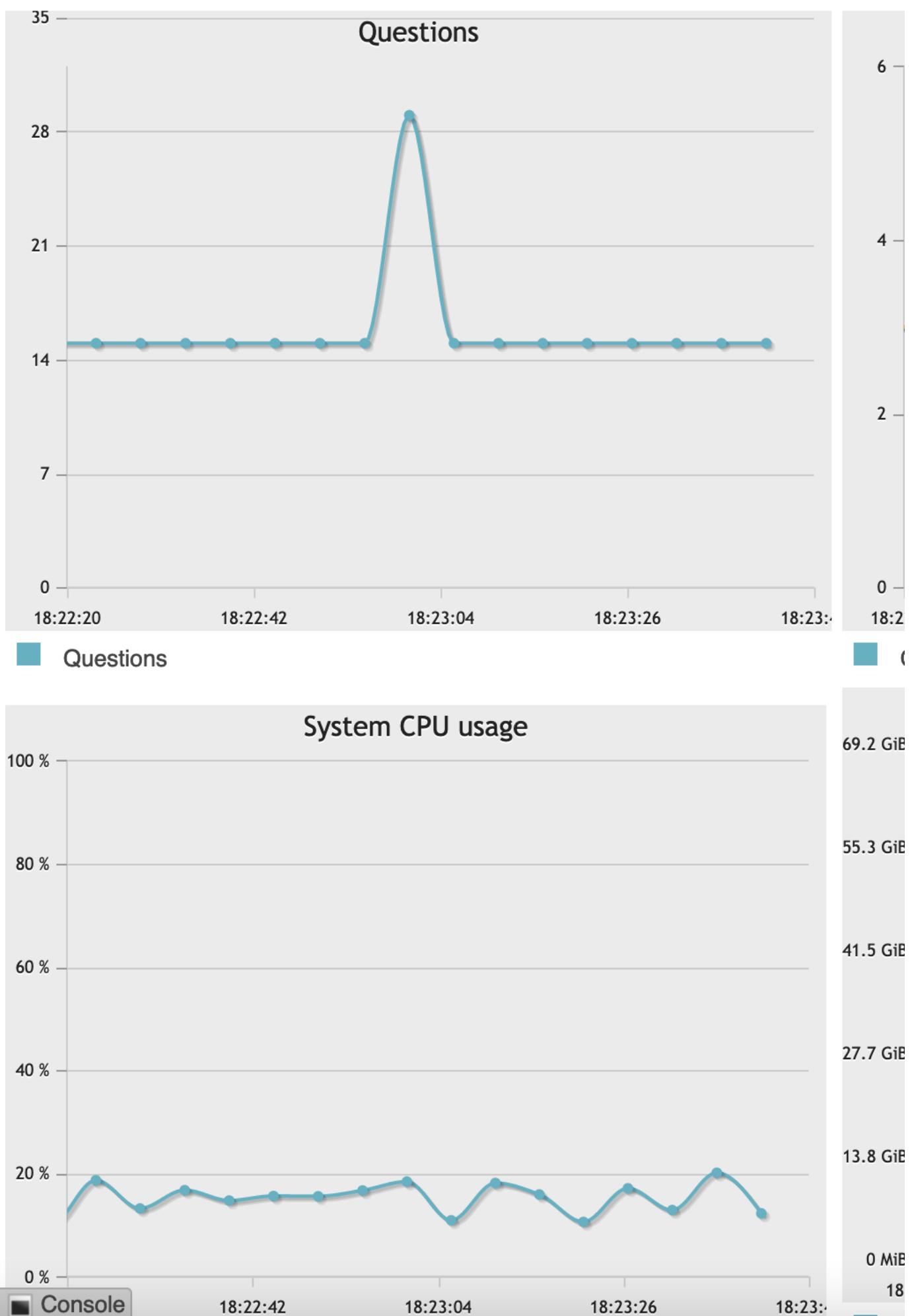
Review how we added the **System CPU Usage** chart. The process is similar, save for one step.

