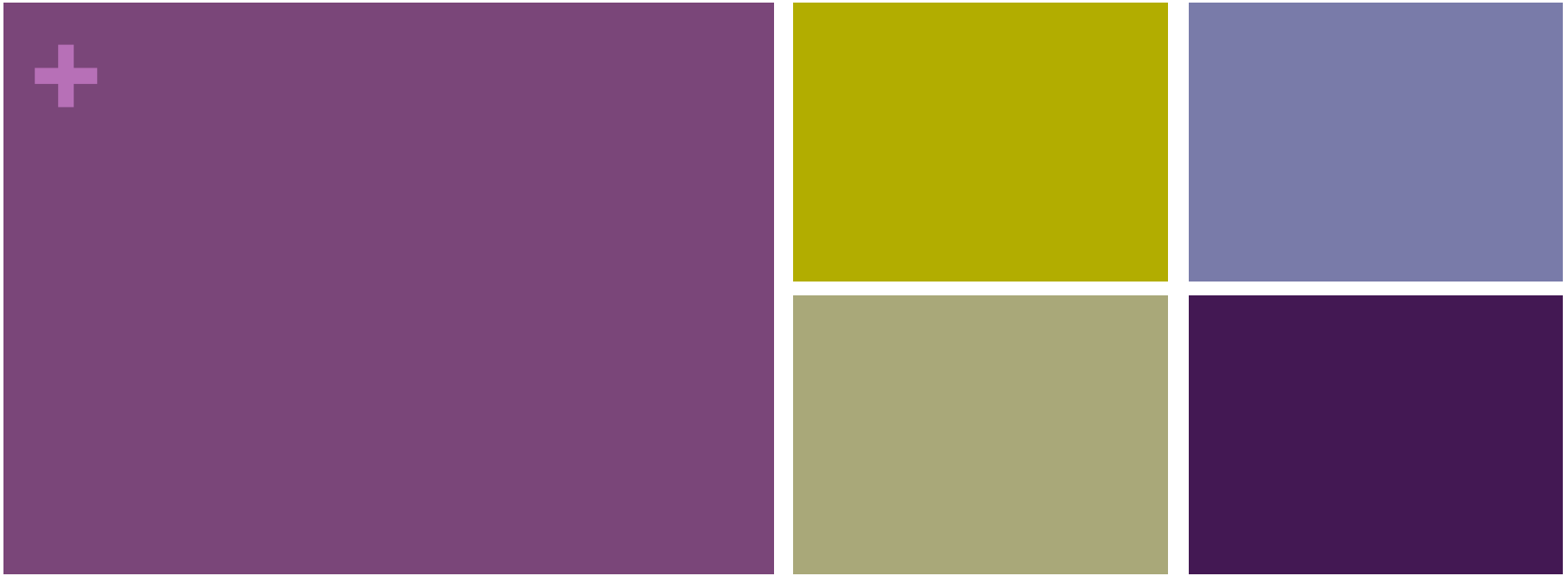

Your New BFFs

The WordPress Core Tables + The MySQL Database
WordCamp Pittsburgh 2017

Is this what you came for?

- You're a rockstar with the front end and the WordPress admin, but the back end is… a mystery. Ever wonder what happens when you create a user or save a post? Where does the data go? Let's dive in to the MySQL database via phpMyAdmin. We'll explore the WordPress core tables and investigate the fields to see how the data is stored. We'll also touch on optimizing your tables and creating database backups without a plugin.

Hey!

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- In former lives I've been… a database developer, a programmer and an instructor
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What are we doing here?

- Follow along with your computer or just watch
- Find me on Twitter to see published slides #wcpgh
- Game plan:
  - Databases are a thing
  - Let's go look at one
  - WordPress uses a database
  - Let's back up and optimize the WordPress database

Database Basics + Lingo

What is a database?

- Organized collection of data
- Data is stored in tables
  - Each table should be about one specific topic
  - Avoid repeating data
- Tables have fields (or columns)
  - Each piece of information that you want to collect about that topic
  - Each field has a specific data type (what's stored there?)
- Tables have records (or rows)
  - Each record is a complete set

Example

- Table Customer
  - All fields (columns) related to the customer
  - One field is a unique identifier called a primary key
  - One record (row) per customer

CustomerID	Name	Address	City	State
1	Mary Smith	123 Main St	Pittsburgh	PA
2	John Doe	444 South St	Pittsburgh	PA
3	Lisa Jones	551 North Ave	Pittsburgh	PA

Relationships

- MySQL stores relational databases
- Remember we collect data in a table about one topic
- Other topics (tables) can be related
- Think of it like a parent/child relationship
  - Can call this one to many (it's the most common)
  - One parent can have many children
- We said the unique identifier in the parent table is the primary key
- The related field in the child table is the foreign key
  - Same data type and let's be cool and name them the same

Example

CustomerID	Name	Address	City	State
1	Mary Smith	123 Main St	Pittsburgh	PA
2	John Doe	444 South St	Pittsburgh	PA
3	Lisa Jones	551 North Ave	Pittsburgh	PA

One customer can have many orders

OrderID	CustomerID	Item	Quantity	OrderDate	Paid
1234	1	Orange shirt	2	9/1/2017	Y
1235	1	Pink shoes	1	9/2/2017	Y
1236	3	Jeans	2	9/3/2017	Y

No no no no no no no!

