**Assignment 4 (Team SuperheroDB - Rohan, Victor , Marc)**

* **Problem statement and use cases. Does you have a clear problem in mind and have thought through *specific* ways the database will be used?**
  + **What is the problem that exists now that will be solved by this database?**
  + **Who specifically will be using the database? How exactly will help them?**
  + **It is easiest to demonstrate this by including detailed use cases.**

**Problem**

It’s a bird! It’s a plane! No… it’s a bunch of data organized in tables! The superhero database incorporates tables and relationships to show how superheroes and villains interact in their given environment, their origin and where they belong in the landscape of comic books and comic history. The problem we are trying to solve is given the many characters - both heroes and villains in the comic book universe and information about them amounts to a lot of data. We have tried to model the information into a relational database and build a simple user interface to explore relationships.

**Who will be using this**

We have built this for enthusiasts to explore their favorite comic book superheroes and villains. It is also a good way for newbies to get introduced to the world of superheroes. Our interface makes it so much easier than picking up a book !

**Use cases**

We identified high level tasks superhero enthusiasts might be interested in. We later implement these use cases using html forms.

* Display all characters with their images ordered alphabetically
* Display all Superhero Teams
* Display Team Details and members associated to the team
* Drill Down into a character to check detailed character description and the relationships (unidirectional and bidirectional) the character has with other entities such as rivalry with other characters, Special powers , armor etc.
* Display the creators and the characters they created.
* Display the Universe and the characters that are part of the universe
* **Database Design. Does the database design make sense given the problem?**
  + **You would at least have to include an ER diagram, but you would also want to *explain* what your entities represent and why they are linked this way or another. Note that ER diagrams generated by Access mis-represent the cardinality of relations. You should either use a different tool or use a pen to correct the diagrams generated by Access.**
  + **Normally, we would expect the database to be fully normalized. If your database is not, make sure to explain why.**
  + **Check that your database design can indeed support all the things that it is supposed to do. If your database *cannot* achieve some of the objectives, explain this (and explain why).**

The superhero database is comprised of 11 tables: ABILITIES, ALLEQUIPMENT, CHARACTERS, CHAR\_HAS\_ABIL, CHAR\_HAS\_EQUIP, CREATORS, HERO\_HAS\_VILL, TEAM, TEAM\_HAS\_CHARS, UNIVERSE, USER. The purpose of this database is to allow users to search and understand superheroes in a complete landscape, where many other databases only work for certain universes (ie Marvel universe or DC universe). Our current database includes characters from DC, Marvel, Arthurian times, Classical Greece among other areas. The current database is in its third iteration, with the data being cleaned up to a more streamlined form each time.

The first and most important table is known as “CHARACTERS”. This table houses the basic biographical information of our heroes and villains. This information includes the characters first and last name, their alias, what race they are and what year they were first created. This table will help users get acquainted with the basics of each character, yet it provides the user with the ability to learn the origin and the age the character was originally conceived. This table links to the most tables in the database by utilizing many foreign keys.

The tables “ABILITY” and “ALLEQUIPMENT” have had more form modification than any other tables. ABILITY is a table that houses the varying abilities that these heroes and villains may have. ABILITY was originally named “POWERS” until the group realized that a character like Batman has no powers, but has abilities such as genius level intellect and tactical expertise. ABILITIY lists all the unique abilities that these heroes have, and relies on another table to determine how many characters posses each one. “ALLEQUIPMENT” was originally created as “EQUIPMENT” and housed columns for armor and weapons. This new format of ALLEQUIPMENT is simpler holding only the name, the type of equipment it is and the equipment type alongside the RowID number. ABILITY and ALLEQUIPMENT have the practical use of storing unique keys that superheroes and super villains could possess.

