Software Design Document
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Submitted by,

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CS3004 Software Engineering

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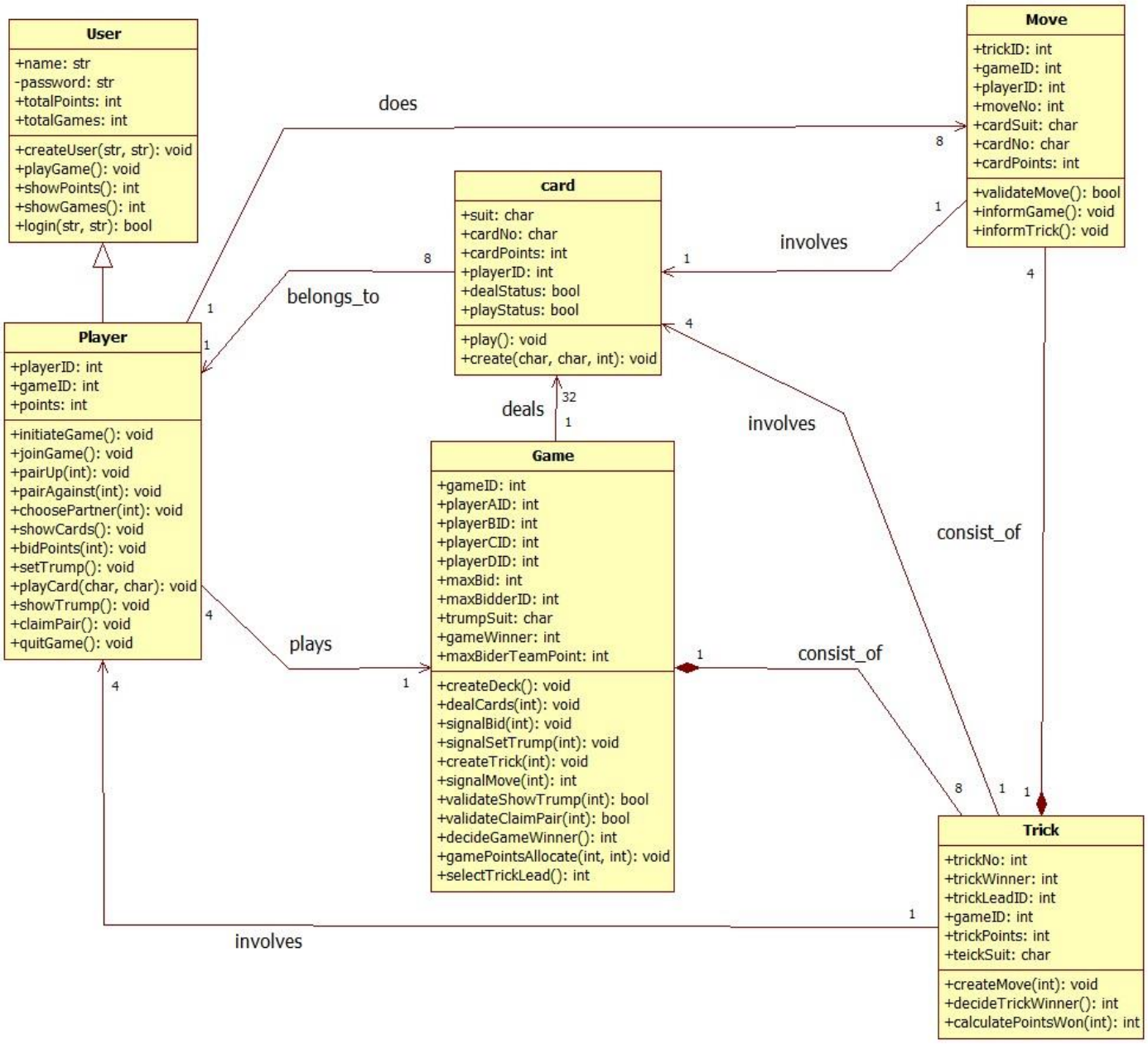
1. Class Diagram



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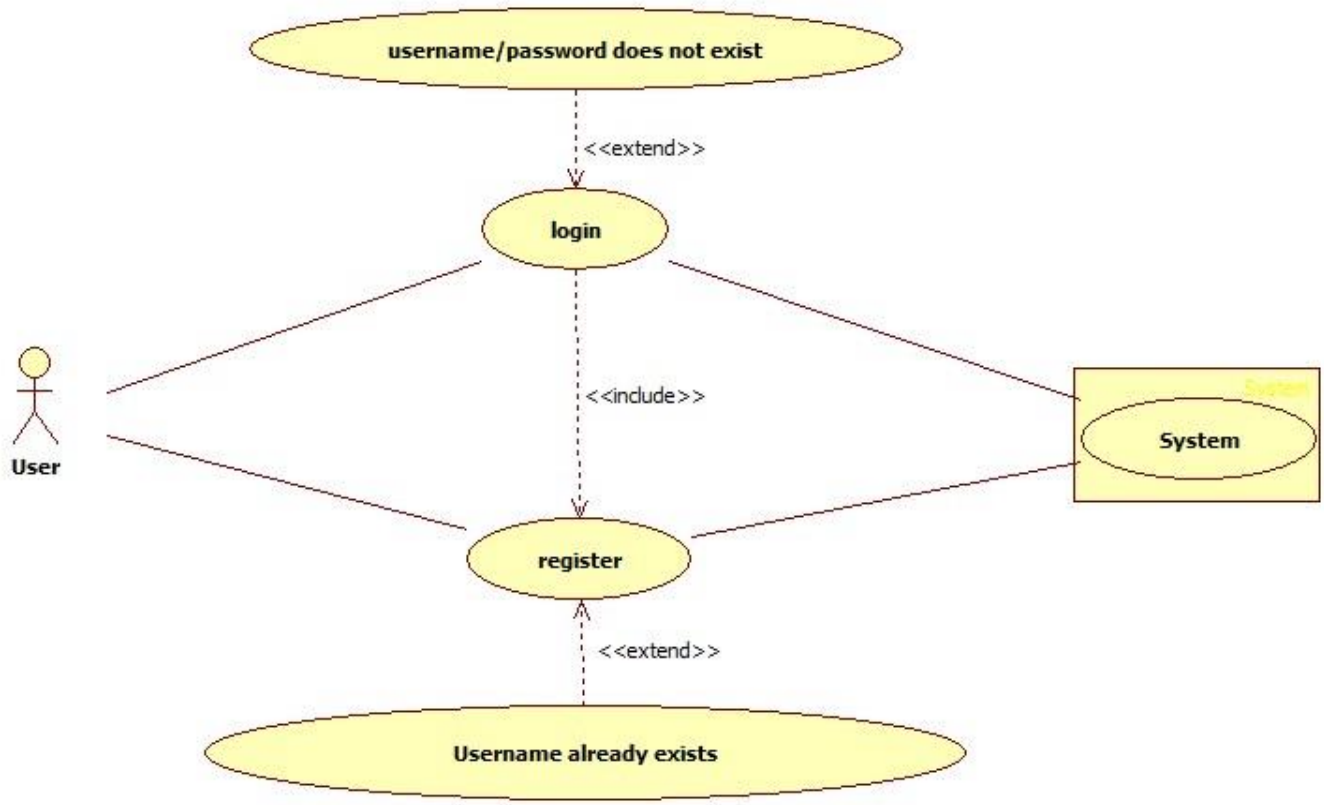
1. User registers i.e. creates an account.
2. Players login and are paired. 4 players forming two pairs play a game against each other.
3. Game deals 32 cards(A,7,8,9,10,J,Q,K of each suit) among the 4 players in two halves i.e. 16 each. After dealing the first half the players bid points and the max bidder is decided by the game that sets the trump suit.
4. 8 cards belong to each player.