Customer ID	Name	Address	City	State	OrderID	Item	Quantity	OrderDate	Paid
1	Mary Smith	123 Main St	Pittsburgh	PA	1234	Orange shirt	2	9/1/2017	Y
1	Mary Smith	123 Main St	Pittsburgh	PA	1235	Pink shoes	1	9/2/2017	Y
2	John Doe	444 South St	Pittsburgh	PA					
3	Lisa Jones	551 North Ave	Pittsburgh	PA	1236	Jeans	2	9/3/2017	Y

I know I just said…

- Each table should be about one specific topic
- But… there are other types of tables (the meta tables) in WordPress
- These tables contain:
  - An ID unique to the table
  - An ID that corresponds back to the table they're related to
  - A key
  - A value
- And they can hold almost anything
- There are drawbacks, however this allows for flexibility!!

MySQL + phpMyAdmin

About MySQL

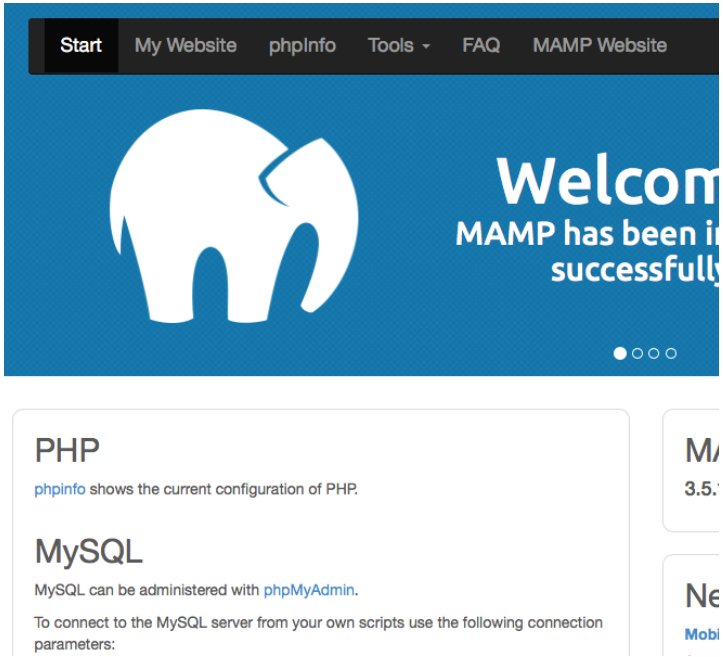
- WordPress supports MySQL 5.0.15 or higher and any version of MariaDB
- “The world’s most popular open source database”
- From Oracle
- Relational Database Management System (RDBMS)
- Uses Structured Query Language (SQL)

Getting to phpMyAdmin

- Every place is different!
- I'll give you four examples and none are the same
- Look around your hosting environment

Working locally, using MAMP

- Start MAMP
- Once the servers start
- http://localhost:8888/MAMP/ opens
- See link for phpMyAdmin under MySQL