The tables ABILITY and ALLEQUIPMENT have intermediary tables between them and CHARACTERS known as CHAR\_HAS\_ABIL and CHAR\_HAS\_EQUIP respectively. These intermediary tables are tasked with holding which characters have which abilities. These tables were not in the in original diagram and have been added to clean up the original “POWERS” and “EQUIPMENT” tables. We as a group did not want to have the same abilities listed multiple times on the ABILITY table, so this intermediary houses which character posses which ability, allowing for characters to have multiple abilities with fewer places to hold data. CHAR\_HAS\_EQUIP was formed after realizing that the entry “Light saber” was found multiple times in the original EQUIPMENT table. This intermediary allows for the EQUIPMENT table to be cleaner with fewer entries. Both intermediaries are practical because they take less overall space on the disk by using ID numbers in the intermediary instead of varchar(45) for each entry of EQUIPMENT or ABILITY that isn’t unique (like Light Saber).

The table UNIVERSE has not changed in form since its original creation. This table houses the varying universes from which these characters originate. Universe acts as an abstract term because it places both the classical Greek era of the Iliad on the same plane as the Detective Comic universe. This table links to the CHARACTER table only. It saves space by allowing the characters to link via a UniverseID instead of writing out the universe multiple times as a varchar(45), saving space and making queries faster.

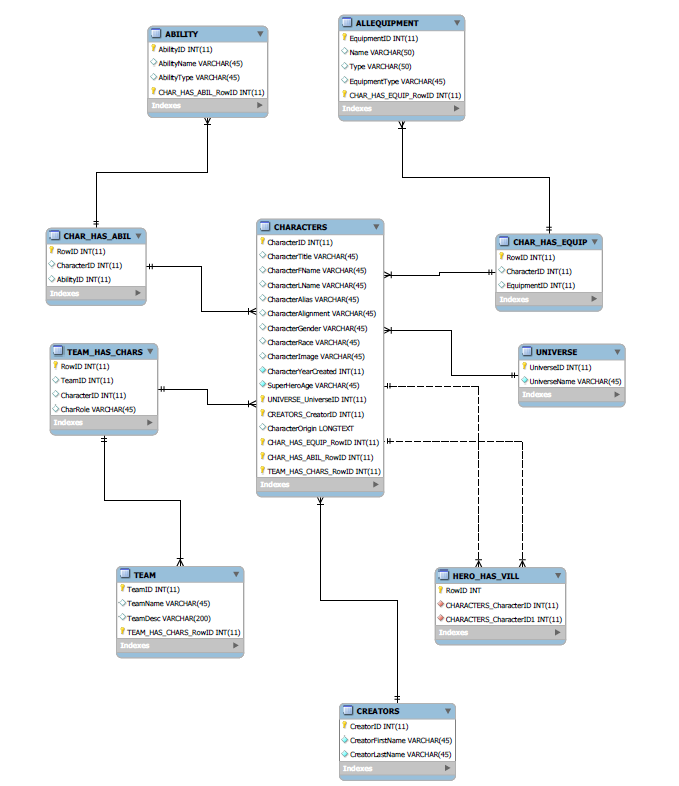
The table UNIVERSE has not changed in form since its original creation. This table houses the varying universes from which these characters originate. Universe acts as an abstract term because it places both the classical Greek era of the Iliad on the same plane as the Detective Comic universe. This table links to the CHARACTER table only. It saves space by allowing the characters to link via a UniverseID instead of writing out the universe multiple times as a varchar(45), saving space and making queries faster.

The TEAM table originally contained the list of every member of every team. That meant that if there was 1 leader and 3 members of a team like “The Avengers”, they were all put into the original TEAM table. The original TEAM table has since been turned into tables, TEAM and TEAM\_HAS\_CHAR. The new TEAM table simply lists the teams that people fit into. It includes a RowID, to keep track of which team is which. TEAM\_HAS\_CHAR is where the specific data of who is on which team and what role they have on those teams. By using integers to link TEAM to TEAM\_HAS\_CHAR, less disk space is taken.

