
Dungeons & Dragons Character Creator Database

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Enterprise Statement – Solution Requirements

- Our group tasked itself with creating a solution to create and store Dungeons and Dragons characters
- A player has a unique username and passphrase
- A player may have many characters
- A character has one race, class, and background
- A character may have more than one spell or item at their disposal
- Races, classes, backgrounds, spells, and items may belong to more than one character

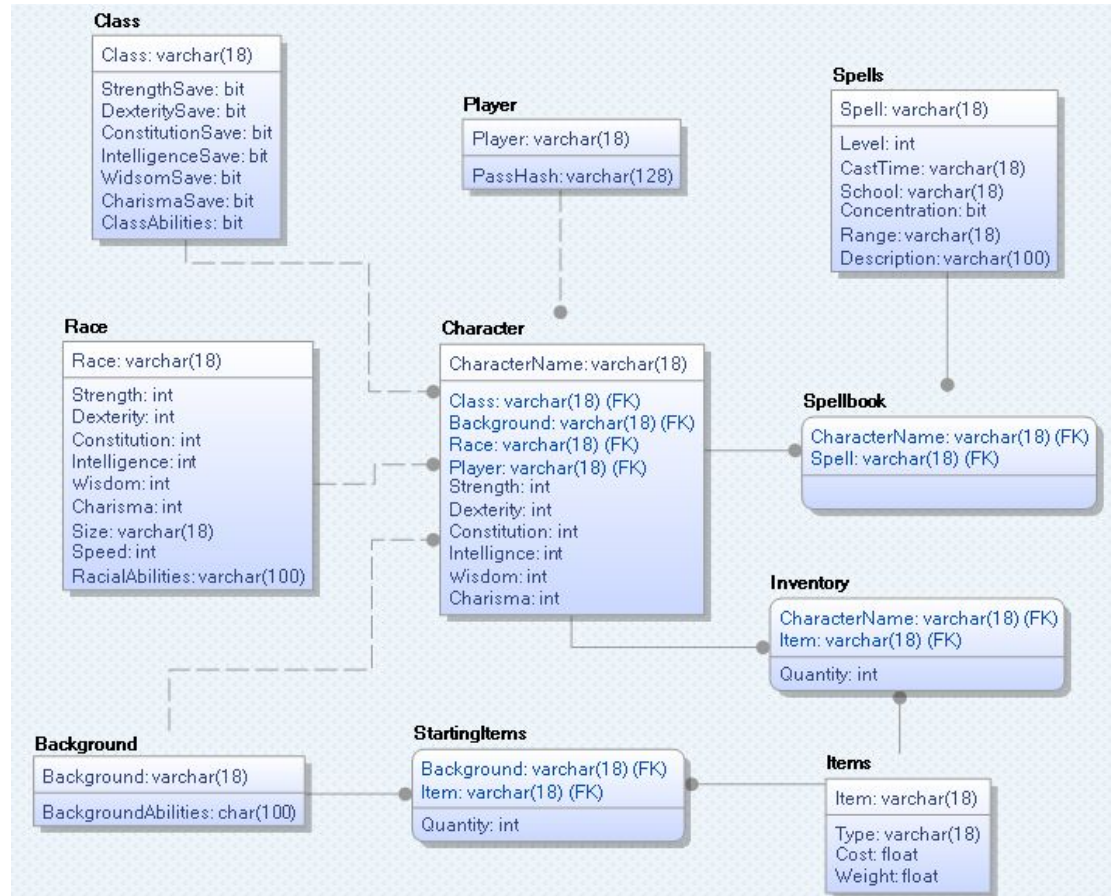
Goals from Enterprise Statement

- UI application to facilitate usability and keep the database hidden from users
- Characters should be collected in player accounts, requiring account creation and authentication
- During character creation, minimal data should be saved to the character table with most entries consisting of foreign keys to other tables
- Character creation options should be pulled from the database to maintain consistency and minimize app updates and local storage
- After character creation, data should be viewable and updatable from a centralized database to provide a portable character collection solution

Part 1: Database



Database Physical Design - ER Diagram



- Physical view of ER Diagram for the database
- Most domains consist of int, bit, or varchar
- Users only save data directly into player, character, spellbook, and inventory
- Other tables are only updated by admins