Hosting, Siteground

- Log in and go to the cPanel
- In the section “Databases” choose phpMyAdmin

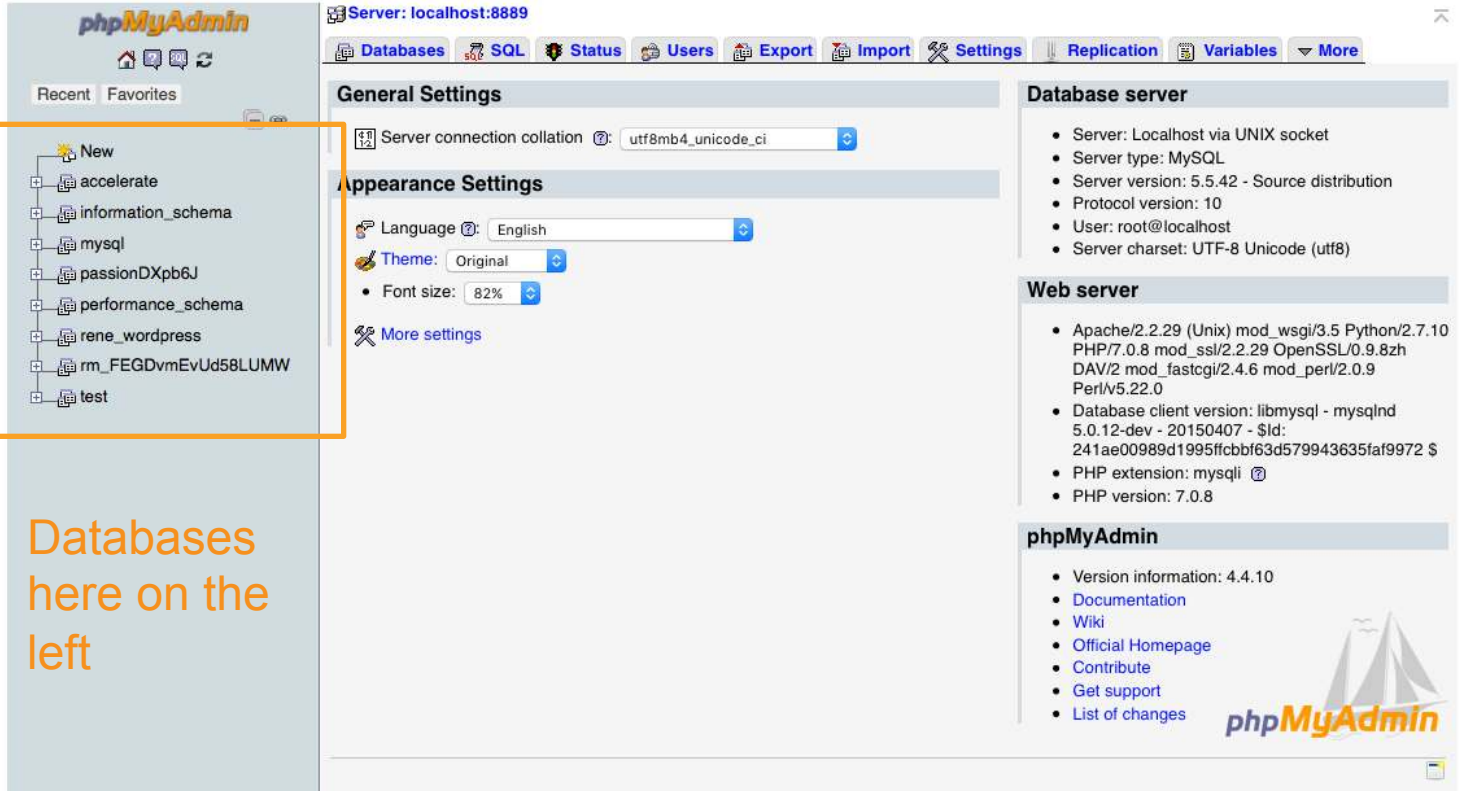
Hosting, Pair

- Log in, go to Databases, choose Manage Your Databases
- Choose the desired database, then click phpMyAdmin
- You will then have to log in with the database username/ password

Hosting, 1&1

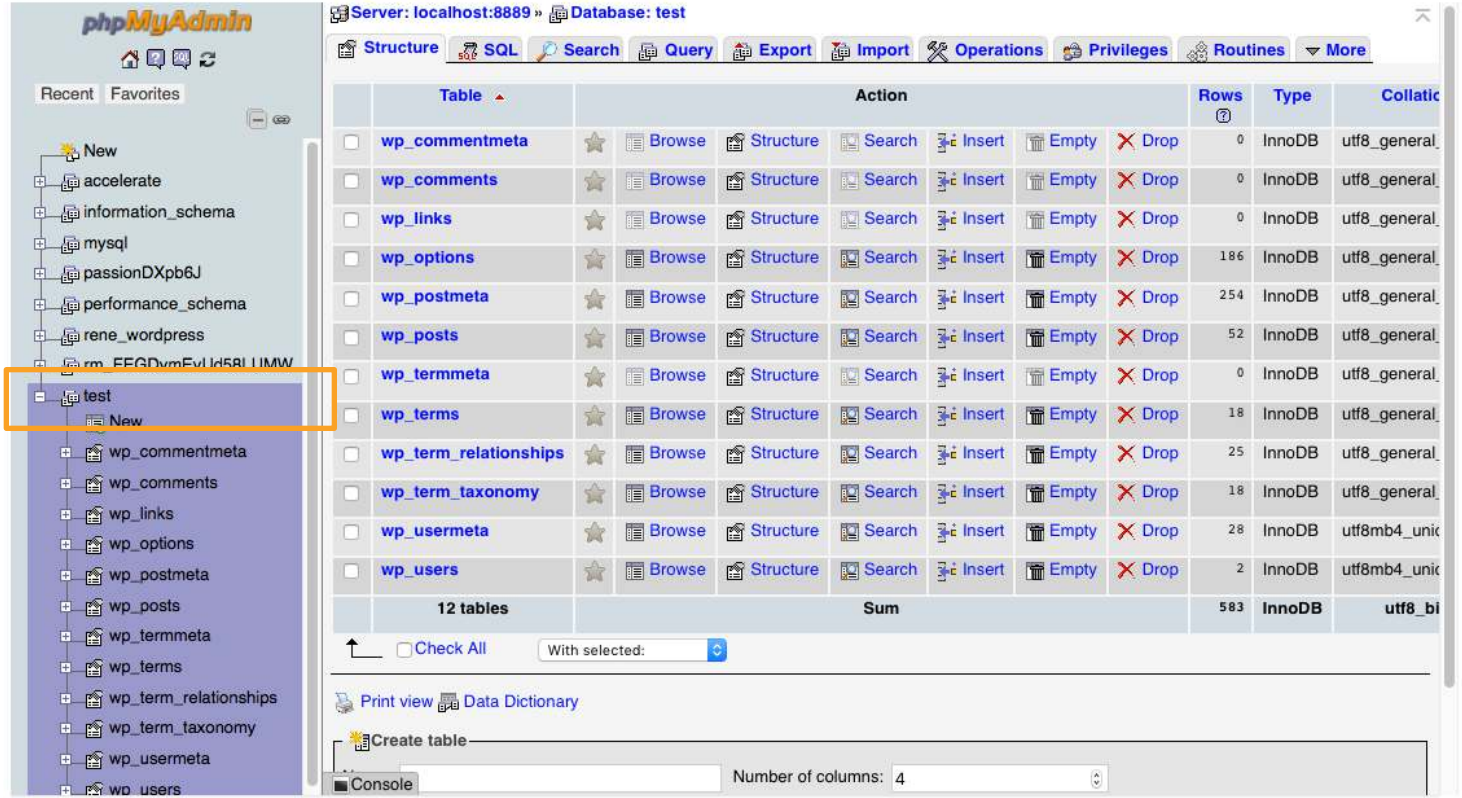
- Setup as Managed by 1&1, you will not be able to see or access your database
- You must switch to Standard mode
- Your installation is moved from their system database to your own database
- Access under My Products, MySQL database, phpMyAdmin