5. Game consists of 8 tricks.
6. A trick consists of 4 moves.
7. Each trick involves 4 cards played by the 4 players in an orderly fashion signaled by the game.
8. Each player does 8 moves per game.
9. Each move is validated and the trick winner is decided at the end of each trick. The trick points won are allocated to the corresponding pair after each trick.
10. Game winner is decided after 8 tricks based on the max bidders bid and game point is allocated accordingly based on the players ID's.

2. Combined Use Cases Diagrams

2.1. User Login & Registration



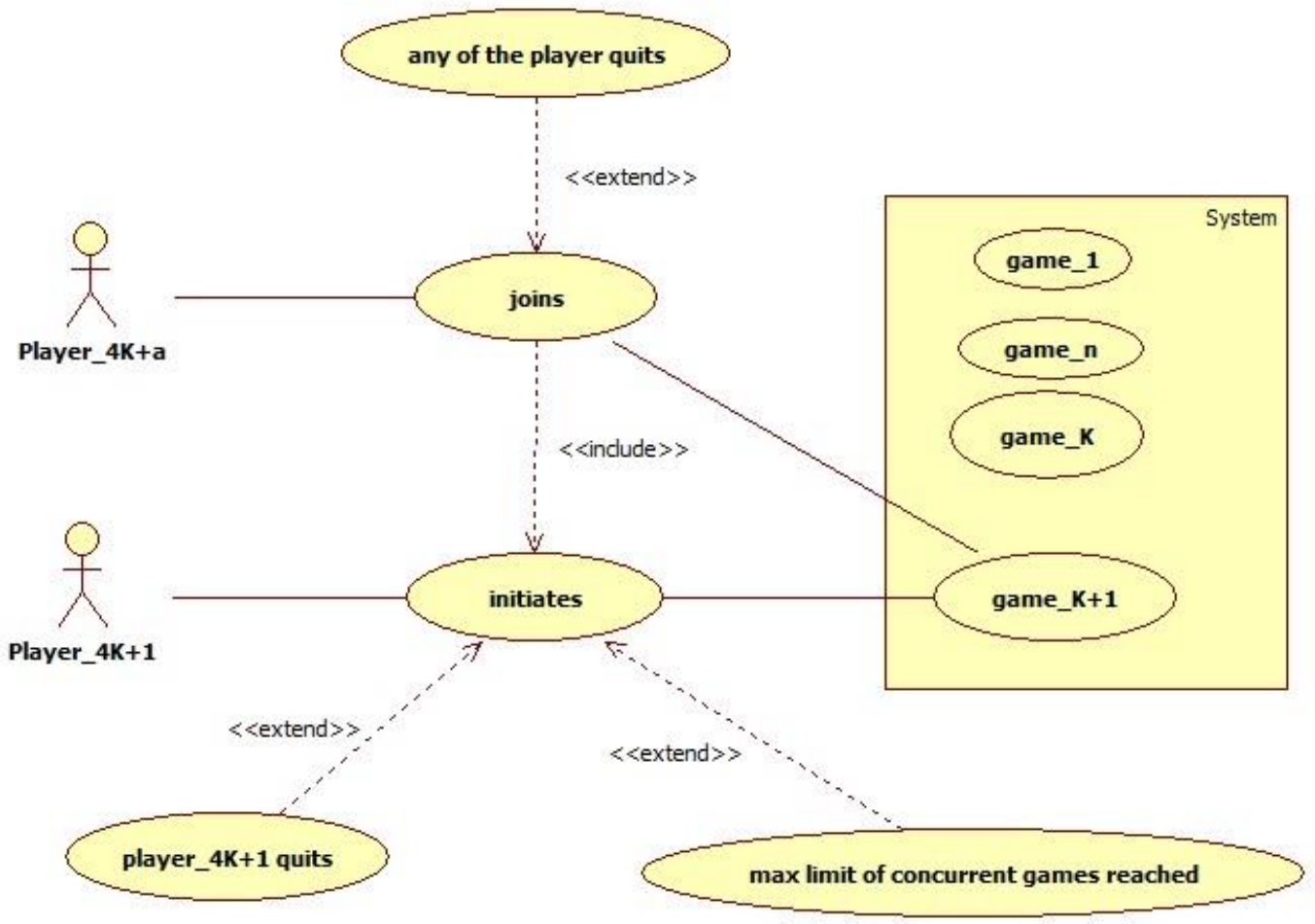
Use Case	New user registration
Precondition	User not already registered

Basic Path	1.User chooses a distinct user-name 2.User chooses a password 3.User goes for registration 4.System successfully registers user
Alternate Path	N/A
Postcondition	New user entry created in system database
Exception Path	1.User chooses an user-name that already exists 2.User goes for registration 3.Registration unsuccessful 4.User is informed about reason

Use Case Name:	User login
Precondition	User need to be registered
Basic Path	1.User enters user-name 2.User enters corresponding password 3.User goes for login

	4.System matches the password against the user-name stored in database 5.Upon successful matching system allows user to login
Alternate Path	N/A
Postcondition	User logs in into the system
Exception Path 1	1.User-name doesn't exist 2.Login unsuccessful 3.User redirected to new user registration option
Exception Path 2	1. Password doesn't match 2. User is informed 3. User redirected to login option

2.2. Player Initiates or Join Game

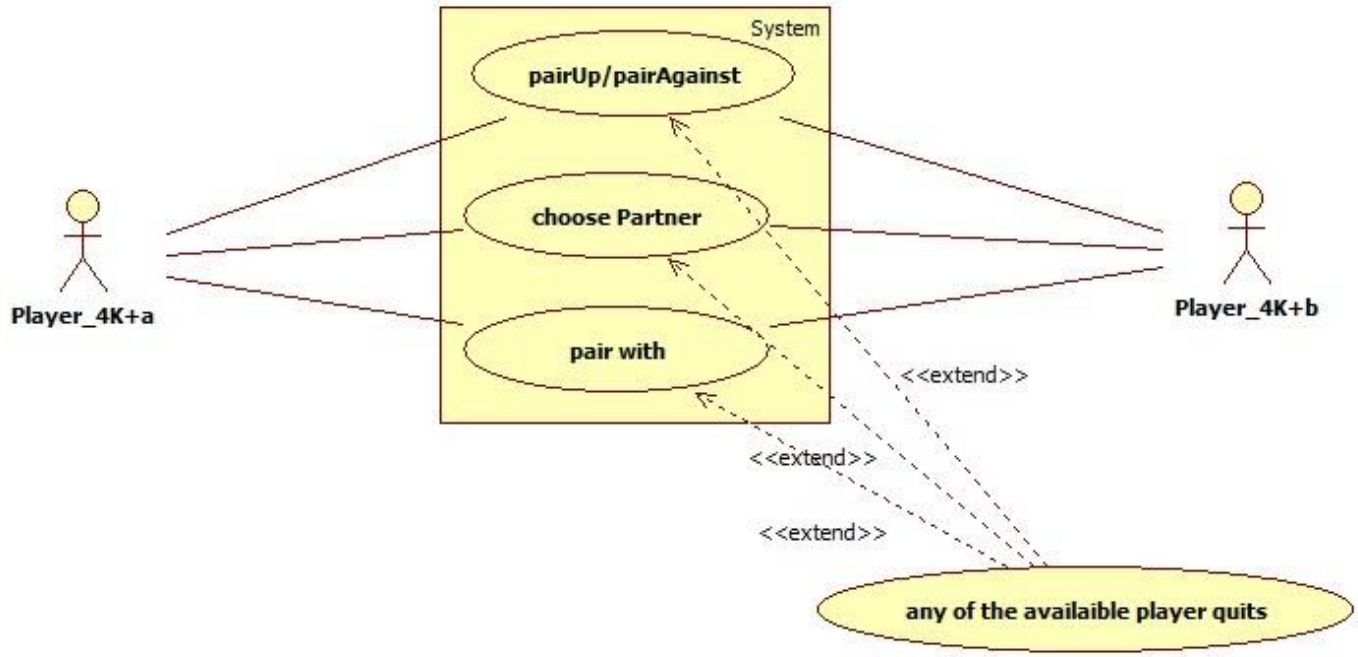


Use Case	Player_4K+1 initiates game_K+1
Precondition	User had successful login into system
Basic Path	1. User wants to play game 2. System checks limits of concurrent games 2. User initiates a new game 3. User as a player waits for 3 more players
Alternate Path	N/A
Postcondition	One player is assigned to the game_K+1