Player Table and Authentication

	Player	PassHash
1	Foster	*****
2	Dan	*****
3	GaryGygax	*****

- A player table stores player usernames and passphrase hashes
- Passphrases are salted and hashed with MD5
- Passphrases can be updated from within the application if the currently passphrase is known
- If a passphrase is forgotten, admins can send a temp passphrase to players to update

Character Data Tables – Example: Race Table

- Character class, race, and background tables contain data relevant to each selection
- When a character is created, its race is stored in the character table as a foreign key
- Since racial data is static, the table can be used consistently to construct character stat totals. This is also convenient in the rare case that a character's race changes
- The race table is given below as an example. Class and background tables are similar

	Race	Strength	RacialAbilities	Dexterity	Constitution	Intelligence	Wisdom	Charisma	Size	Speed
1	Dragonborn	2	Dragon Ancestry	0	0	0	0	1	Medium	30
2	High Elf	0	Darkvision, Fey Ancestry, Keen Senses, and Trance	2	0	1	0	0	Medium	30
3	Hill Dwarf	0	Darkvision, Dwarven Resilience, Combat Training,...	0	2	0	1	0	Medium	25
4	Human	1	None	1	1	1	1	1	Medium	30
5	Lightfoot Halfling	0	Lucky, Brave, Halfling Nimbleness, and Naturally S...	2	0	0	0	1	Small	25

Spell and Item Tables

	Spell	Level	CastTime	School	Concentration	Range	Description
1	Bless	1	1 action	Enchantment	1	30 FT	You bless up to three creatures of your choice withi...
2	Chill Touch	0	1 action	Necromancy	0	120 FT	You create a ghostly, skeletal hand in the space of ...
3	Cure Wounds	1	1 action	Evocation	0	Touch	A creature you touch regains a number of hit points...
4	Fire Bolt	0	1 action	Evocation	0	120 FT	You hurl a mote of fire at a creature or object within...
5	Fog Cloud	1	1 action	Conjuration	1	120 FT	You create a 20-foot-radius sphere of fog centered ...
6	Light	0	1 action	Evocation	0	Touch	You touch one object that is no larger than 10 feet i...
7	Mage Hand	0	1 action	Conjuration	0	30 FT	A spectral, floating hand appears at a point you ch...
8	Magic Missile	1	1 action	Evocation	0	120 FT	You create three glowing darts of magical force. E...
9	Sacred Flame	0	1 action	Evocation	0	60 FT	Flame-like radiance descends on a creature that y...
10	Shield	1	Reaction	Abjuration	0	Self	An invisible barrier of magical force appears and p...
11	Shield of Faith	1	Bonus Action	Abjuration	1	60 FT	A shimmering field appears and surrounds a creat...