▼ Solution (Click Here)

When adding the chart, the dialog box should look like the following:

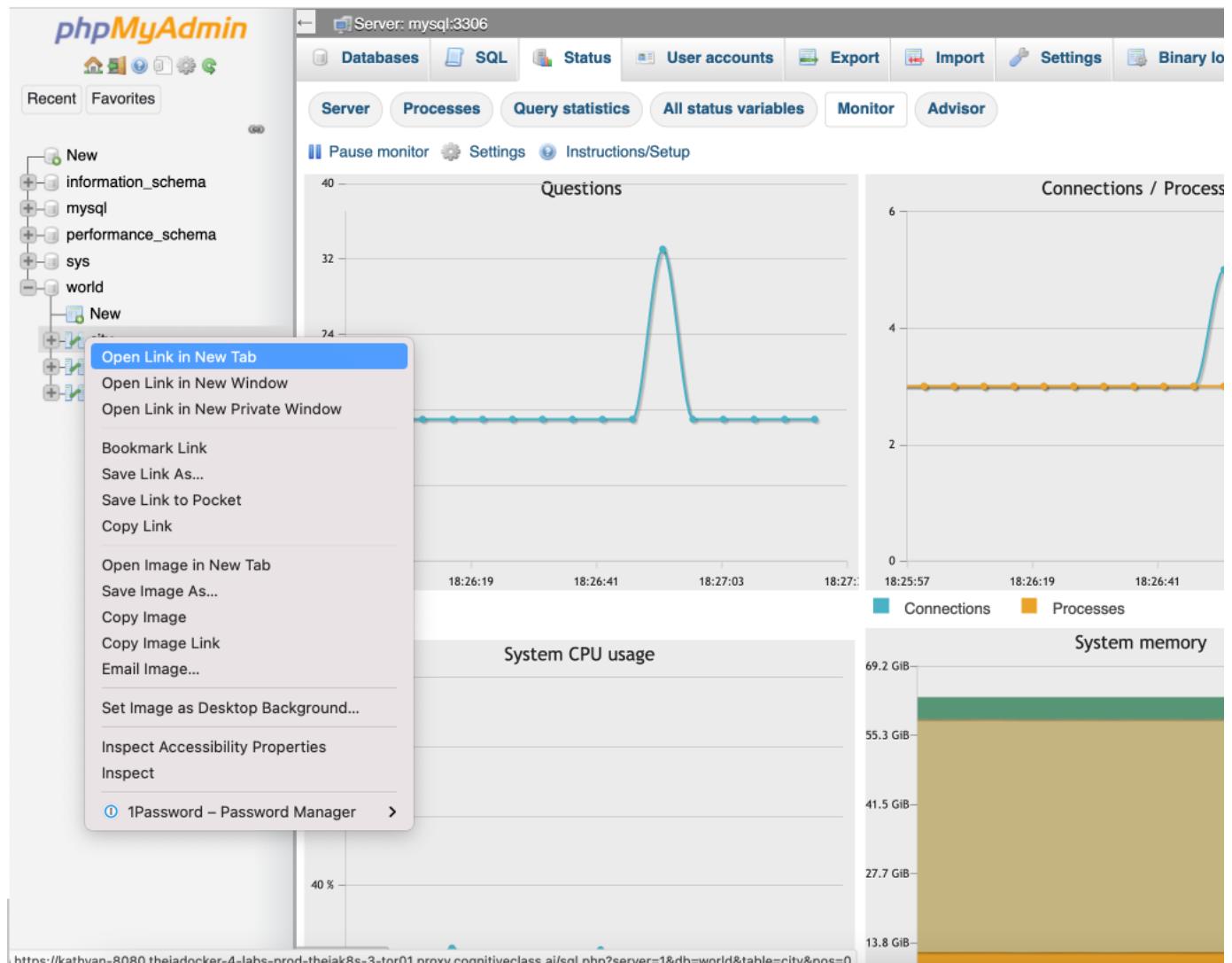
[Server](#)[Processes](#)[Query statistics](#)[All status variables](#)[Monitor](#)[II Pause monitor](#) [Settings](#) [Instructions/Setup](#)

Your Monitor page should now look like the following:

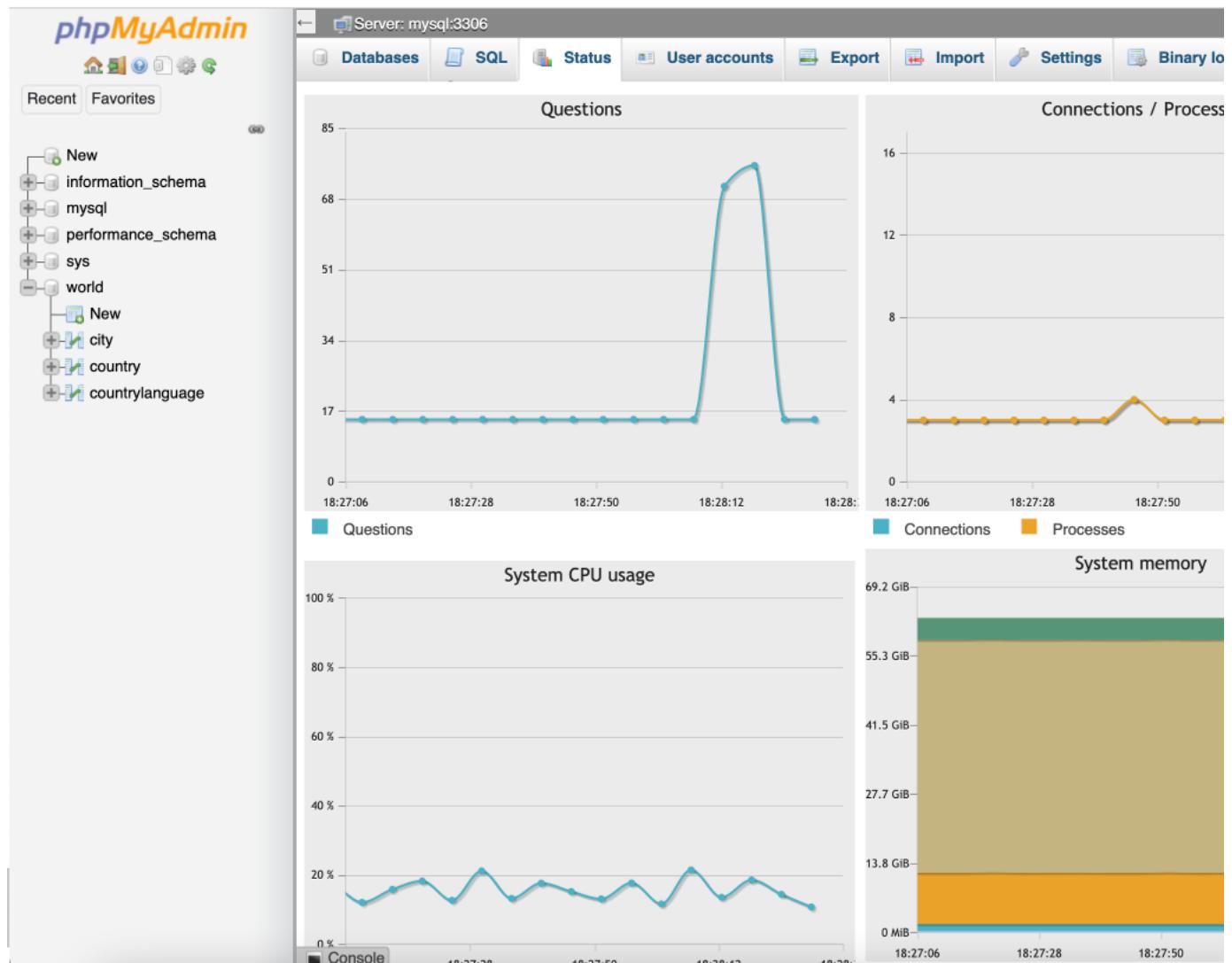


What happens when we run a query? Let's take a look!

- On the left sidebar, press the + sign next to the database **world**. Then, right-click **city** and select **Open link in new tab**.