Exception Path 1	1. Maxi-limit of concurrent games reached 2. User can't initiate a new game 3. User waits for a new game
Exception Path 2	1. User stop waiting & quits 2. Game_K+1 cancelled & players removed

Use Case	Player_4K+A joins game_K+1
Precondition	1.User had successful login into system 2.2 <= A <= 4
Basic Path	1. User wants to play game 2. User joins the game_K+1
Alternate Path	N/A
Postcondition	User is assigned to the game_K+1 as player
Exception Path	N/A

2.3. Player Pair Up / Against



Use Case	Player_4K+2 pair up / against player_4K+1 for game_K+1
Precondition	Both players are assigned to the game_K+1
Basic Path	1. System asks player_4K+2 to pair up with player_4K+1 2. Player_4K+2 accepts the proposal 3. Player_4K+2 pair up with Player_4K+1
Alternate Path	1. System asks player_4K+2 to pair up with player_4K+1 2. Player_4K+2 denies the proposal 3. Player_4K+2 pair against Player_4K+1
Postcondition	Both players either pair up or pair against each other
Exception Path	Any of two players quits & game_K+1

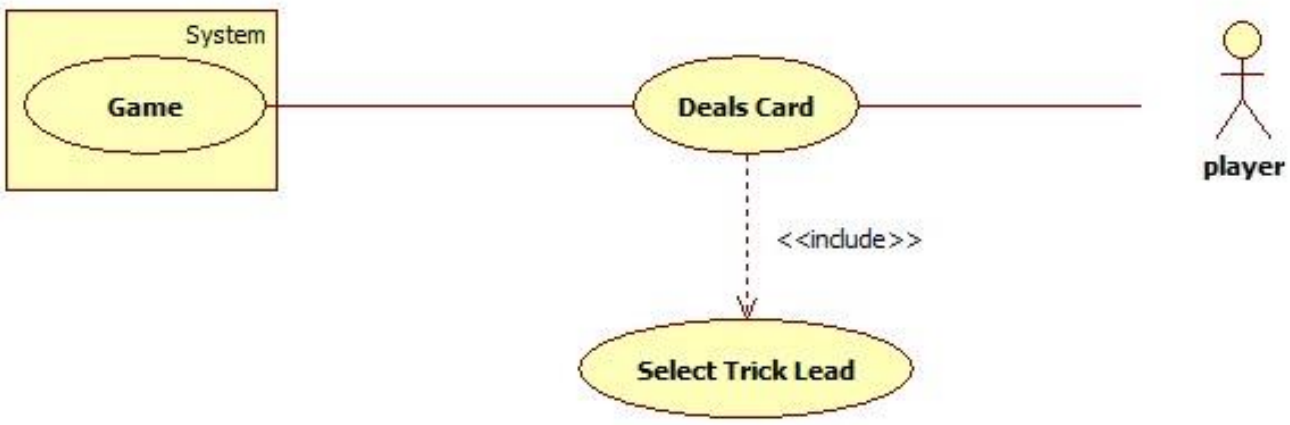
	cancelled , players removed

Use Case	Player_4K+3 chooses partner to pair up for game_K+1
Precondition	Player_4K+1 and Player_4K+2 paired against each other
Basic Path	1. System asks player_4K+3 to pair up with player_4K+1 2. Player_4K+3 accepts the proposal 3. Player_4K+3 pair up with Player_4K+1
Alternate Path	1. System asks player_4K+3 to pair up with player_4K+1 2. Player_4K+3 denies the proposal 3. Player_4K+3 pair against Player_4K+2
Postcondition	Player_4K+3 pair up with either player_4K+1 or player_4K+2
Exception Path	Any of three players quits & game_K+1 cancelled , players removed

Use Case	Player_4K+4 pair up with unpaired player for game_K+1
Precondition	Player_4K+4 joins the game & one among other 3 players waiting for partner to pair up
Basic Path	Player_4K+4 paired up with the unpaired player by the system
Alternate Path	N/A
Postcondition	All 4 players paired up forming 2 teams

Exception Path	Any of four players quits & game_K+1 cancelled , players removed

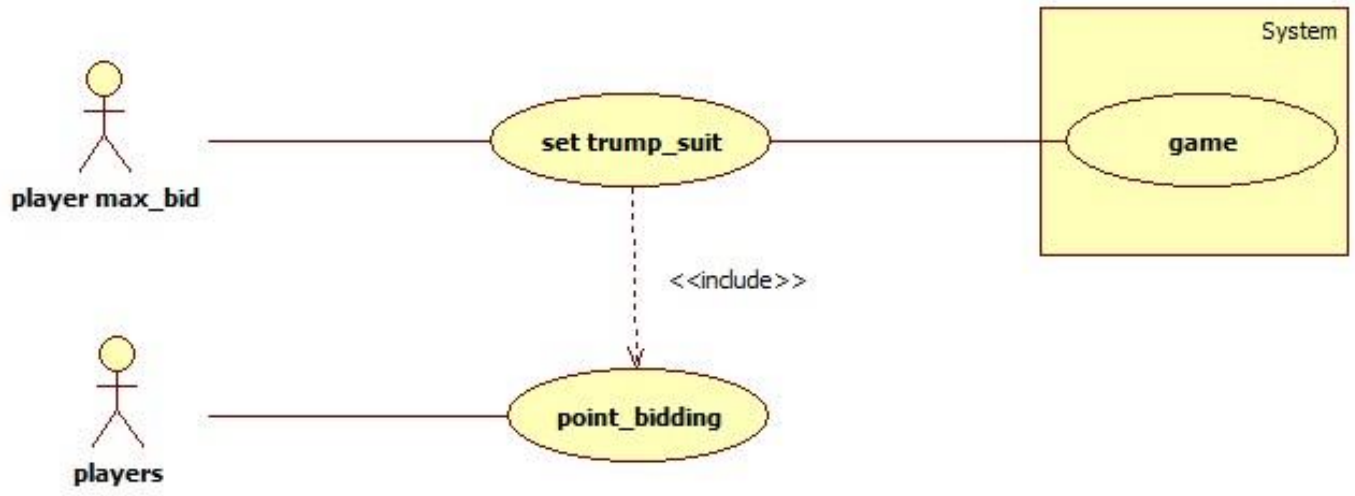
2.4. Game Deals Cards to the Players



Use Case	System selects the player to lead a trick
Precondition	Either the game is about to start or a new trick of the game is to begin.
Basic Path	Player_4K+1 is chosen to lead the first trick of the game_K+1
Alternate Path	The player who won the last trick is chosen to lead the next trick
Postcondition	Trick leader signalled to leads the next trick also, bidding & dealing starts with trick lead in case of a fresh game
Exception Path	N/A