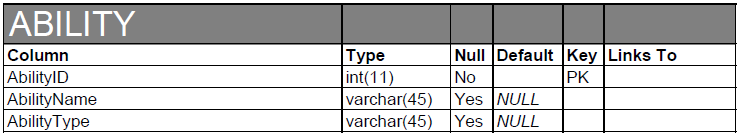
CREATOR contains a list of the comic book authors that created the characters from the CHARACTER table. The form of this table has not changed since its original inception, however the columns may have been renamed to make them more specific. It contains the columns CreatorID, CreatorFirstName, and CreatorLastName. These creators can make multiple characters, so CREATORS relates to CHARACTERS via the CreatorID.

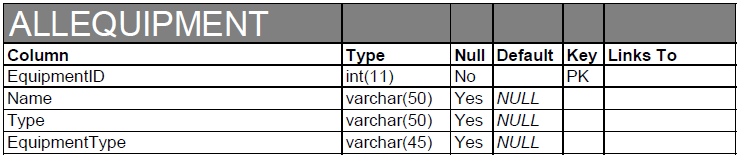
The last table known as HERO\_HAS\_VILL contains the information about which people from CHARACTERS square off in the field of battle. This table contains a RowID, HeroID and VillainID. The table links directly to CHARACTERS. The type of relationship is Many-to-Many, because each hero can battle against several villains and each villain can battle with several heroes. This was the trickiest part of our relational model as the table has to link back to itself. It solely contains integers making it take less room as a table.

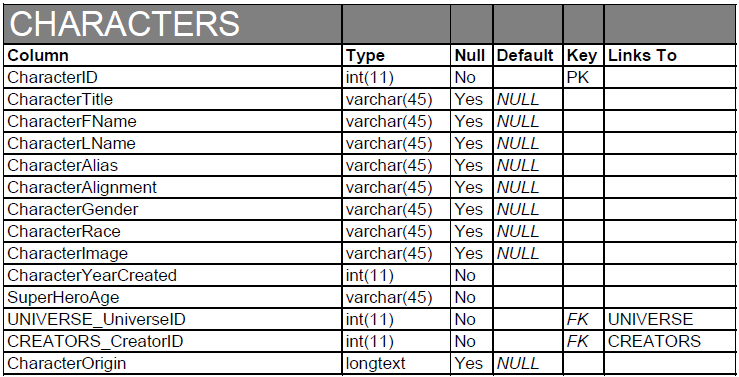
* **Relationships Diagram** -- For MySQL you will need to generate an up-to-date ER diagram (note that the tables in ER diagram SHOULD match those in the Data Dictionary.)

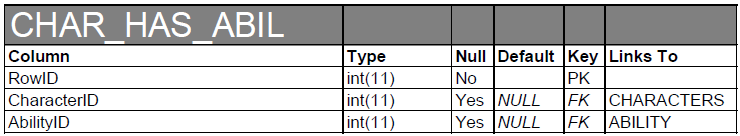


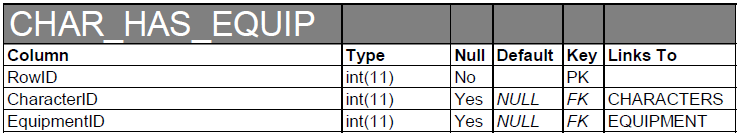
* **Database Implementation. Has the database been successfully implemented (as designed)?**
  + **A good starting point is to include table descriptions, SQL queries that match your use cases and their results. A successful demo during your presentation would also help.**
  + **Your implementation must match your design.**
* **Data Dictionary** -- For MySQL, you can use the "DESCRIBE" command for each table to generate the same kind of information based on the tables you have created. Or, you can have a manually maintained document with this information, just be sure that it includes what table the data element is associated with, its data type, size and whether it is a primary or foreign key - Victor