Doing this will run a `SELECT * FROM city` query. Notice the spike in the charts. Hovering over the number will provide you more insight into the number of questions, or queries, that are run.



To confirm that we ran the query, we can navigate to the new tab we opened and take a look at the success message:

s.ai/tools/theia X  localhost:8080 / mysql | phpMyA X  localhost:8080 / mysql / world

Server: mysql:3306 » Database: world » Table: city

Browse Structure SQL Search Insert Export

Showing rows 0 - 24 (4006 total, Query took 0.0007 seconds.)

```
SELECT * FROM `city`
```

1 > >> Number of rows: 25 Filter rows: Search

+ Options

		ID	Name	CountryCode	District
<input type="checkbox"/>	 Edit  Copy  Delete	1	Kabul	AFG	Kabol
<input type="checkbox"/>	 Edit  Copy  Delete	2	Qandahar	AFG	Qanda
<input type="checkbox"/>	 Edit  Copy  Delete	3	Herat	AFG	Herat
<input type="checkbox"/>	 Edit  Copy  Delete	4	Mazar-e-Sharif	AFG	Balkh
<input type="checkbox"/>	 Edit  Copy  Delete	5	Amsterdam	NLD	Noord-H
<input type="checkbox"/>	 Edit  Copy  Delete	6	Rotterdam	NLD	Zuid-Ho
<input type="checkbox"/>	 Edit  Copy  Delete	7	Haag	NLD	Zuid-Ho
<input type="checkbox"/>	 Edit  Copy  Delete	8	Utrecht	NLD	Utrecht
<input type="checkbox"/>	 Edit  Copy  Delete	9	Eindhoven	NLD	Noord-E
<input type="checkbox"/>	 Edit  Copy  Delete	10	Tilburg	NLD	Noord-E
<input type="checkbox"/>	 Edit  Copy  Delete	11	Groningen	NLD	Groning
<input type="checkbox"/>	 Edit  Copy  Delete	12	Breda	NLD	Noord-E
<input type="checkbox"/>	 Edit  Copy  Delete	13	Apeldoorn	NLD	Gelderl
<input type="checkbox"/>	 Edit  Copy  Delete	14	Nijmegen	NLD	Gelderl



Edit

Copy

Delete

15

Enschede

NLD

Overijss

Since phpMyAdmin limits queries to displaying the first 25 rows (similar to the `LIMIT` clause), the query did not take long to load.

The **Status** page is helpful in monitoring the health and performance of your server and database. Particularly with the **Monitor** page's charts, you'll be able to see real-time information on how your databases are doing. If there are unexpected irregularities, such as a sudden spike in queries or a high volume of incoming traffic, then that may point to a problem that needs to be attended to.

Exercise 3: Optimize Your Database

Database optimization refers to maximizing the speed and efficiency of retrieving data from your database. When you optimize your database, you are improving its performance, which can also improve the performance of slow queries. By optimizing your database, you'll improve the experience for both yourself and your users.

We can see this in practice with the following scenario:

Imagine that you are the organizer of a sports tournament with a total of 120 participating teams. There's three pieces of information that you've collected from each team: their (unique) team number, their three-letter team code for the system, and the date of the team's creation.

How can we go about optimizing a database containing that information? Let's take a look!

Task A: Create Your Table

1. To start, we'll create a database in phpMyAdmin.

On the left sidebar, select the **New** button to create a new database.

The screenshot shows the phpMyAdmin interface. On the left, there is a sidebar with a tree view of databases: information_schema, mysql, performance_schema, sys, and world. A red box highlights the 'New' button under the 'Recent' tab. The main content area has two sections: 'General settings' and 'Appearance settings'. In 'General settings', the 'Server connection collation' is set to 'utf8mb4_unicode_ci'. In 'Appearance settings', the 'Language' is set to 'English' and the 'Theme' is set to 'pmahomme'.

2. On the **Databases** page, you can enter a Database name and leave it as the **UTF-8** encoding. UTF-8 is the most commonly used character encoding for content or data.

Let's call our database **tournament_teams**.

Press **Create**.