Use Case	System deals card to all 4 players
Precondition	1. Player to lead a trick is selected and teams are formed 2. Ordering of players is done 3. In case of 2nd dealing the trump suit is set by the max bidder
Basic Path	1. System shuffles 32 cards (J,9,A,10,K,Q,8,7 of 4 suits) in random 2.First 4 cards shown to the trick lead 3. Next 4 cards shown to the next player in order, who is in opponent team of trick lead 4. Next 4 cards shown to the next player in order, who is paired up with trick lead 5. Next 4 cards shown to the last player in order, who is in opponent team of trick lead
Alternate Path	1. System starts with rest 16 cards remaining without shuffling them again 2. System follows the same order to distribute 4 cards at a time to all 4 players
Postcondition	4 cards are dealt at a time to all 4 players
Exception Path	N/A

2.5. System Organizes point bidding & Max bidder sets trump suit

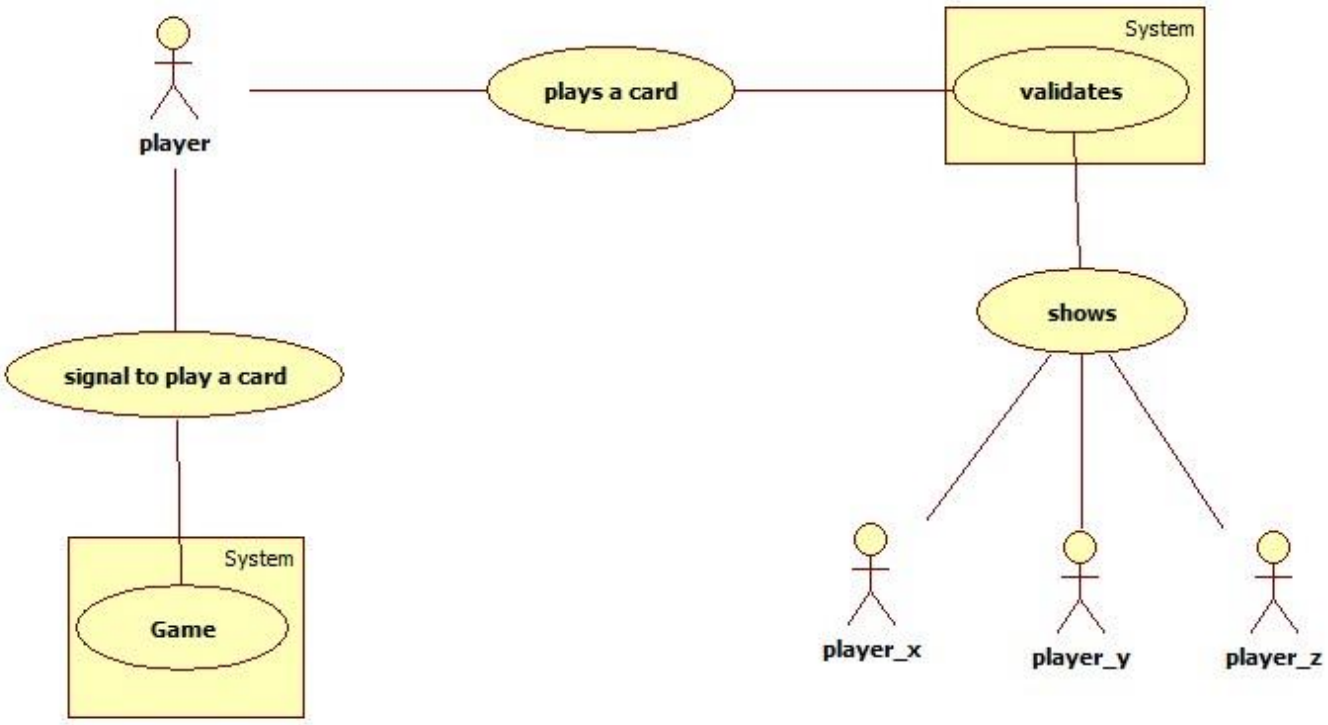


Use Case	System organizes point bidding among 4 players to find the highest bidder
Precondition	All 4 players have been dealt 4 cars only
Basic Path	1. Minimum bid is 15 , maximum 28 2. Players can either Pass or bid higher point than last one 3. System takes primary point bid from all 4 players in the order the cards dealt . 4. If first 3 players in order call Pass then 4th player starts game with 15 automatically 5. Next round of bidding takes place in circular order leaving those who called Pass in last round 4. Bidding goes on till any player calls 28 or at least 3 player call Pass
Alternate Path	N/A

Postcondition	The player bids maximum point without calling Pass wins the bidding
Exception Path	N/A

Use Case	The player wins points bidding sets the trump suit for the game
Precondition	1. Bidding is over 2. Max bidder is selected
Basic Path	1. Max bidder sets the trump suit (one among diamond, heart, spade ,club) 2. Only system knows the suit, not exposed to the rest 3 players
Alternate Path	1. Max bidder sets the trump suit as NONE i.e. No Trump suit
Postcondition	Trump suit is set either one of 5 options by max bidder
Exception Path	N/A

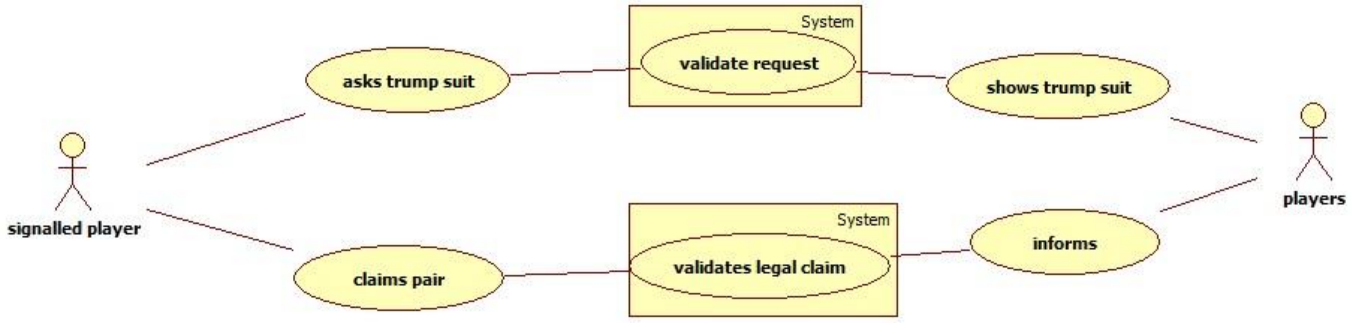
2.6. Game Signals Player to play Card & Player plays



Use Case	System signals a particular player to play a card
Precondition	1. Trump suit is set 2. If in middle of a trick then the previous player in order has played its turn
Basic Path	1. System signal the player to play a card 2. System allots a time limit to the player to play its turn
Alternate Path	N/A
Postcondition	The player signalled is allowed to play a card
Exception Path	N/A

Use Case	Player plays a card and system validates the play before showing it to other 3 players
Precondition	The player who plays a card is signalled by system to play a card
Basic Path	1. Player plays a card 2. System validates the play, whether the correct suit is played or not 3. If validated system shows the card to all rest 3 players
Alternate Path	N/A
Postcondition	All players can see the card played
Exception Path	1. Player plays a wrong suit intentionally 2. On calling for trump suit the player play a different suit intentionally 3. System invalidate the play 4. Player forced to play again