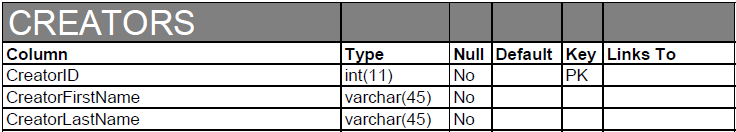


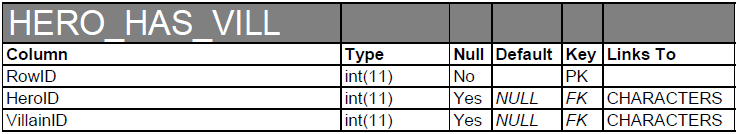


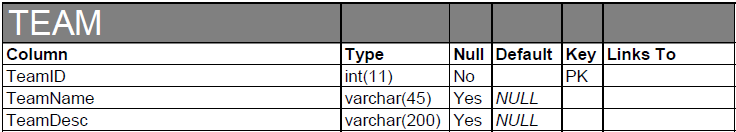


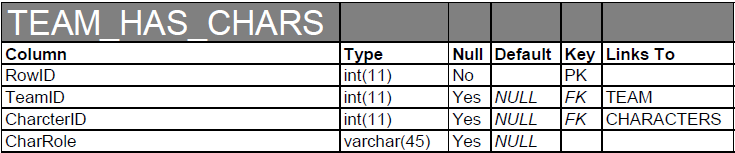


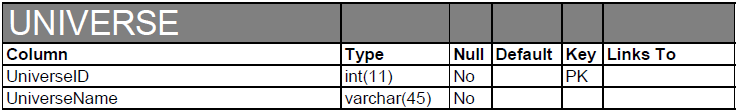












* **Sample queries and results** -- Include at least **3** queries of your database that demonstrate how it can be used. The report should include the SQL form of the query and the table result from running the query. **This implies, of course, that you will have created the database and put at least part of your data into it.** (Rohan)

Queries

**Who has the ability of Sword Combat and weapon with name Excalibur, a sword?**

[**SELECT**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fselect.html&token=410cb5c9d24e834f5335b37fff4d7c53) **CHARACTERS.CharacterAlias**

**FROM CHARACTERS, ABILITY, CHAR\_HAS\_ABIL, CHAR\_HAS\_EQUIP, ALLEQUIPMENT**

**WHERE ABILITY.AbilityName** [**=**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fcomparison-operators.html%23operator_equal&token=410cb5c9d24e834f5335b37fff4d7c53) **'Sword combat expertise'**

[**AND**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Flogical-operators.html%23operator_and&token=410cb5c9d24e834f5335b37fff4d7c53) **CHAR\_HAS\_ABIL.AbilityID** [**=**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fcomparison-operators.html%23operator_equal&token=410cb5c9d24e834f5335b37fff4d7c53) **ABILITY.AbilityID**

[**AND**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Flogical-operators.html%23operator_and&token=410cb5c9d24e834f5335b37fff4d7c53) **CHAR\_HAS\_ABIL.CharacterID** [**=**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fcomparison-operators.html%23operator_equal&token=410cb5c9d24e834f5335b37fff4d7c53) **CHARACTERS.CharacterID**

[**AND**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Flogical-operators.html%23operator_and&token=410cb5c9d24e834f5335b37fff4d7c53) **ALLEQUIPMENT.Name** [**=**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fcomparison-operators.html%23operator_equal&token=410cb5c9d24e834f5335b37fff4d7c53) **'Excalibur'**

[**AND**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Flogical-operators.html%23operator_and&token=410cb5c9d24e834f5335b37fff4d7c53) **ALLEQUIPMENT.Type** [**=**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fcomparison-operators.html%23operator_equal&token=410cb5c9d24e834f5335b37fff4d7c53) **'Sword'**

[**AND**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Flogical-operators.html%23operator_and&token=410cb5c9d24e834f5335b37fff4d7c53) **ALLEQUIPMENT.EquipmentType** [**=**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fcomparison-operators.html%23operator_equal&token=410cb5c9d24e834f5335b37fff4d7c53) **'Weapon'**

[**AND**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Flogical-operators.html%23operator_and&token=410cb5c9d24e834f5335b37fff4d7c53) **ALLEQUIPMENT.EquipmentID** [**=**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fcomparison-operators.html%23operator_equal&token=410cb5c9d24e834f5335b37fff4d7c53) **CHAR\_HAS\_EQUIP.EquipmentID**