Walking around the screen



Databases here on the left

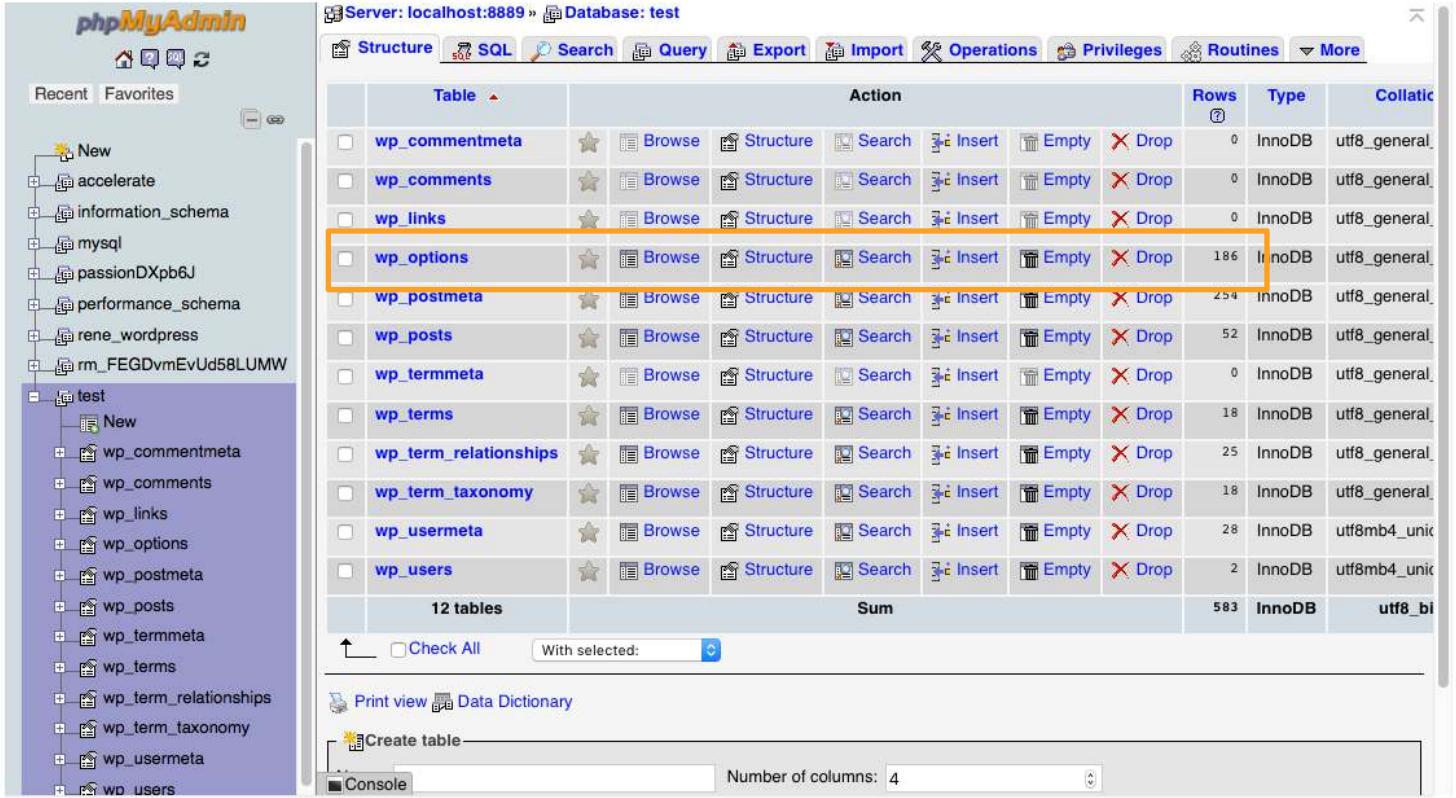
And around



Select database on left

See tables on right

And around…



For each table: Browse, Structure, Rows

Size and Overhead, too (not pictured)

What are we looking at?

- The WordPress core tables!!
- There are 12 of them currently
  - A bit of a mystery with wp_termmeta
- Last updated with version 4.4 (we're on 4.8.1)
- https://codex.wordpress.org/Database_Description
- Let's discuss what they are, how they're related and the fields in each table

But first… a note about prefixes

- The default naming for WordPress tables is wp_table_name
- There is debate on whether using a different prefix makes your database more secure
- Some hosting companies also require you to use a prefix other than wp_

WordPress Core Tables

Posts!

- wp_posts
  - The most important!!
  - More than just posts
  - Also stores pages, menu items, media attachments and custom types
- wp_postmeta
  - Holds extra information about individual items above
  - The first of our key/value pair tables
- 1 to many
  - For every one post (primary key ID), there can be many meta records (foreign key post_id)

Fields in wp_posts

- **ID** – unique number assigned to each post
- **post_author** – the user ID who created it (wp_users)
- **post_date** – time and date of creation
- **post_date_gmt** – GMT time and date of creation (no dependency on a site's timezone in the future, so brilliant)
- **post_content** – holds all the content for the post, including HTML, shortcodes and other content
- **post_title** – title of the post

Fields in wp_posts

- **post_excerpt** – custom intro or short version of the content
- **post_status** – status of the post such as *draft, pending, private, publish*
- **comment_status** – if comments are allowed
- **ping_status** – if the post allows ping and trackbacks
- **post_password** – optional password used to view the post
- **post_name** – URL friendly slug of the post title

Wait, what's a ping?