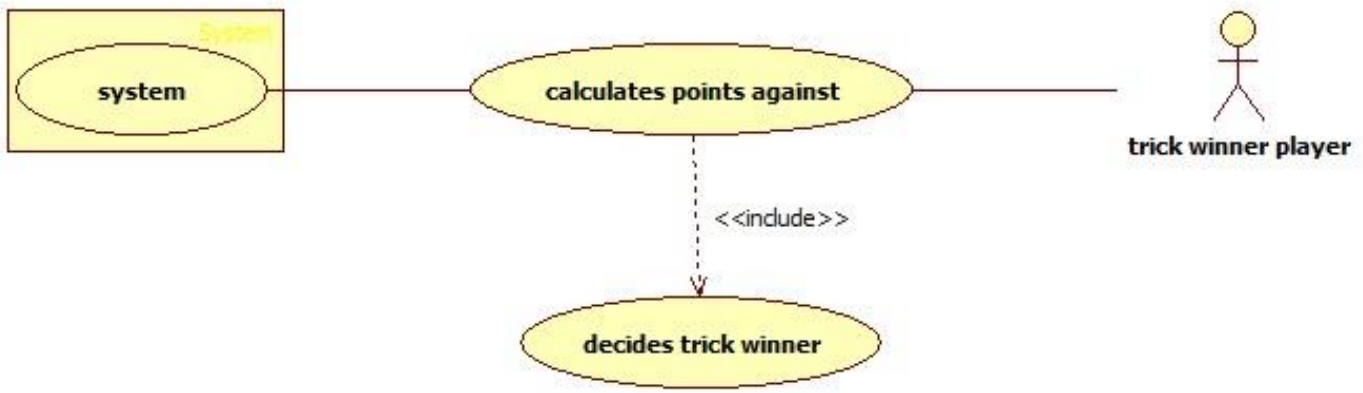
2.7. Player Claims Pair/ asks Trump suit & System Validates



Use Case	Player asks the trump suit to the system & system valiadates the request before showing up trump suit to all players
Precondition	1. The Player asks for trump suit need to be signalled to play a card 2. Trump suit should not be exposed already 3. The player should not be a trick lead for that particular trick
Basic Path	1. Player requests for trump suit 2. System validates the request 3. If validated system shows the suit to all 4 players
Alternate Path	N/A
Postcondition	Trump suit is exposed to all 4 players
Exception Path	1. Player has the current suit card to play, but yet requests for trump suit 2. System denies the request

Use Case	Player claims the possession of King – Queen pair of the trump suit & system validates legality of claim before informing other players
Precondition	1. The player who claims is signalled by system to play a card 2. Trump suit is already exposed to all players 3. Player's team already won a trick
Basic Path	1. Player claims pair 2. System validates the claim 3. If validated system informs rest 3 players 4. Points bidded are reduced or increased according to side of the player claims
Alternate Path	N/A
Postcondition	All players are informed & points bidded are recalculated
Exception Path	1. Player raises wrong claim 2. Bidded points doesn't support pair showup by the player 3. System invalidate the claim

2.8. System Decides Trick winner

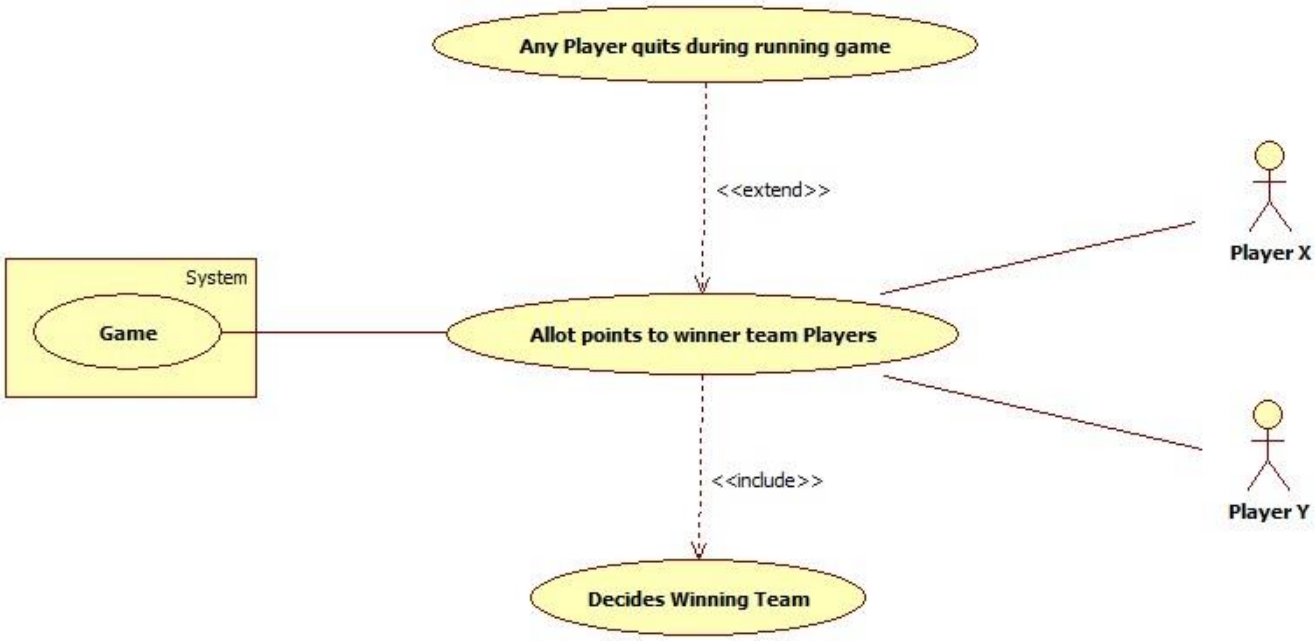


Use Case	System decides trick winner
Precondition	All 4 players played their turn in the trick
Basic Path	1. Ranking of cards of cards for any suit is J,9,A,10,K,Q,8,7 in decreasing order of weightage , same for trump suit also 2. Any card of trump suit holds more weightage than any other suit card if trump suit is exposed at time of playing the card 3. System decides the player who played the highest weightage card to be the trick winner
Alternate Path	N/A
Postcondition	The player among 4 players who wins the trick is decided
Exception Path	N/A

Use Case	System calculates points against trick winner
Precondition	Trick winner is decided
Basic Path	1. Points given to cards as J -> 3 , 9 -> 2, A,10 -> 1, K,Q,8,7 -> 0

	2. System adds up points for all 4 cards played in the trick 3. System stores the points against the trick winner
Alternate Path	N/A
Postcondition	Points won by the trick winner is stored against the player
Exception Path	N/A