[**AND**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Flogical-operators.html%23operator_and&token=410cb5c9d24e834f5335b37fff4d7c53) **CHARACTERS.CharacterID** [**=**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fcomparison-operators.html%23operator_equal&token=410cb5c9d24e834f5335b37fff4d7c53) **CHAR\_HAS\_EQUIP.CharacterID**

**LIMIT 0 , 30**

**What Characters are from the DC universe?**

[**SELECT**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fselect.html&token=b5fa2cefa3a12a5f517ac00d712be42d) CHARACTERS.CharacterAlias

**FROM** CHARACTERS, UNIVERSE

**WHERE** UNIVERSE.UniverseName [=](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fcomparison-operators.html%23operator_equal&token=b5fa2cefa3a12a5f517ac00d712be42d) 'Detective Comics (DC)'

[**AND**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Flogical-operators.html%23operator_and&token=b5fa2cefa3a12a5f517ac00d712be42d) CHARACTERS.UNIVERSE\_UniverseID [=](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fcomparison-operators.html%23operator_equal&token=b5fa2cefa3a12a5f517ac00d712be42d) UNIVERSE.UniverseID

**LIMIT** 0 , 30

**Which HERO character has the most enemies ?**

[**SELECT**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fselect.html&token=410cb5c9d24e834f5335b37fff4d7c53) CHARACTERS.CharacterAlias, CharacterAlignment, [COUNT](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fgroup-by-functions.html%23function_count&token=410cb5c9d24e834f5335b37fff4d7c53)( 1 ) **AS** VILLIANCOUNT

**FROM** CHARACTERS, HERO\_HAS\_VILL

**WHERE** CHARACTERS.CharacterID [=](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fcomparison-operators.html%23operator_equal&token=410cb5c9d24e834f5335b37fff4d7c53) HERO\_HAS\_VILL.HeroID

**GROUP** **BY** HeroID

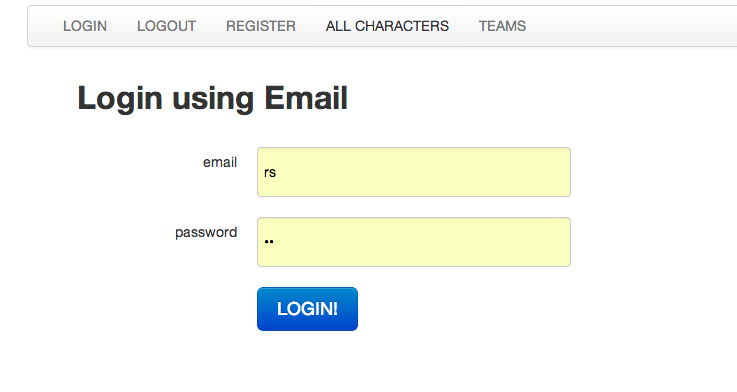
**ORDER** **BY** VILLIANCOUNT **DESC**

**LIMIT** 1

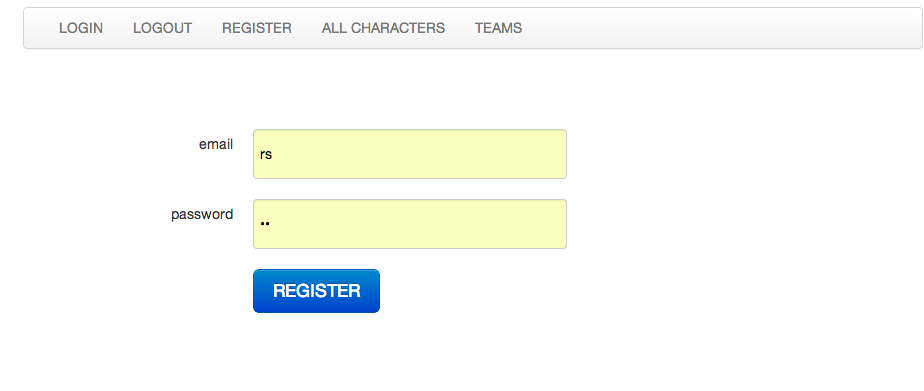
* **User Interaction. Does your database have a *usable* user interface?**
  + **Please include some screenshots and explain any non-obvious design decisions. Again, the demo should help convince us of this.**
  + **As a general rule, asking users to enter IDs of entities does *not* make for a usable interface. If your interface requires them to enter IDs, make sure to explain why.**
  + **If you encountered problems implementing your interface as you conceived it, please make sure to document any discrepancies.I.e., tell us both what you really wanted to make and what you've got, why you couldn't get it to work as it wanted and what you would do it you had more time. You'll get partial credit for well-thought out interface that you couldn't implement.**