- In the early days, blog A could notify blog B automatically when blog A linked to blog B's content
- The pingback would appear in blog B's comment moderation queue with a link to blog A's website
- Kinda cool, but now often just used by spammers
- Turn it off under Settings, Discussion

Back to it. More fields in wp_posts

- **to_ping** – a list of URLs WP should send pingbacks to when updated
- **pinged** – a list of URLs WP has sent pingbacks to when updated
- **post_modified** – time and date of last modification
- **post_modified_gmt** – GMT time and date of last modification
- **post_content_filtered** – used by plugins to cache a version of post_content
- **post_parent** – used to create a relationship between this post and another when this post is a revision, attachment or another type

Oh so many fields in wp_posts

- **guid** – global unique identifier, the permanent URL to the post, not the permalink version
- **menu_order** – holds the display number for pages and other non-post types
- **post_type** – the content type identifier (posts, revisions, pages, menu items, media attachments and custom post types)
- **post_mime_type** – only used for attachments, the MIME type of the uploaded file
- **comment_count** – total number of comments, pingbacks and trackbacks

Fields in wp_postmeta

- **meta_id** – unique number assigned to each row of the table
- **post_id** – ID of the related post (wp_posts)
- **meta_key** – an identifying key for the piece of data
- **meta_value** – the actual piece of data

Terms and taxonomies

- Four term tables, but before we get to them…
- Terms
  - Any descriptive words
- Taxonomies
  - Category
  - Tag
  - Other custom ones
    - Cars could be a taxonomy with terms like Toyota, Honda and Audi
    - Fruits a taxonomy with terms like strawberries, apples and grapes

Term tables

- wp_terms
  - Holds our generic terms (descriptive adjectives)
- wp_termmeta
  - Holds additional data about terms
- 1 to many
  - For every one term (primary key term_id), there can be many meta records (foreign key term_id)

Fields in wp_terms

- **term_id** – unique number assigned to each term
- **name** – the name of the term
- **slug** – the URL friendly slug of the name
- **term_group** – ability for themes or plugins to group terms together to use aliases; not populated by WordPress core itself

Fields in wp_termmeta

- **meta_id** – unique number assigned to each row of the table
- **term_id** – ID of the related term (wp_terms)
- **meta_key** – an identifying key for the piece of data
- **meta_value** – the actual piece of data

Now with the taxonomy

- Mark each term with an appropriate taxonomy
- What's a taxonomy again?
- Remember categories and tags
- Creating a term/taxonomy pair

Fields in wp_term_taxonomy

- **term_taxonomy_id** – unique number assigned to each row of the table
- **term_id** – the ID of the related term (wp_terms)
- **taxonomy** – the slug of the taxonomy (category, post_tag, etc.)
- **description** – description of the term in this taxonomy
- **parent** – ID of a parent term; used for hierarchical taxonomies like categories
- **count** – number of post objects assigned the term for this taxonomy

Finally with the relationship

- This is a junction table!
- Many to many
  - Each post can have many term/taxonomy pair records
  - Each term/taxonomy pair can be used by many posts

Fields in wp_term_relationships

- **object_id** – the ID of the post object (wp_posts)
- **term_taxonomy_id** – the ID of the term / taxonomy pair (wp_term_taxonomy)
- **term_order** – allow ordering of terms for an object, not fully used

Some additional reading

- https://codex.wordpress.org/Taxonomies
- https://codex.wordpress.org/WordPress_Taxonomy
- https://en.wikipedia.org/wiki/Associative_entity

Comments

- wp_comments
  - Each comment of a post
- wp_commentmeta
  - Any additional information needed about comments; Akismet anti-spam plugin uses this for example
- 1 to many
  - For every one comment (primary key comment_ID), there can be many meta records (foreign key comment_id)

Fields in wp_comments

- **comment_ID** – unique number assigned to each comment
- **comment_post_ID** – ID of the post this comment relates to (wp_posts)
- **comment_author** – Name of the comment author
- **comment_author_email** – Email of the comment author
- **comment_author_url** – URL for the comment author
- **comment_author_IP** – IP Address of the comment author
- **comment_date** – Time and date the comment was posted
- **comment_date_gmt** – GMT time and date the comment was posted

Fields in wp_comments

- **comment_content** – the actual comment text
- **comment_karma** – unused by WordPress core; can be used by plugins to help manage comments
- **comment_approved** – if the comment has been approved
- **comment_agent** – where the comment was posted from (browser, operating system, etc.)
- **comment_type** – type of comment (comment, pingback or trackback)
- **comment_parent** – refers to another comment when this comment is a reply
- **user_id** – ID of the comment author if registered user on the site (wp_users)

Fields in wp_commentmeta

- **meta_id** – unique number assigned to each row of the table
- **comment_id** – the ID of the related comment (wp_comments)
- **meta_key** – an identifying key for the piece of data
- **meta_value** – the actual piece of data

Users

- wp_users
  - Each WordPress user
- wp_usermeta
  - Any additional information needed about users
  - For example, first_name and last_name
- 1 to many
  - For every one user (primary key ID), there can be many meta records (foreign key user_id)

Fields in wp_users

- **ID** – unique number assigned to each user
- **user_login** – unique username
- **user_pass** – hash of the user's password
- **user_nicename** – user display name
- **user_email** – email address of the user

Fields in wp_users

- **user_url** – user's URL
- **user_registered** – time and date the user registered
- **user_activation_key** – used for resetting passwords
- **user_status** – was used in Multisite pre WordPress 3.0 to indicate a spam user
- **display_name** – desired name to be used publicly in the site (user_login, user_nicename or first_name/last_name from wp_usermeta)

Fields in wp_usermeta

- **umeta_id** – unique number assigned to each row of the table
- **user_id** – ID of the related user (wp_users)
- **meta_key** – an identifying key for the piece of data
- **meta_value** – the actual piece of data