2.9. System Decides Game winner & Allot Points

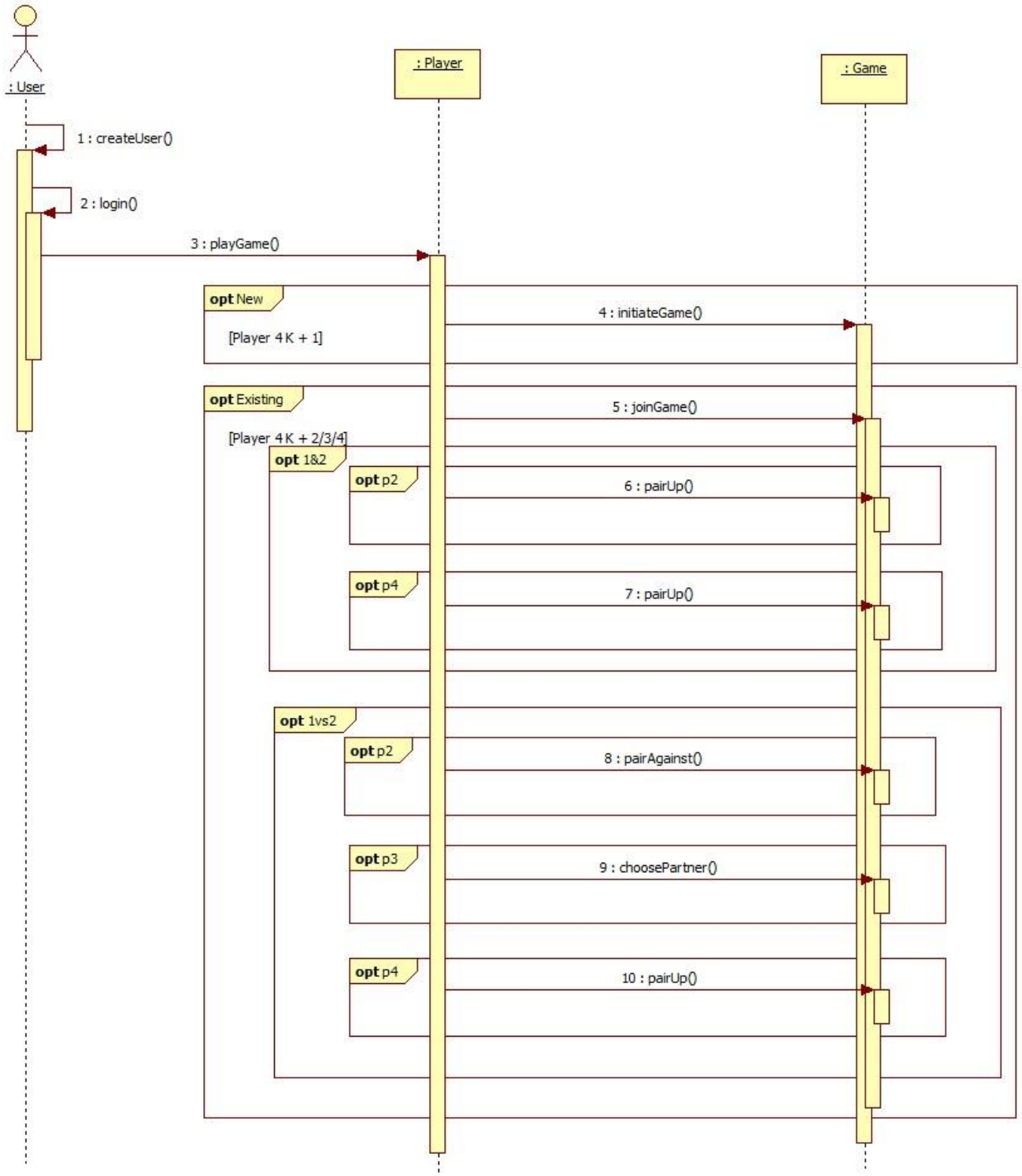


Use Case	System decides the team which wins the game
Precondition	All 8 tricks should be completed

Basic Path	1. System adds up points stored against the max point bidder and its partner 2. System compares the total points by them with the bidded points by the max bidder or updated point bid if it is changed by pair showup 3. If the total points won are equal or more then they wins the game otherwise looses
Alternate Path	If any player quits while game is on, then if the player belong to max bidders team the team looses otherwise opponent team wins
Postcondition	Two players who win the game is decided
Exception Path	N/A

