Homework #4
CS486/586
Prof. Charles Winstead
CRN: 40876

Jiacheng Zhao
Jordan Witte
Resheet Schultz
Due: 02-06-2019

Exercise 1

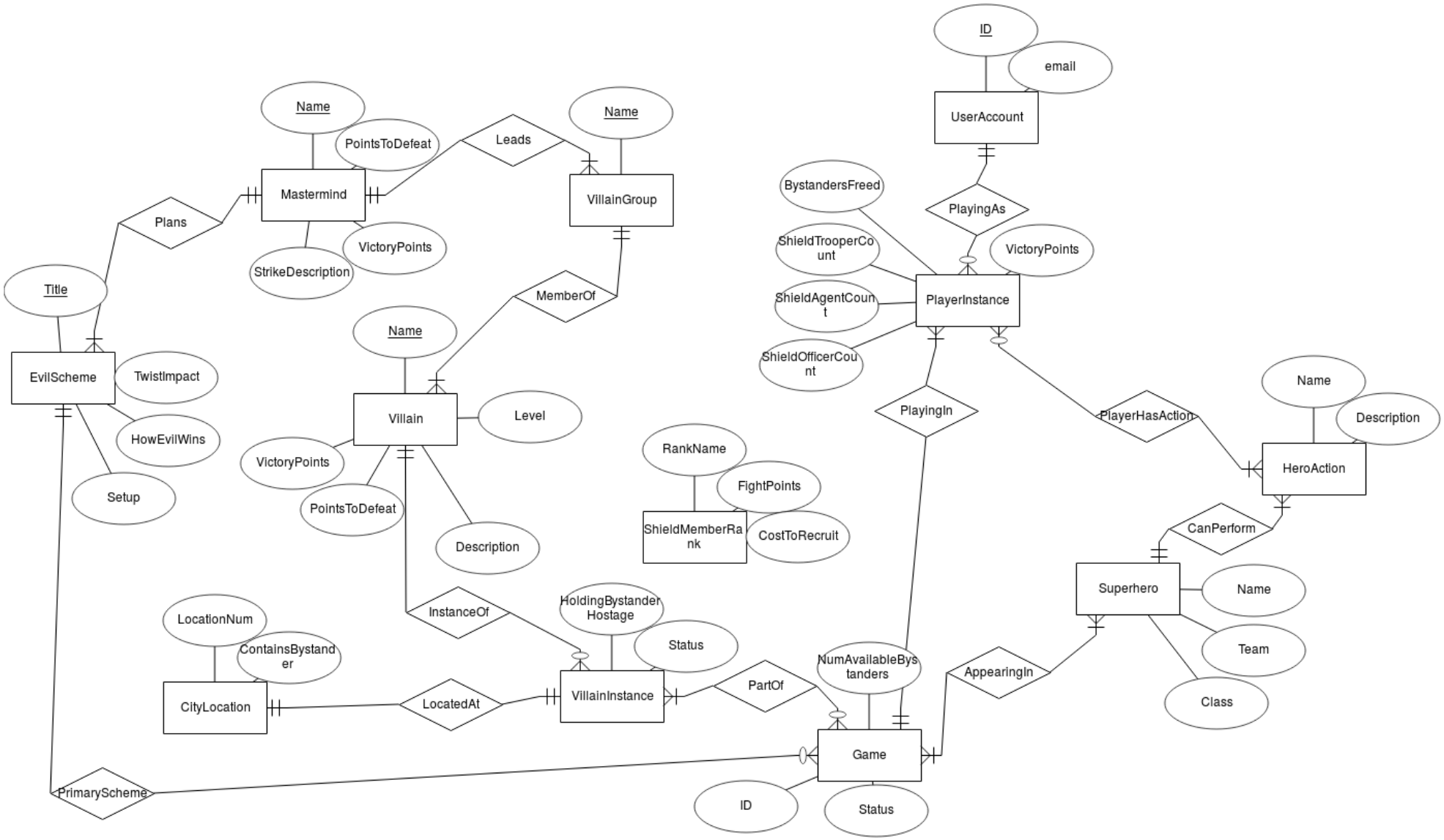
Write a brief paragraph about what's in scope and out of scope for the system you're designing. Identify 3-4 potential Actors for this system. Identify 1-2 potential Use Cases for each Actors in the system. (10 pts)