* **Sample forms** -- For MySQL include the web pages (screen captures) you intend to use for data input and output. These need not be complete for this report. (Rohan)

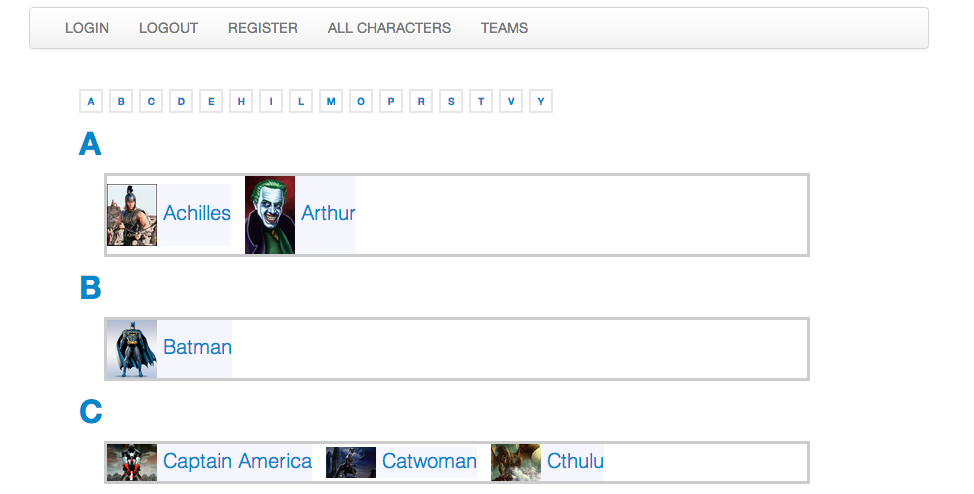
**Form 1 - User login Form**



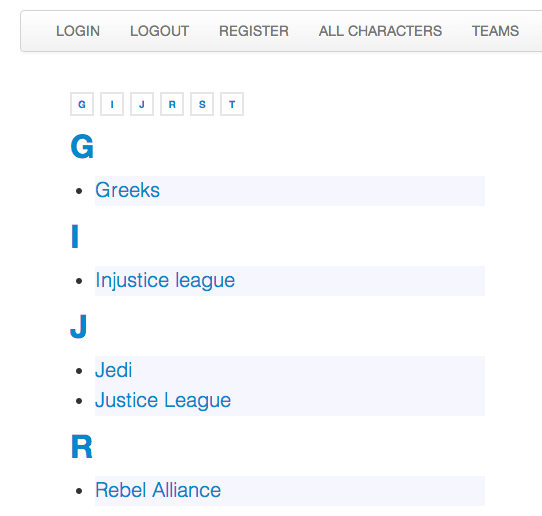
**Form 2 - Registration Form**



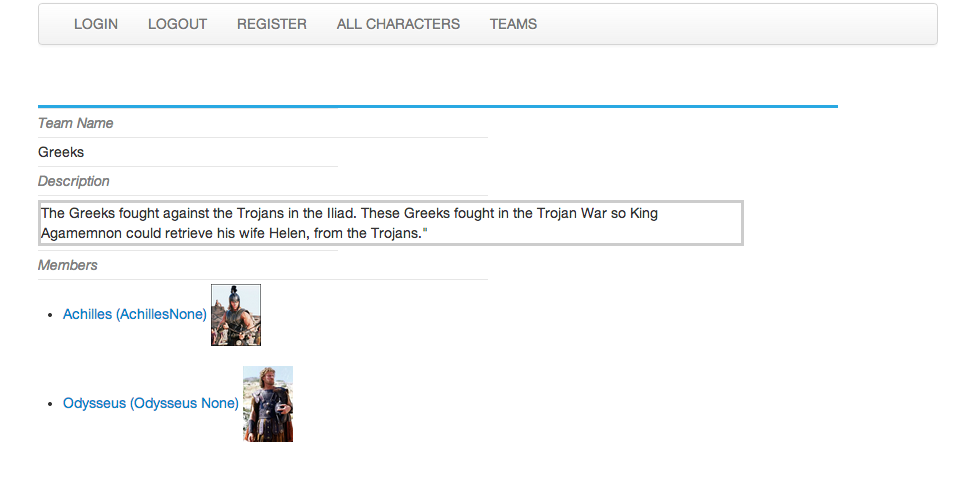