	CharacterName	Spell
1	Kermit	Bless
2	Kermit	Chill Touch

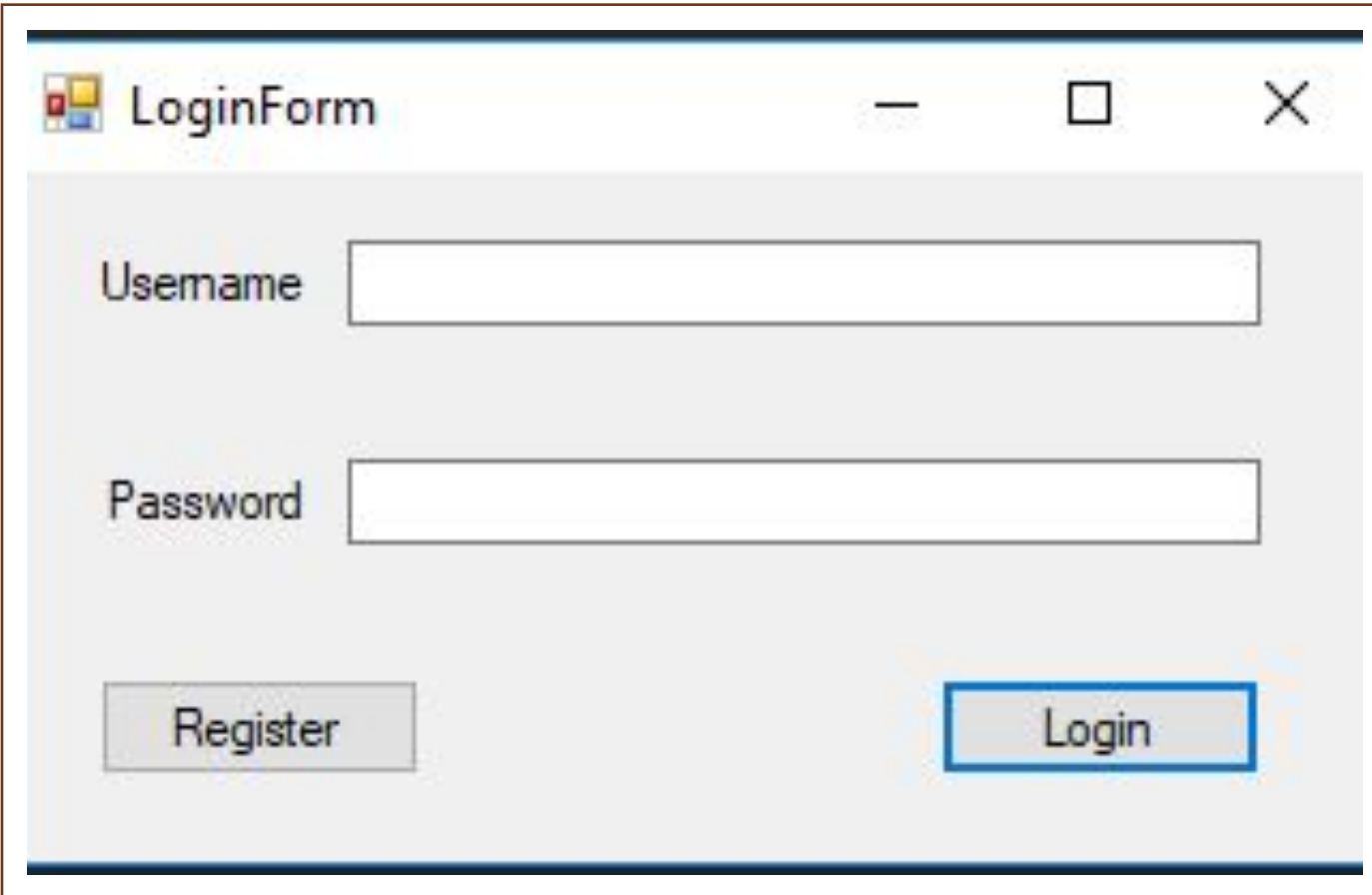
Spells Table (top) and Spellbook Table (bottom)

- Tables for spells and items are connected to characters through intermediate spellbook and inventory tables to facilitate many-to-many relationships
- Spells and items are not stored in the character table, making frequent updates only necessary in the smaller tables with less risk of breaking characters.