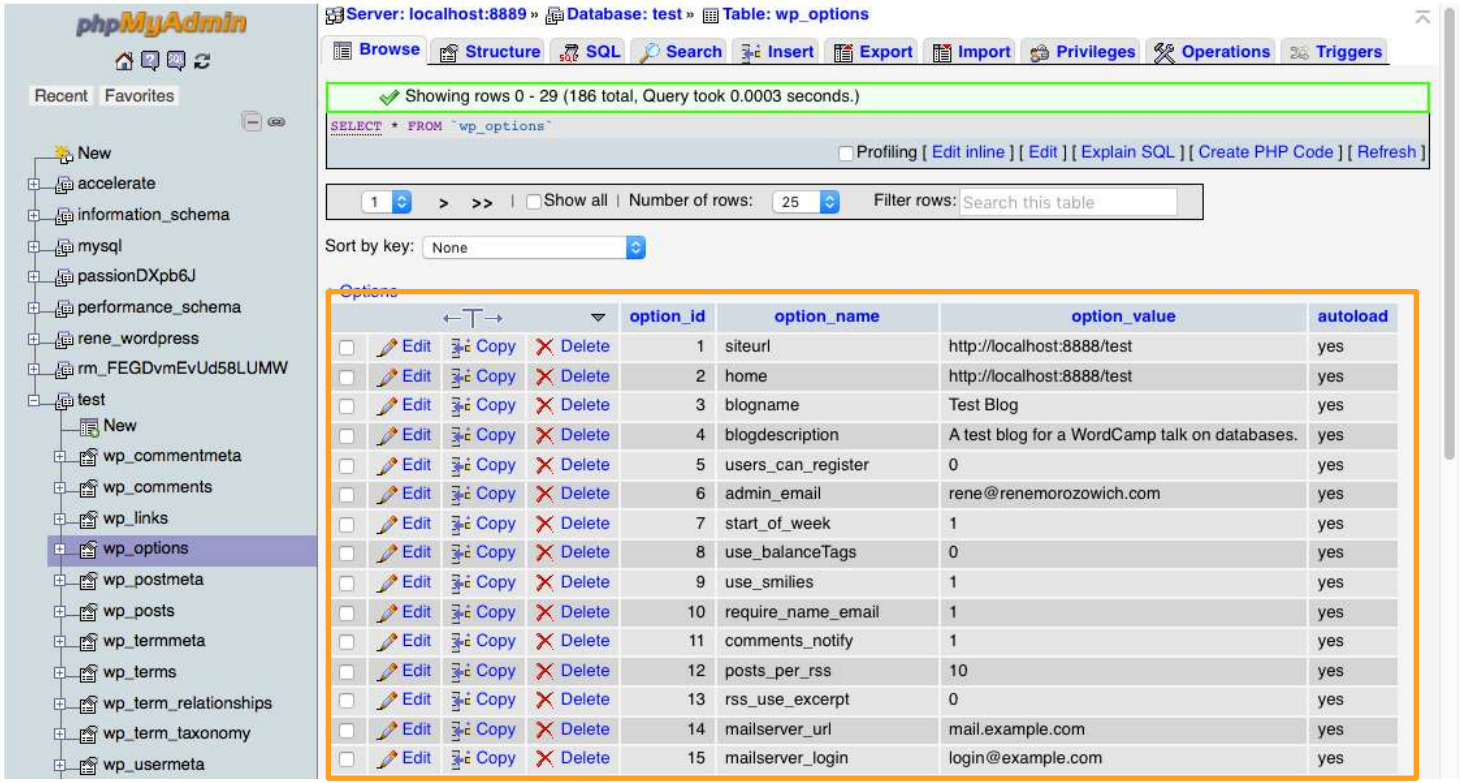
Other

- wp_options
  - Table that stores site configuration settings
  - Data about themes, active plugins, widgets, temporary cached data
  - Where other plugins and themes store settings
- wp_links
  - Many sites used to have a blogroll (list of links to other sites)
  - This table held those links!
  - Removed from the admin UI
  - But table remains for backwards compatibility

Fields in wp_options

- **option_id** – unique number assigned to each row of the table
- **option_name** – an identifying key for the piece of data
- **option_value** – the actual piece of data (often serialized)
- **autoload** – controls if the option is automatically loaded by the function wp_load_alloptions() (puts options into object cache on each page load)

Browse wp_options



	option_id	option_name	option_value	autoload
Edit Copy Delete	1	siteurl	http://localhost:8888/test	yes
Edit Copy Delete	2	home	http://localhost:8888/test	yes
Edit Copy Delete	3	blogname	Test Blog	yes
Edit Copy Delete	4	blogdescription	A test blog for a WordCamp talk on databases.	yes
Edit Copy Delete	5	users_can_register	0	yes
Edit Copy Delete	6	admin_email	rene@renemorozowich.com	yes
Edit Copy Delete	7	start_of_week	1	yes
Edit Copy Delete	8	use_balanceTags	0	yes
Edit Copy Delete	9	use_smilies	1	yes
Edit Copy Delete	10	require_name_email	1	yes
Edit Copy Delete	11	comments_notify	1	yes
Edit Copy Delete	12	posts_per_rss	10	yes
Edit Copy Delete	13	rss_use_excerpt	0	yes
Edit Copy Delete	14	mailserver_url	mail.example.com	yes
Edit Copy Delete	15	mailserver_login	login@example.com	yes