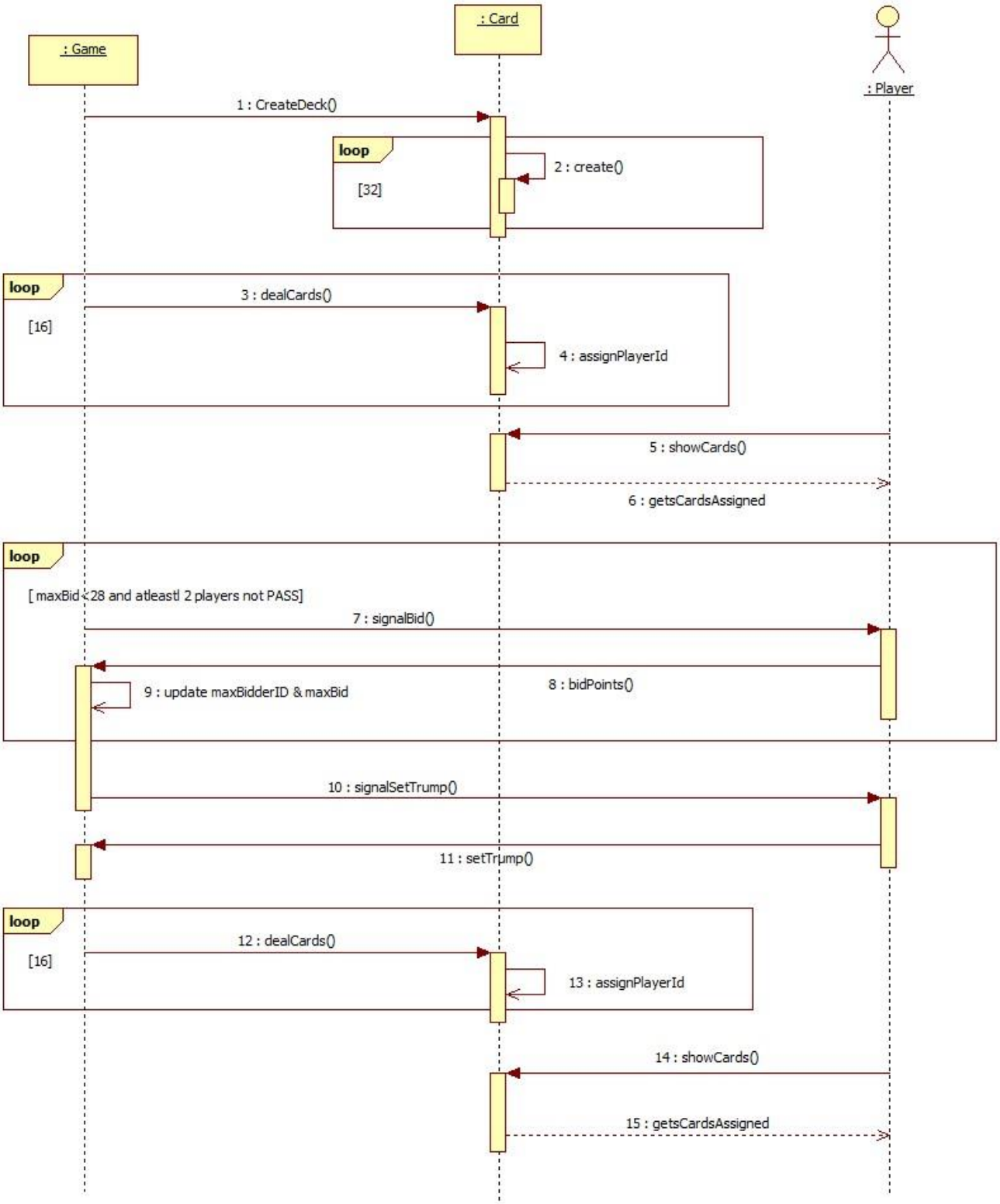
3. Sequence Diagrams

3.1. Registration/Login to Forming 2 Teams of 2 Players in each team



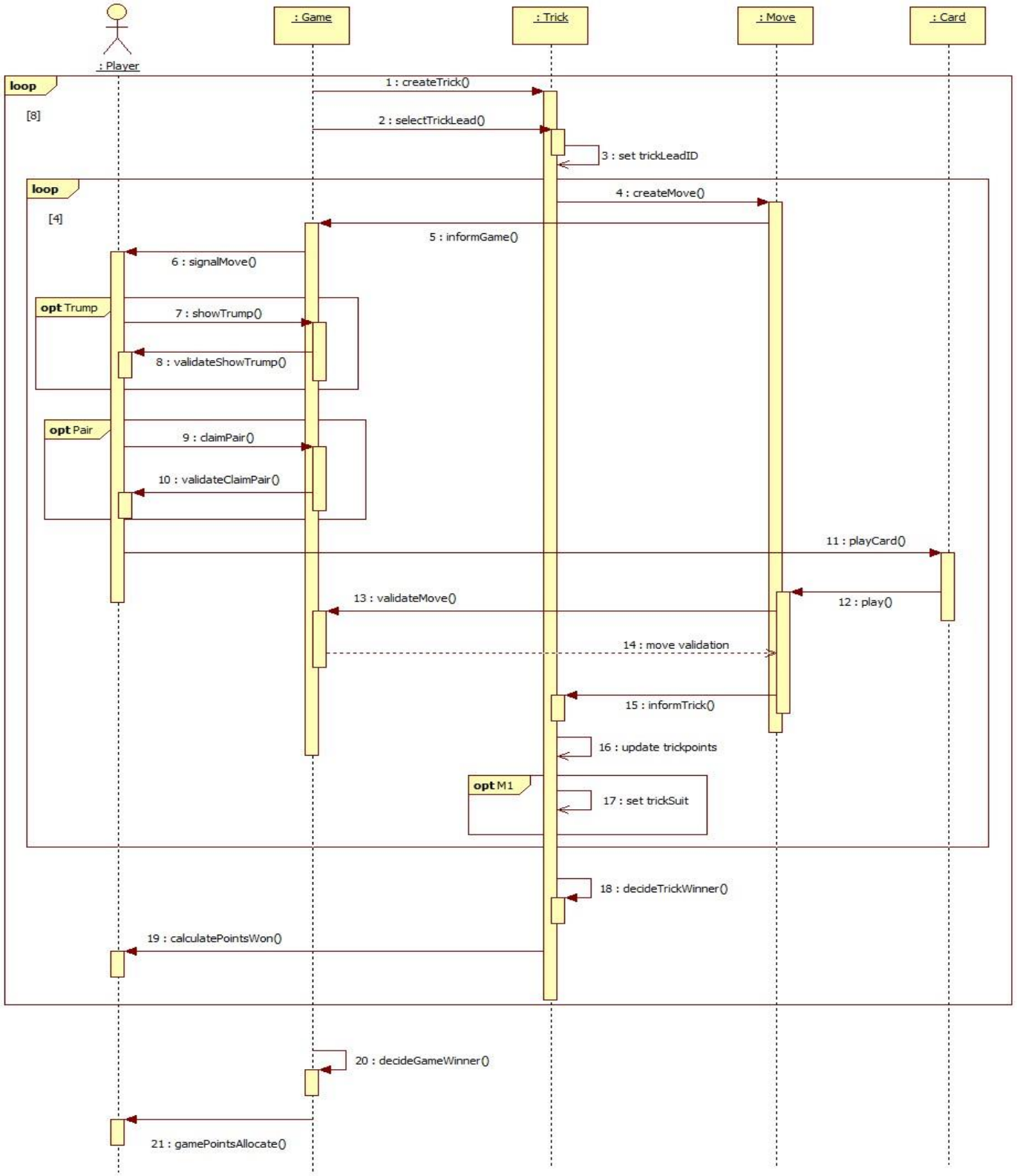
Reference Use Cases : SDD 2.1, SDD 2.2, SDD 2.3