**Form 3 - Display all characters with their images ordered alphabetically (Full form not shown)**



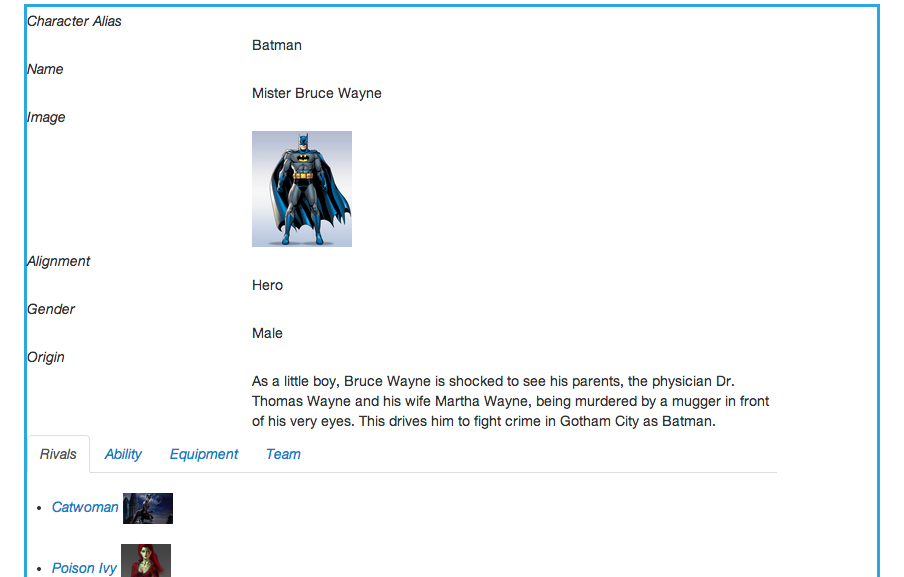
**Form 4 - Display all Superhero Teams**



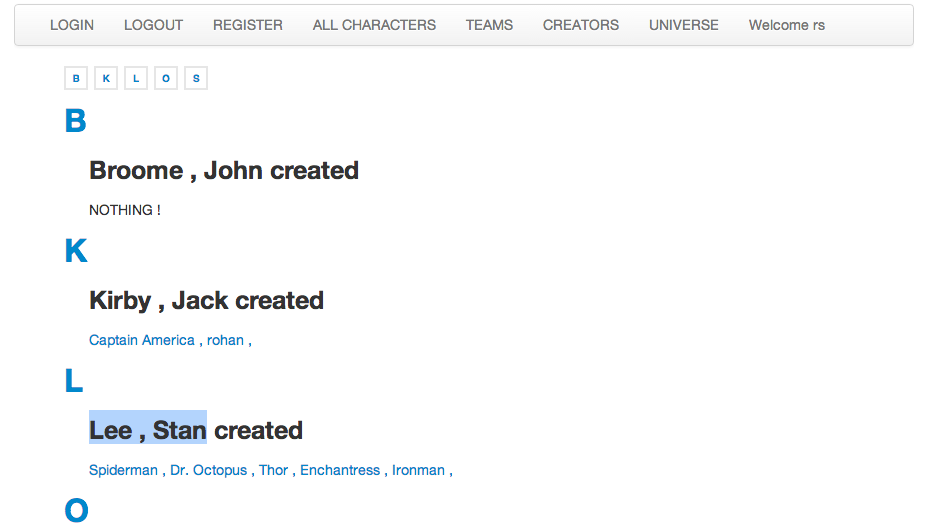
**Form 5 - Display Team Details and members associated to the team (The form will appear if the user drills down on a particular team)**