Databases

Create database

1 tournament_teams 2

Database	Collation	Master replication	Action
information_schema	utf8_general_ci	Replicated	Check privileges
mysql	utf8mb4_0900_ai_ci	Replicated	Check privileges
performance_schema	utf8mb4_0900_ai_ci	Replicated	Check privileges
sys	utf8mb4_0900_ai_ci	Replicated	Check privileges
world	utf8mb4_0900_ai_ci	Replicated	Check privileges

Total: 5

[Check all](#) With selected: [Drop](#)

3. Now, we can make a table. Let's call it **teams**.

Recall the information we want to store in this database: team number, team code and team creation date. We can make three columns for that.

← Server: mysql:3306 » Database: tournament_teams

Structure SQL Search Query Export Import

⚠ No tables found in database.

1 Create table 2

Name: teams Number of columns: 3

Press **Go**.

4. We can now add in the column names and data types.

We'll enter the following information into the table. Below are only the values that you'll need to fill out. Anything else can be left as is:

Name	Type	Length/Values
team_no	INT	
team_code	CHAR	100
creation_date	CHAR	100

Since the team number is unique, with each of the 120 teams having their own number ranging from 1 to 120, that will be our primary key. We will set that later. It is a numeric data type, so we use **INT** for now.

The team code and creation date are both set as the **CHAR** data type. Notice that for the **CHAR** type, we must include the length of the value. To be safe, we've set that to 100.

You might be thinking that these data types aren't the best choices for this database. You'd be correct! Given what we know, there are better choices for each of the entries, but let's first take a look at an unoptimized database and how we can optimize it.

When all the values are entered, press **Save**.

Browse Structure SQL Search Insert Export

Table name: teams Add 1 column(s)

Name	Type	Length/Values	Default
team_no	INT		None
team_code	CHAR	100	None
creation_date	CHAR	100	None

Structure

Table comments:

Collation:

PARTITION definition:

Partition by: (Expression or column)

Partitions:

5. On the **Structure** page, select the checkbox next to **team_no** and click **Primary**.

Browse Structure SQL Search Insert Export

Table structure Relation view

1	#	Name	Type	Collation	Attributes	Null	Default	C
<input checked="" type="checkbox"/>	1	team_no	int		No	None		
<input type="checkbox"/>	2	team_code	char(100)	utf8mb4_0900_ai_ci	No	None		
<input type="checkbox"/>	3	creation_date	char(100)	utf8mb4_0900_ai_ci	No	None		

Check all With selected: Browse Change Drop

This will set **team_no** as the primary key of the table. If you were successful in doing so, you'll receive a success message, like the following:



Your SQL query has been executed successfully.

```
ALTER TABLE `teams` ADD PRIMARY KEY(`team_no`);
```

Table structure

Relation view

#	Name	Type	Collation	Attributes	Null	Default	C
<input type="checkbox"/>	1 team_no	int			No	<i>None</i>	
<input type="checkbox"/>	2 team_code	char(100)	utf8mb4_0900_ai_ci		No	<i>None</i>	
<input type="checkbox"/>	3 creation_date	char(100)	utf8mb4_0900_ai_ci		No	<i>None</i>	



Check all

With selected:

Browse

Change

Drop



Move columns

Normalize



1 column(s)

after creation_date

Go

Indexes

Action	Keyname	Type	Unique	Packed	Column	Cardinality	Colla
Edit Drop	PRIMARY	BTREE	Yes	No	team_no	0	A

Create an index on

1

columns Go

Notice that **team_no** was automatically added as a PRIMARY index as well.

6. Let's import the data! This sample teams data has been prepared specifically for this lab and is composed of team numbers, team code names, and the creation date of these teams.

You can download the file by clicking the following link: [tournament_teams_data.sql](#).

To import it, navigate to **Import**, then select **Browse** and find the file you just downloaded.

← Server: mysql:3306 » Database: tournament_teams » Table: teams

Browse **Structure** **SQL** **Search** **Insert** **Export**

File to import:

File may be compressed (gzip, bzip2, zip) or uncompressed.