3.2. First Round card dealing, trump set & 2nd round card dealing



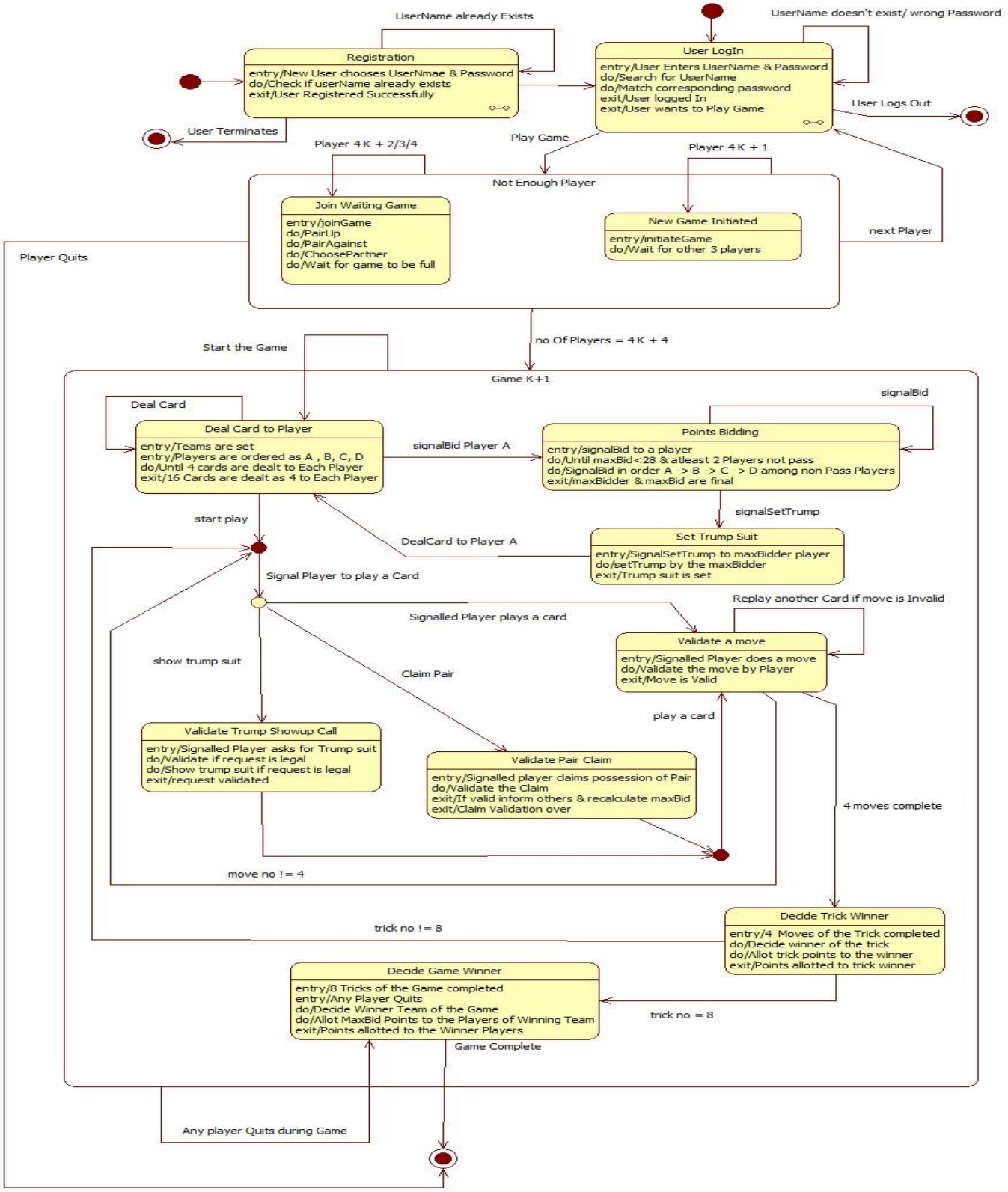
Reference Use Cases : SDD 2.4, SDD 2.5

3.3. Starting of game to completion of game



Reference Use Cases : SDD 2.6, SDD 2.7, SDD 2.8, SDD 2.9

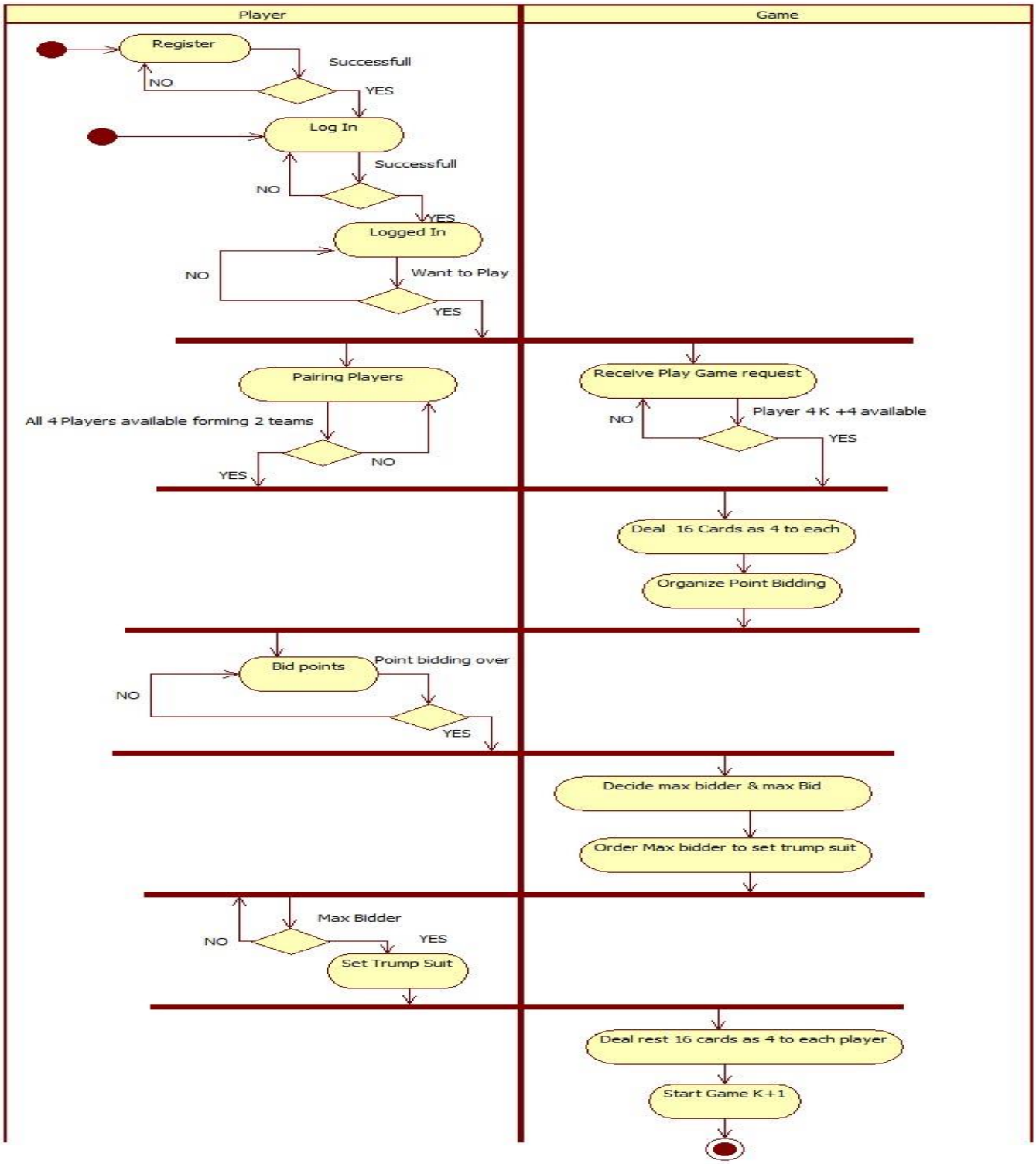
4. State Diagram



Reference Use Cases : SDD 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9

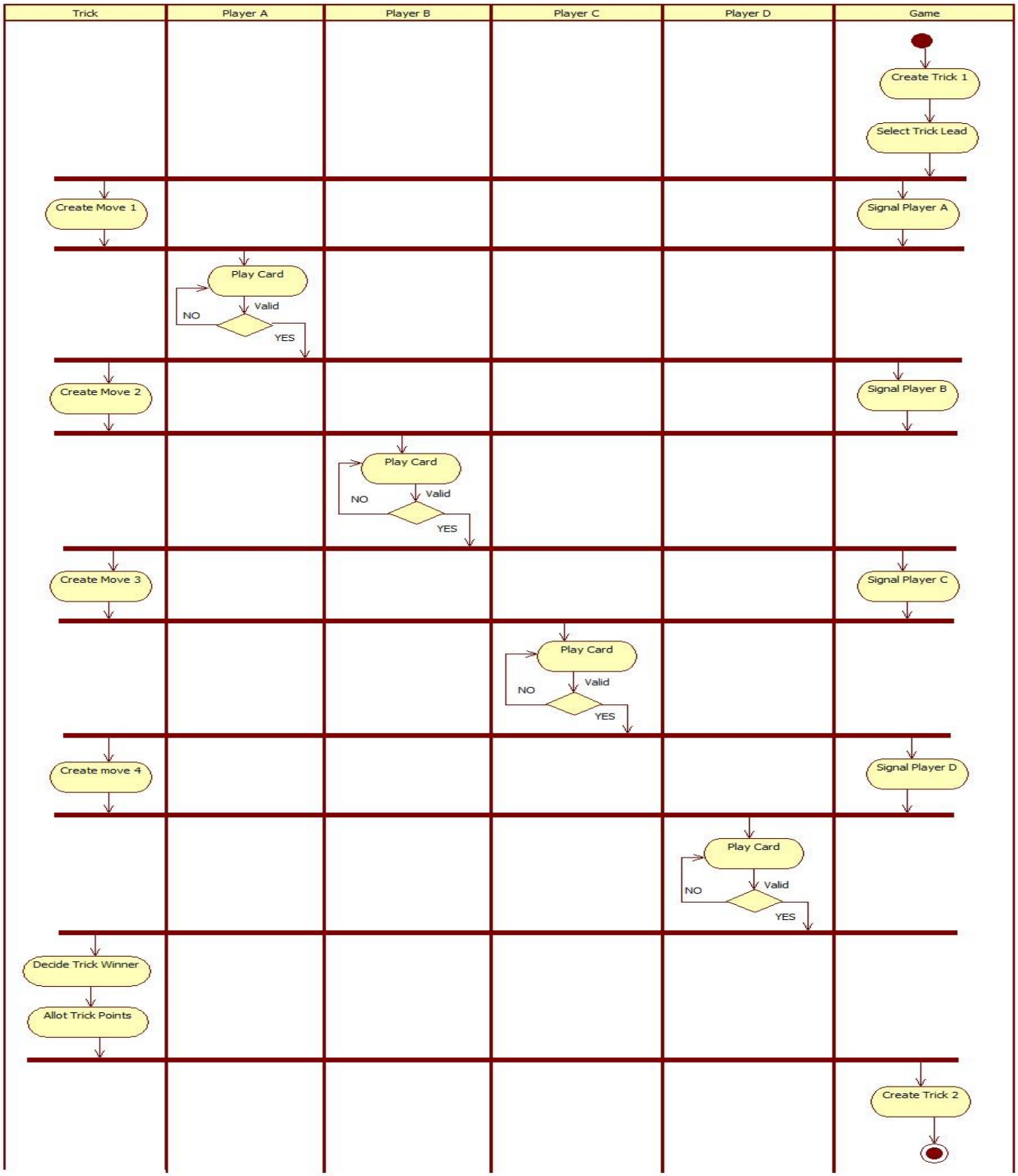
5. Activity Diagrams

5.1. Player & Game till Start of playing card



Reference Use Cases : SDD 2.1, 2.2, 2.3, 2.4, 2.5

5.2. Game , Trick & 4 Players from start to end of 1st Trick



Reference Use Cases : SDD 2.6, SDD 2.8