A database for this game would track game state but generally not the active functionality of the game. Tracking the locations of cards and tokens is in-scope, whereas the out-of-scope features consist of the players acting in various roles, as well as the active behavior of the game itself. These are all mechanics that influence game state. We describe these roles and use cases in a table:

Actor	**Use cases**
Player-as-administrator	Create account, join game, update account info
Player-as-hero	draw new hero cards from deck, perform hero actions
Player-as-SHIELD-agent	Recruit new hero actions
Game-as-villian	Move villain pieces forward (and maybe capture bystanders)

Exercise 2

Draw an ER diagram that represents these game requirements. (40 pts)

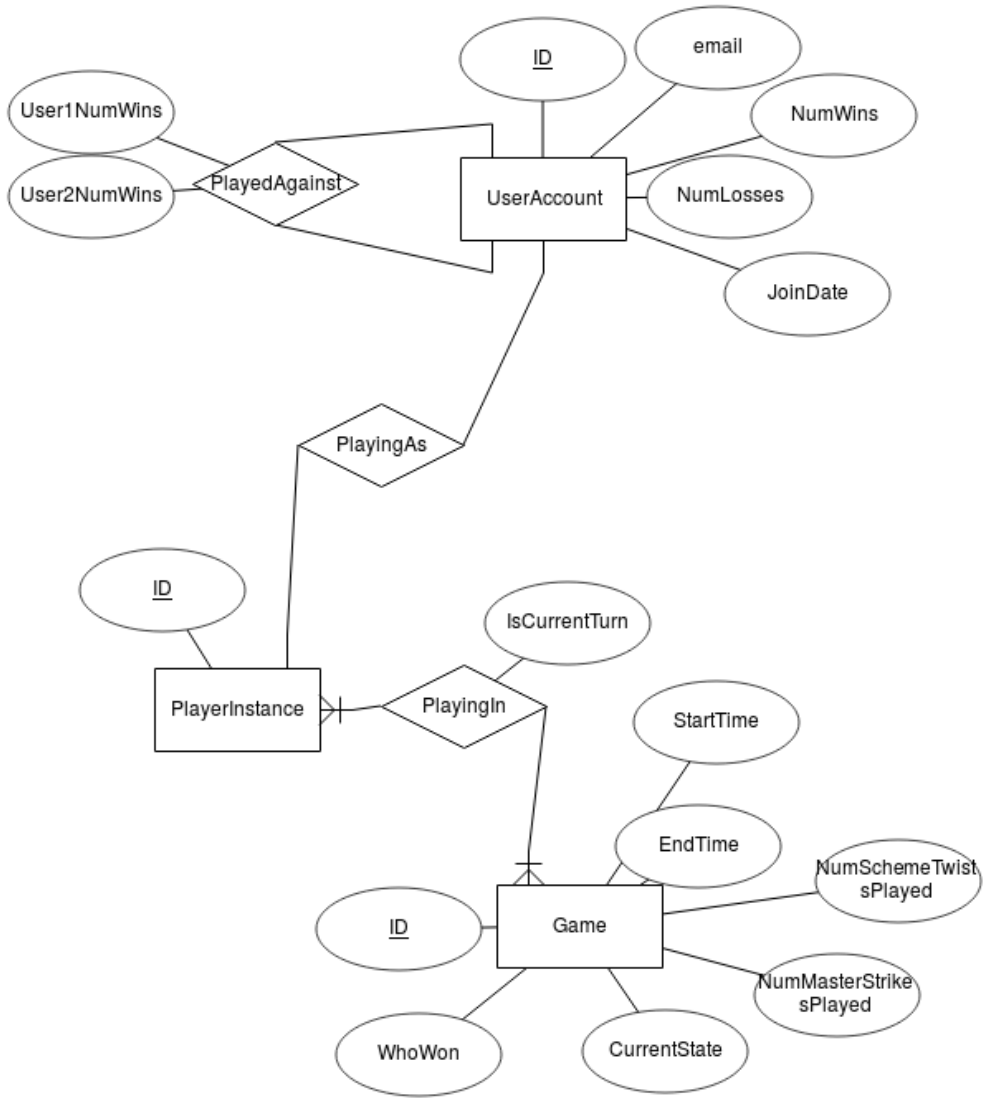