A compressed file's name must end in **.[format].[compression]**. Example: **.sql.zip**

2

Browse your computer: tournament_teams_data.sql (Max: 2,048KiB)

You may also drag and drop a file on any page.

Character set of the file:

utf-8



Partial import:

Allow the interruption of an import in case the script detects it is close to the PHP

Skip this number of queries (for SQL) starting from the first one:

0



Other options:

Enable foreign key checks

Format:

SQL



Format-specific options:

SQL compatibility mode:

N

Do not use AUTO_INCREMENT for zero values

Press **Go**.

When your import is successful, you'll see the following message:



Import has been successfully finished, 120 queries executed. (tournament_teams)

7. Now, we can take a look at the imported data by navigating back to **Browse**. This automatically loads a `SELECT * FROM teams` statement, which will load the first 25 rows from the **teams** table.

← Server: mysql:3306 » Database: tournament_teams » Table: teams

Browse **Structure** **SQL** **Search** **Insert** **Export**

Showing rows 0 - 24 (120 total, Query took 0.0006 seconds.)

```
SELECT * FROM `teams`
```

1 < > >> | Show all | Number of rows: 25 Filter rows

+ Options

	← →	team_no	team_code	creation_date
<input type="checkbox"/>	Edit Copy Delete	1	ACE	2021-01-01
<input type="checkbox"/>	Edit Copy Delete	2	FAX	2021-01-03
<input type="checkbox"/>	Edit Copy Delete	3	RED	2021-01-04
<input type="checkbox"/>	Edit Copy Delete	4	MAZ	2021-01-05
<input type="checkbox"/>	Edit Copy Delete	5	AMS	2021-01-06
<input type="checkbox"/>	Edit Copy Delete	6	ROT	2022-02-10
<input type="checkbox"/>	Edit Copy Delete	7	HAS	2021-01-08
<input type="checkbox"/>	Edit Copy Delete	8	BLU	2021-01-09
<input type="checkbox"/>	Edit Copy Delete	9	EIN	2021-01-10
<input type="checkbox"/>	Edit Copy Delete	10	TIL	2021-01-11
<input type="checkbox"/>	Edit Copy Delete	11	GRO	2021-01-12
<input type="checkbox"/>	Edit Copy Delete	12	BRE	2021-01-13
<input type="checkbox"/>	Edit Copy Delete	13	APE	2021-01-14
<input type="checkbox"/>	Edit Copy Delete	14	NIJ	2021-01-15
<input type="checkbox"/>	Edit Copy Delete	15	ENS	2021-01-16
<input type="checkbox"/>	Edit Copy Delete	16	HAR	2021-01-17

The limit is implemented by phpMyAdmin, but you can easily show all rows by checking the **Show all** checkbox.

You will receive a warning asking if you'd like to see all rows. Since there's only 120 rows in this example, you can click **OK**. In larger datasets, loading all the rows will likely crash your browser.

← Server: mysql:3306 » Database: tournament_teams » Table: teams

Browse **Structure** **SQL** **Search** **Insert** **Export**

Showing rows 0 - 119 (120 total, Query took 0.0008 seconds.)

```
SELECT * FROM `teams`
```

Show all | Number of rows: All Filter rows: Search this table

+ Options

		team_no	team_code	creation_date
<input type="checkbox"/>	Edit Copy Delete	1	ACE	2021-01-01
<input type="checkbox"/>	Edit Copy Delete	2	FAX	2021-01-03
<input type="checkbox"/>	Edit Copy Delete	3	RED	2021-01-04
<input type="checkbox"/>	Edit Copy Delete	4	MAZ	2021-01-05
<input type="checkbox"/>	Edit Copy Delete	5	AMS	2021-01-06
<input type="checkbox"/>	Edit Copy Delete	6	ROT	2022-02-10
<input type="checkbox"/>	Edit Copy Delete	7	HAS	2021-01-08
<input type="checkbox"/>	Edit Copy Delete	8	BLU	2021-01-09
<input type="checkbox"/>	Edit Copy Delete	9	EIN	2021-01-10
<input type="checkbox"/>	Edit Copy Delete	10	TIL	2021-01-11
<input type="checkbox"/>	Edit Copy Delete	11	GRO	2021-01-12
<input type="checkbox"/>	Edit Copy Delete	12	BRE	2021-01-13
<input type="checkbox"/>	Edit Copy Delete	13	APE	2021-01-14
<input type="checkbox"/>	Edit Copy Delete	14	NIJ	2021-01-15
<input type="checkbox"/>	Edit Copy Delete	15	ENS	2021-01-16
<input type="checkbox"/>	Edit Copy Delete	16	HAR	2021-01-17
<input type="checkbox"/>	Edit Copy Delete	17	LAM	2021-01-18