Part 2: Application



Account Creation and Authentication

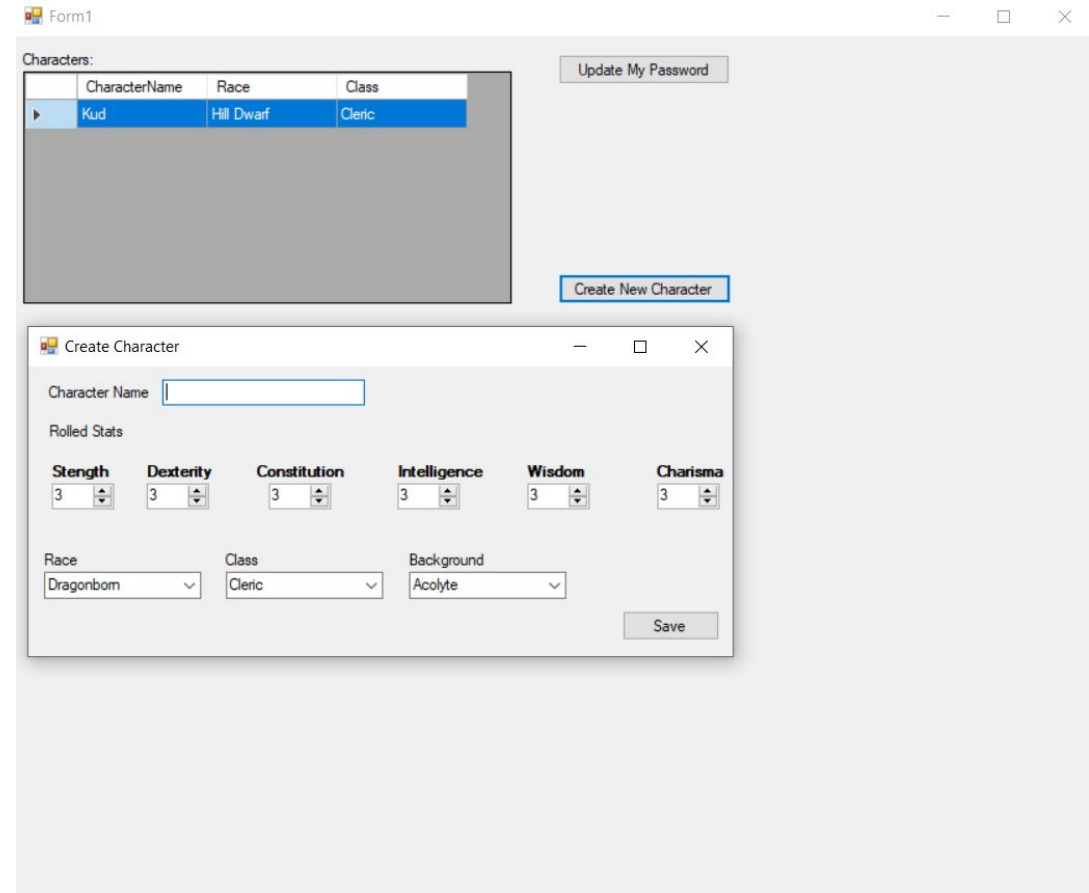


The image shows a screenshot of a Windows-style window titled "LoginForm". The window has a standard title bar with minimize, maximize, and close buttons. The main content area is light gray and contains two text input fields. The first field is labeled "Username" and the second is labeled "Password". Below the "Password" field, there are two buttons: "Register" on the left and "Login" on the right. The "Login" button is highlighted with a blue border.

- New users begin by registering, saving their information to the player table
- Returning players authenticate with username and passphrase checked against the player table
- Incorrect passphrases and duplicate usernames return error messages from DBMS (PK Violations) or stored procedure

Character Creation and List

- Characters with the logged in player's username assigned in the character table are displayed in a table format in the top left
- Buttons allow passphrase updating and new character creation
- Newly created characters are saved to the character table and are immediately viewable in the character list



Character Information

Form1

Player Kud Change Player

Race
Hill Dwarf

Class
Cleric

Background
Outlander

Speed
25

Size
Medium

Saves
Charisma, Wisdom

Strength 14 **Dexterity** 10 **Constitution** 16 **Intelligence** 10 **Wisdom** 16 **Charisma** 8

Spells

Item	Quantity	Cost	Type	Weight
Backpack	1	2	Adventuring Gear	5
Hempen Rope	1	1	Adventuring Gear	10

Spells Add Spell

Spell	Level	Cast Time	Concentration	Description	Range	School
Sacred Flame	0	1 action	■	Flame-like radiance descends on a creature that you can see within range. The target must succeed on a Dexterity saving throw or take 1d8 radiant damage. The target gains no benefit from cover for this saving throw.	60 FT	Evocation

- Double clicking a character in the character list brings up a form with detailed character information
- Values such as player, race, class, and background are pulled directly from the character table
- Other values such as speed, size, and saves are pulled from other tables (e.g. race table) using foreign keys saved in the character table
- Item and spell lists are pulled from inventory and spellbook tables with entries matching the character's name

Add Spells

- As characters gain new spells, updates to the spellbook table can be made with Add Spell
- Selectable spells are pulled from the spell table based on the character's class
- Adding spells saves additional entries to the spellbook table
- Adding items, while not currently implemented, works the same way as spells

Player Kud Change Player

Race Hill Dwarf Class Cleric Background Outlander
Speed 25 Size Medium Saves Charisma, Wisdom

Strength 14 Dexterity 10 Constitution 16 Intelligence 10 Wisdom 16 Charisma 8

Spe AddSpell

Spell	Level	CastTime	School	Concentration	Range	Description
Bless	1	1 action	Enchantment	<input checked="" type="checkbox"/>	30 FT	You bless up to three creatures of your choice within range. Whenever a target makes an attack roll or a saving throw before the spell ends, the target can roll a d4 and add the number rolled to the attack roll or saving throw.
Chill Touch	0	1 action	Necromancy	<input type="checkbox"/>	120 FT	You create a ghostly, skeletal hand in the space of a creature within range. Make a ranged spell attack against the creature to assail it with the chill of the grave. On a hit, the target takes 1d8 necrotic damage, and it can't regain hit points until the start of your next turn. Until then, the hand clings to the target. If you hit an undead target, it also has disadvantage on attack rolls against you.