Name
PointsToDefeat
Mastermind
VictoryPoints
StrikeDescription
Leads
Name
VillainGroup
Plans
Title
EvilScheme
TwistImpact
HowEvilWins
Setup
MemberOf
Name
Villain
Level
VictoryPoints
PointsToDefeat
Description
InstanceOf
LocationNum
ContainsBystander
CityLocation
LocatedAt
HoldingBystanderHostage
Status
VillainInstance
PartOf
PrimaryScheme
ID
email
UserAccount
PlayingAs
BystandersFreed
ShieldTrooperCount
ShieldAgentCount
ShieldOfficerCount
VictoryPoints
PlayerInstance
PlayingIn
RankName
FightPoints
ShieldMemberRank
CostToRecruit
NumAvailableBystanders
Game
ID
Status
PlayerHasAction
Name
Description
HeroAction
CanPerform
Superhero
Name
Team
Class
AppearingIn

Exercise 3

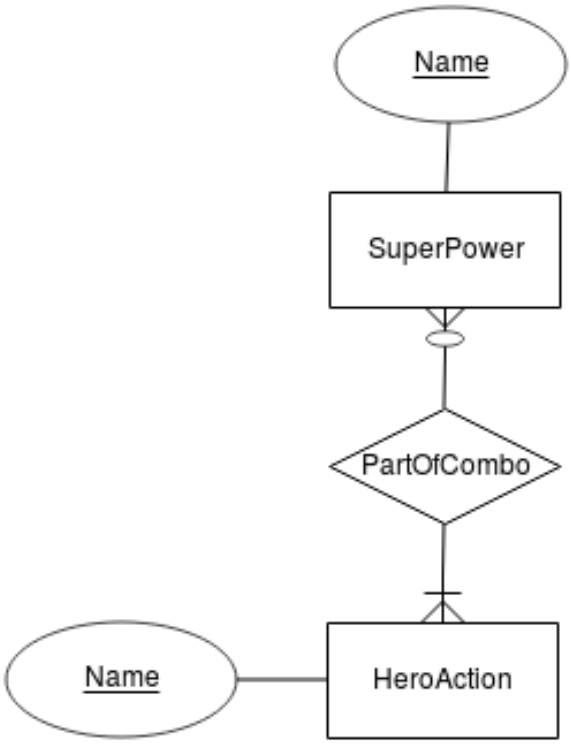
Modify your ER diagram to handle the following extensions. (15 pts).