We can now confirm that all 120 rows have been loaded.

8. On the left sidebar, select the **tournament_teams** database.

phpMyAdmin

Server: mysql:3306 » Database: tournament

Structure SQL Search

Recent Favorites

New

information_schema

mysql

performance_schema

sys

tournament_teams

New

teams

world

Filters

Containing the word:

Table	Action
teams	Browse Structure Edit

1 table Sum

Check all With selected:

Print Data dictionary

Create table

Name:

Number of columns:

Red boxes highlight the "tournament_teams" schema and the "teams" table in the results table.

With this view, you can see all the tables in the database, including the **teams** table that we just created. As you can see, the size of the database is currently 64 KiB, that is, 64 kilobytes. While this is a small size, do remember that this would not be the case with larger datasets as this sample table only has 120 entries.

Keep this number in mind as we start optimizing this table.

Task B: Optimize Your Data Types

- Under **Action** for the **teams** table, select **Structure**. This will bring you back to the **Structure** page.

Next to **team_no**, click **Change**. This function is helpful when you need to make adjustments to a column, for any reason.

The screenshot shows the MySQL Workbench interface for the 'teams' table. The top navigation bar includes 'Server: mysql:3306', 'Database: tournament_teams', and 'Table: teams'. Below the navigation are tabs: 'Browse', 'Structure' (which is selected), 'SQL', 'Search', 'Insert', and 'Export'. Underneath these are two buttons: 'Table structure' and 'Relation view'. The main area displays the table structure in a grid:

#	Name	Type	Collation	Attributes	Null	Default	C
1	team_no	int			No	<i>None</i>	
2	team_code	char(100)	utf8mb4_0900_ai_ci		No	<i>None</i>	
3	creation_date	char(100)	utf8mb4_0900_ai_ci		No	<i>None</i>	

Below the grid are buttons: 'Check all', 'With selected:', 'Browse' (with a magnifying glass icon), 'Change' (with a pencil icon), and 'Drop' (with a trash bin icon). There is also an upward arrow button.

- In this editor, let's change the **Type** to one that would be better suited for this column.

▼ Hint (Click Here)

Consider the available numeric integer data types: **TINYINT**, **SMALLINT**, **MEDIUMINT**, **INT** and **BIGINT**. Which one would be most fitting for this situation?

▼ Solution (Click Here)

If you were thinking **TINYINT**, you would be correct! As we know the maximum signed value of **TINYINT** is 127, this data type would work for our maximum number of 120 teams.

Please note, if you'd like to add an unsigned integer type, you can do that under the **Attributes** column. In this case, we only have 120 teams, so we are within the **TINYINT** maximum signed value range.

Your entry should now look like this:

The screenshot shows the MySQL Workbench interface for the 'teams' table. The top navigation bar includes 'Server: mysql:3306', 'Database: tournament_teams', and 'Table: teams'. Below the navigation are tabs: 'Browse', 'Structure' (which is selected), 'SQL', 'Search', 'Insert', and 'Export'. The main area displays the table structure in a grid:

Name	Type	Length/Values	Default
team_no	TINYINT		None

Below the grid is a section titled 'Structure' with a magnifying glass icon.

- Change the data type for **team_code**!

▼ Hint (Click Here)

Consider the string data types: **CHAR** and **VARCHAR**. Given what we know about this data, that all teams have a three-letter team code, which data type and length would be best?
 ▼ Solution (Click Here)

If you were thinking **CHAR** with a length of **3**, you would be correct! Since we know for sure that every team code is exactly 3 letters, the fixed length **CHAR** data type would be the most suitable in this case.