Each record in our options table

Serialized Data

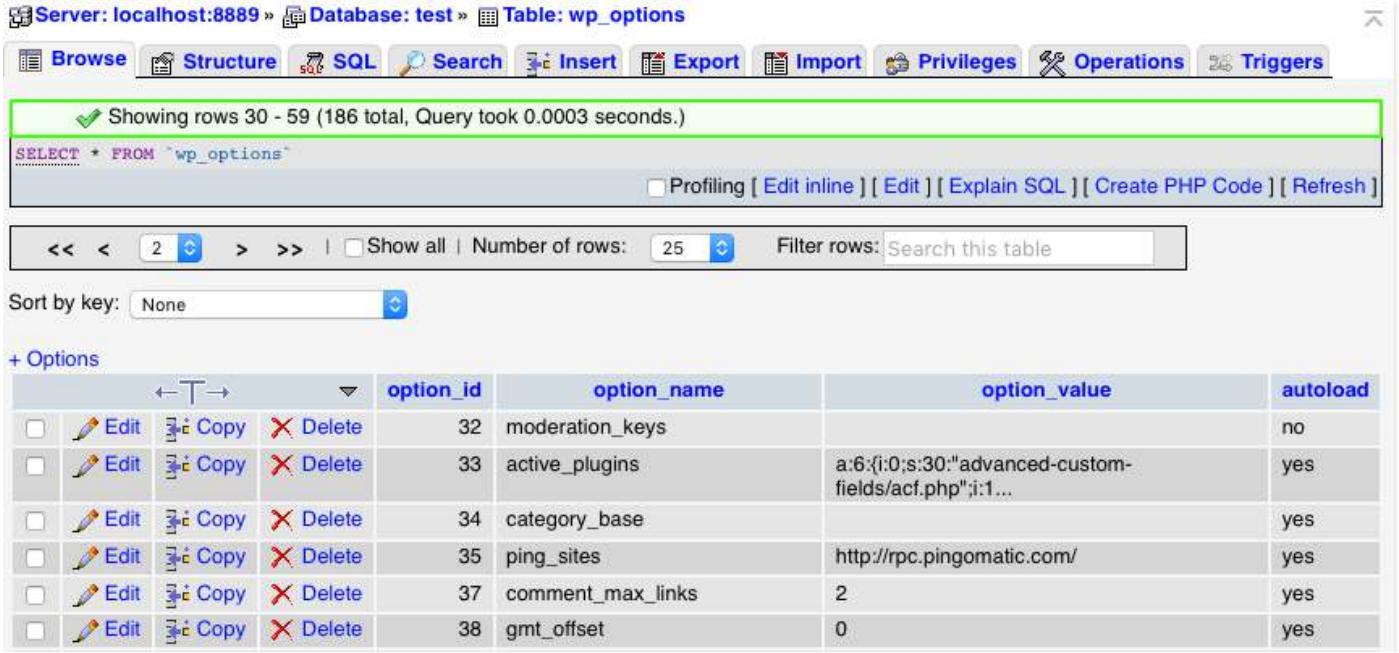
- Some rows store serialized data, like the active_plugins row

```
a:3:{i:0;s:31:"query-monitor/query-monitor.php";i:1;s:
57:"accesspress-instagram-feed/accesspress-instagram-
feed.php";i:2;s:19:"akismet/akismet.php”;}
```

```
$array = array(
'0' => 'query-monitor/query-monitor.php'
'1' => 'accesspress-instagram-feed/accesspress-
instagram-feed.php'
'2' => 'akismet/akismet.php’
);
```

- Read more at https://wpengine.com/support/wordpress-serialized-data/

Look! There it is!



				option_id	option_name	option_value	autoload
☐	Edit	Copy	Delete	32	moderation_keys		no
☐	Edit	Copy	Delete	33	active_plugins	a:6:{i:0;s:30:"advanced-custom-fields/acf.php";i:1...	yes
☐	Edit	Copy	Delete	34	category_base		yes
☐	Edit	Copy	Delete	35	ping_sites	http://rpc.pingomatic.com/	yes
☐	Edit	Copy	Delete	37	comment_max_links	2	yes
☐	Edit	Copy	Delete	38	gmt_offset	0	yes