a) *Game and user statistics*

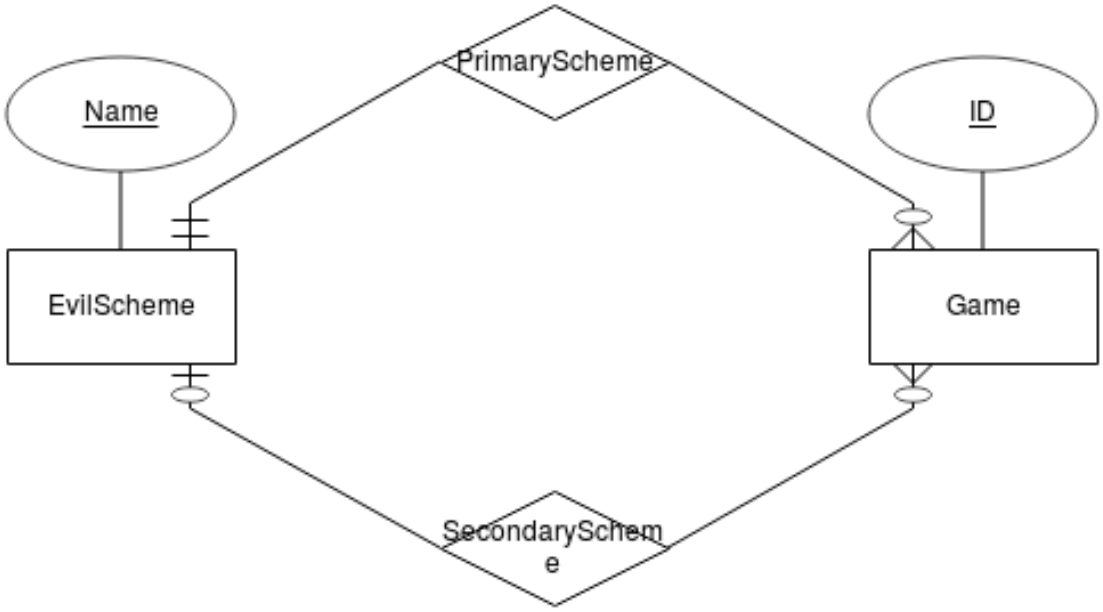
note: unchanged nodes (including attributes) omitted.



b) *Super Powers*



c) *Optional Secondary Scheme*



Exercise 4

Describe your overall design choices. (10 pts)

- Our model includes a hero entity because it helps to describe the more explicit game elements. Namely, hero powers are tied to specific heroes; and furthermore heroes have their own attributes which are best expressed as an entity.
- We chose to model city location as its own entity, which seemed intuitive because, if we're understanding the game correctly, a city location can contain a villian, a bystander, or neither. An alternate way to express bystander location may have been to define a bystander as an entity.
- We expressed a player's number of SHIELD members as a set of 3 values (for the 3 ranks). This could alternately be expressed instead with a relationship between AgentRank and PlayerInstance. This relationship node would need its own attribute of "count". Attributes on relationships feel unintuitive and our final model contains none of these.
- Some ambiguity in the rules summary led us to express certain relations as "one-of" when they might be better defined as "many-of" such as VillainGroup led by only one Mastermind. This might instead be a many-to-many relationship depending on intricacies of the game rules.

Exercise 5

Translate your answer to Question 2 into a db schema. (25 pts)

Mastermind (Name, FightPointsToDefeat, VictoryPoints, StrikeDescription)

EvilScheme (Title, PlannedBy, Setup, TwistImpact, HowEvilWins)

PlannedBy is a FK to Mastermind(Name)

VillainGroup (Name, LedBy)

LedBy is a foreign key referencing Mastermind(Name)

Villain (Name, Description, Level, GroupMembership, FightPointsToDefeat, VictoryPoints)

GroupMembership is a foreign key referencing VillainGroup(Name)

ShieldMemberRank (RankName, FightPoints, CostToRecruit)

Superhero (Name, Team, Class)

HeroAction (Name SuperheroName, Description)

SuperheroName is a foreign key referencing Superhero(Name)

UserAccount (ID, name, email)

Game(ID, Status, NumAvailableBystanders, Primary Scheme, Mastermind)

PrimaryScheme is a foreign key referencing EvilScheme(Title)

Mastermind is a foreign key referencing Mastermind(Name)

VillainInstance(ID, GameID, Location, VillainName, HoldingBystanderHostage)

VillainName is a foreign key referencing Villain(Name)

Location is a foreign key referencing GameCityLocation(LocationNum)

GameID is a foreign key referencing Game(ID)

CityLocation (LocationNum, ContainsBystander)

PlayerInstance (ID, UserID, GameID, VictoryPoints, BystandersFreed, ShieldTrooperCount, ShieldAgentCount, ShieldOfficerCount)

UserID is a foreign key referencing UserAccount(ID)

GameID is a foreign key referencing Game(ID)

SuperHeroInGame(GameID, SuperheroName)

PlayerHasAction(PlayerInstanceID, HeroActionName)

PlayerInstanceID is a foreign key referencing PlayerInstance(ID)

HeroActionName is a foreign key referencing HeroAction(Name)