Your entry should now look like this:

Name	Type	Length/Values	Default
team_code	CHAR	3	None

4. Finally, let's change the **creation_date**.

▼ Hint (Click Here)

Consider the available data types. Which would be the best choice to contain the values in this column?

▼ Solution (Click Here)

If you were thinking **DATE**, you would be correct! As we know, **DATE** is optimized to contain date values, which is exactly what **creation_date** is.

Your entry should now look like this:

Name	Type	Length/Values	Default
creation_date	DATE		None

5. After updating your data types, your **Structure** page should look like the following:

← Server: mysql:3306 » Database: tournament_teams » Table: teams

Browse **Structure** **SQL** **Search** **Insert** **Export**

✓ Table teams has been altered successfully.

```
ALTER TABLE `teams` CHANGE `creation_date` `creation_date` DATE
```

Table structure **Relation view**

#	Name	Type	Collation	Attributes	Null	Default	Con
<input type="checkbox"/>	1 team_no 	tinyint			No	<i>None</i>	
<input type="checkbox"/>	2 team_code	char(3)	utf8mb4_0900_ai_ci		No	<i>None</i>	
<input type="checkbox"/>	3 creation_date	date			No	<i>None</i>	

 Check all With selected:   

6. We can look at our rows by clicking **Browse**.

As you can see, we still have all 120 entries. Great! So, let's take a look at the size of this table.

7. Return to the **tournament_teams** database in the left sidebar.

← Server: mysql:3306 » Database: tournament_teams

Structure **SQL** **Search** **Query** **Export** **Import**

Filters

Containing the word:

Table	Action
<input type="checkbox"/> teams 	     
1 table	Sum

 Check all With selected:

Upon first glance, we can see that the size of the database has reduced to 16 KiB, four times smaller than the original unoptimized database!

8. We can take optimization a step further by selecting the **teams** table and, in the dropdown, selecting **optimize table**. This is equivalent to performing the **OPTIMIZE TABLE** function in the command-line interface. This command reorganizes the table data and indexes to reduce storage and make accessing the table more efficient. The exact changes made to the table depend on the storage engine in use.

phpMyAdmin

Server: mysql:3306 » Database: tournament

Structure SQL Search

Recent Favorites

New information_schema mysql performance_schema sys tournament_teams

New teams world

Filters

Containing the word:

Table Action

teams ★ Browse Structure

1 table Sum

Check all

Print Data dictionary

Create table

Name:

With selected:

- Copy table
- Show create
- Export
- Delete data or table**
- Empty
- Drop

Table maintenance

- Analyze table
- Check table
- Checksum table
- Optimize table**
- Repair table

Prefix

- Add prefix to
- Replace table
- Copy table

about:blank

With the InnoDB engine, which is what we are currently using, the table is actually rebuilt, with the index statistics updated to free unused space.

phpMyAdmin

Server: mysql:3306 » Database: tournament

Structure SQL Search

Your SQL query has been executed successfully.

OPTIMIZE TABLE `teams`

+ Options

Table	Op	Msg_type
tournament_teams.teams	optimize	note
tournament_teams.teams	optimize	status

Query results operations

Print Copy to clipboard Create

Filters

Containing the word:

Table	Action
<input type="checkbox"/> teams	

1 table Sum

Check all With selected:

Print Data dictionary

Create table

Name: Num

That is what the returned table tells us: InnoDB “optimizes” tables by recreating and analyzing them, and that the optimization had been completed.

Conclusion

Congratulations! You now know how to monitor and optimize your database with the help of the handy tool, phpMyAdmin. Now, you can apply what you have learned to any database that you create or modify in the future.

Author(s)

Kathy An

Other Contributor(s)

Rav Ahuja

Changelog

Date	Version	Changed by	Change Description
2021-10-12	1.0	Kathy An	Created initial version
2021-10-13	1.1	Steve Hord	Copy edits
2023-05-04	1.2	Rahul Jaideep	Updated Markdown file

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