Part 3: Procedures, Queries, and Security



Stored Procedures

```
USE [Group5]
GO
/***** Object: StoredProcedure [dbo].[Sp_CheckPlayerLogin]    Script Date: 4/19/2020 12:45:18 PM *****/
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
-- =====
-- Author:      Foster Clinton
-- Create date: 4/13/2020
-- Description: Checks Player Login
-- =====
ALTER PROCEDURE [dbo].[Sp_CheckPlayerLogin]
    -- Add the parameters for the stored procedure here
    @PlayerName varchar(18),
    @PassHash varchar(128),
    @LoginResult BIT OUTPUT,
    @ErrorMessage varchar(200) OUTPUT
AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;

    SELECT @LoginResult = CASE WHEN PassHash=@PassHash THEN 1 ELSE 0 END
    FROM [dbo].[Player]
    WHERE Player=@PlayerName;

    IF(@LoginResult is null)
        SET @ErrorMessage='Player Not Found';
    ELSE IF(@LoginResult=0)
        SET @ErrorMessage='Invalid Password';
END
```

- Stored procedures were created to implement player authentication and new character creation
- Part of the CheckPlayerLogin procedure is presented to the right as an example
- This implementation reduces exposure to Password Hashes and SQL Injection

Application Stored Queries

- UPDATE & INSERT queries saves information into player, character, spellbook, and inventory
- SELECT queries get information from all of the tables
- Many queries, such as GetCharacterDetails pull data from multiple tables.
- Example: GetCharacterDetails combines character table stats (player input) with racial stats (static) to calculate total character stats

```

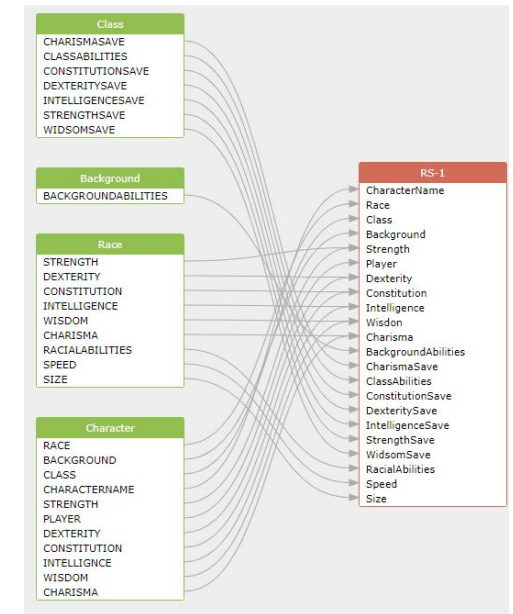
SELECT C.charactername,
       C.race,
       C.class,
       C.background,
       C.strength + R.strength      AS Strength,
       C.player,
       C.dexterity + R.dexterity    AS Dexterity,
       C.constitution + R.constitution AS Constitution,
       C.intelligence + R.intelligence AS Intelligence,
       C.wisdom + R.wisdom          AS Wisdom,
       C.charisma + R.charisma      AS Charisma,
       B.backgroundabilities,
       CL.charismasave,
       CL.classabilities,
       CL.constitutionsave,
       CL.dexteritysave,
       CL.intelligencesave,
       CL.strengthsave,
       CL.widsomsave,
       R.racialabilities,
       R.speed,
       R.size
FROM   character AS C
       INNER JOIN race AS R
           ON C.race = R.race
       INNER JOIN background AS B
           ON C.background = B.background
       INNER JOIN class AS CL
           ON C.class = CL.class
WHERE  ( C.charactername = @CharName )

```

```

/*
** To Be Used With Paramaterization
*/
SELECT [CharacterName]
       , [Race]
       , [Class]
       , [Player]
FROM   [dbo].[Character]
WHERE  Player=@PlayerName

```



GetCharacterDetails (above)
GetCharactersByPlayer (left)

Security Considerations

- Player accounts check for duplicate usernames, salt and hash passphrases, and require authentication to use the app
- All queries are parameterized to protect against SQL injection attacks
- Whenever possible, the database structure is hidden from users
- Users are not allowed to modify many tables such as race, class, spells, etc. to help prevent corruption or creating impossible characters

Part 4: Demo

- Create a new player
- Create a new character
- Add a new spell