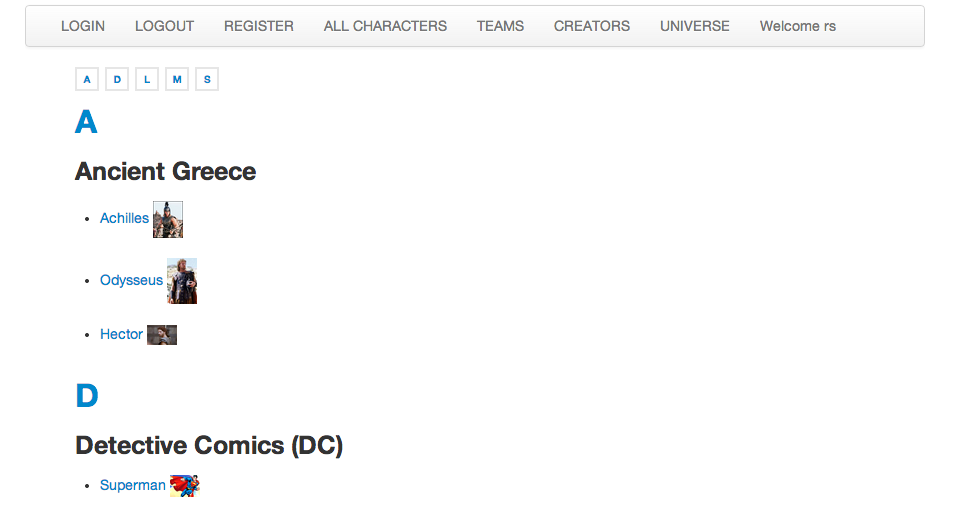
**Form 6 - Drill Down into a character to check detailed character description and the relationships (unidirectional and bidirectional) the character has with other entities such as rivalry with other characters, Special powers , armor etc.**



**Form 7 - Display the creators and the characters they created.**



**Form 8 - Display the Universe and the characters that are part of the universe**



* **Sample reports** -- Create at least 3 reports showing information from tables and queries of your database. Print the reports and include them. For MySQL create and use SQL scripts (or PHP Scripts) to generate the reports. (Reports usually are intended to be printed documents, typically showing summary information for the database, or breakdowns such as numbers of customers by state, total sales by state or region, average sales per customer, etc.)

- Report showing who the heroes are with their enemies

[**SELECT**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fselect.html&token=f2a5bc9c1add01c184ee80f815d8fefe) C.CharacterAlias hero, V.CharacterAlias villain

**FROM** CHARACTERS C, HERO\_HAS\_VILL HV, CHARACTERS V

**WHERE** C.CharacterID [=](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fcomparison-operators.html%23operator_equal&token=f2a5bc9c1add01c184ee80f815d8fefe) HV.HeroID

[**AND**](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Flogical-operators.html%23operator_and&token=f2a5bc9c1add01c184ee80f815d8fefe) HV.VillainID [=](https://groups.ischool.berkeley.edu/pma/url.php?url=http%3A%2F%2Fdev.mysql.com%2Fdoc%2Frefman%2F5.5%2Fen%2Fcomparison-operators.html%23operator_equal&token=f2a5bc9c1add01c184ee80f815d8fefe) V.CharacterID

**ORDER** **BY** hero

**LIMIT** 0 , 30

- Report showing all the characters with their abilities and equipments

- Report showing all the creators and the characters they created