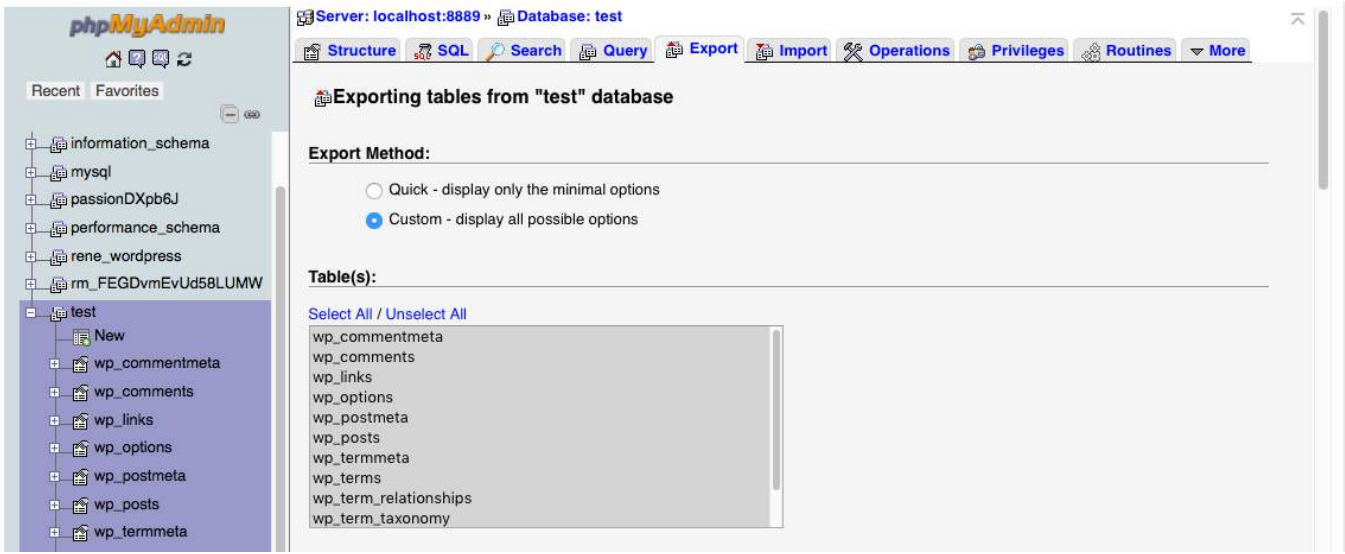
Backup + Optimize

A note on backups

- Before making a change, back up your database!
- Also backup regularly
- Do it. No seriously. Do it.

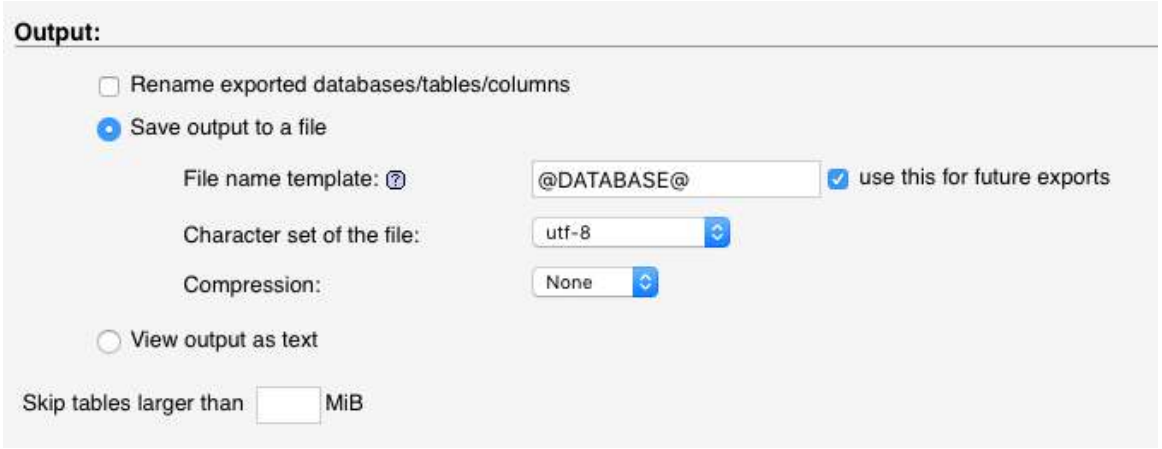
Creating a database backup

- Choose the database, click Export and choose Custom



Options

- Save output to a file



More options

- Check Add DROP TABLE / VIEW / PROCEDURE / FUNCTION / EVENT / TRIGGER statement
  - If the tables (etc.) are already there, they will be dropped and recreated

Done!

- Click Go
- This downloads a .sql file for you
- Feel free to check it out in your text editor

What does optimizing mean?

- Your database will grow!
- Anytime you add/change/remove data
- A large database can affect performance
- It takes awhile for your site to fetch the data from the database
  - When there's so much to look through
  - When data isn't stored efficiently

It’s like…

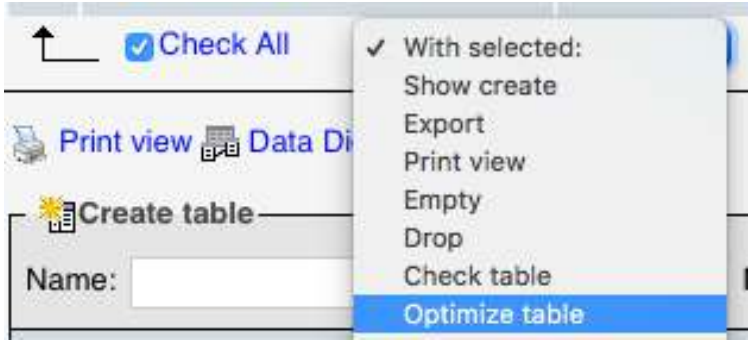
- Cleaning out your closet
  - You put things in there day after day
  - It gets cluttered
  - Harder and harder to find things
  - Space isn’t used efficiently over time
- Defragmenting your hard drive
- And maybe a little like that 3,000 mile oil change

What does it actually do?

- “Reorganizes the physical storage or table data and associated index data, to reduce storage space and improve I/O efficiency when accessing the table”
- Got that?
- Plain English:
  - Reorganizes it
  - Frees up space
  - Now data can get in and out more quickly (I/O)

How to optimize tables

- In phpMyAdmin, choose the database on the left
- On the right at the bottom of the table list, check “Check all”
- In the drop down “With selected:” choose Optimize table



Also…

- You may also want to purge old post revisions!
- You can do this with the database, however I don't recommend it
  - Running insert/update/delete SQL statements can be scary!
- Try a plugin like WP-Optimize or Better Delete Revision
- You can also limit the number of post revisions you keep
- Add/modify in your wp-config.php file:

```
define('WP_POST_REVISIONS', 5);
```

Questions?

Thanks for attending!

Credits

- Field descriptions from the tables were used from https://deliciousbrains.com/tour-wordpress-database/