3. External Interfaces

3.1 User Interfaces

For human Players, the Hanabi Client is presented a graphical user interface (GUI) which primarily takes mouse inputs from a Player via buttons, as well as keyboard inputs so the user can fill in text boxes. It also commonly uses windowed prompts that appear when a button is selected to present more buttons or text boxes where action parameters can be specified. When creating AI Players, however, it instead uses a command line interface (CLI) where a Player types in a command (described in Section 4.4) to start another process which handles the AI Player.

The states of the GUI are broken up into 4 screens: The Main Menu, Lobby, Game, and Game Over screens. The Main Menu screen is what a Player sees when they start up the Client or leave a game, and it displays 3 buttons for creating a game, joining a game, and closing the client. When the “Create Game” or “Join Game” buttons are selected, a prompt appears asking for the information required for those actions, which in entered by the Player into text boxes. Those prompts have buttons for “Create” or “Join” and “Quit”, which cancels the action and closes the prompt.

Once a game is created but before it starts the Lobby screen is shown, which shows which Player slots have been filled so far both as a fraction of current over maximum Player slots and as blank avatars with names. It also displays the Game ID and Token for the game in the corner, which the Players can give to other Players so that they can join the game as well.

The Game screen is then shown once enough Players have joined a game for it to start. It has several different possible appearances depending on the total number of Players in the game, but they all share similar visual and interactive features. Each Player’s hand is displayed as a row of 4 or 5 cards. The Player only sees the backs of their cards but can see the front of the other Player’s cards, displaying a number and color. The Firework piles are then displayed near the center face up, and the Information and Fuse tokens are displayed off to the side and greyed out when they are used during game play. The Discard and Draw piles are also shown off to the side and are face down. The corners of the screen then have an Action Log, which is either a single line or a box that displays multiple lines or game actions, a button for toggling the size of the Action Log, and a button for leaving the game after the Player confirms that in a prompt.

While minimizing and expanding the Action Log and leaving the game are done with buttons, other game actions are taken by selecting the cards themselves. A Player can view the Discard pile at any time by selecting it’s visual, which displays a prompt with the cards in the Discard pile. The main actions of playing and discarding cards and giving information are done by selecting a card visual in one of the Player’s hands. If it is one of the Player’s own cards, a prompt appears asking whether to play or discard it, though the Discard button will be greyed out and unresponsive if there are all 8 Information tokens available. If it is one of the other Player’s cards and there is at least 1 Information token available, then a similar prompt appears asking whether to tell them about the color or number of that card and similar cards in their hand.

When the game ends, whether because of a Player disconnecting from the game or natural end conditions like running out of fuses or finishing all 5 fireworks piles, then the screen displays a Game Over screen. This screen only shows a prompt with the game’s score and a button that disconnects the Player from the game and takes them back to the Main Menu screen.

Appendix A shows sample screens of what the GUI described above will look like.

3.2 Hardware Interfaces

The Hanabi Client will support the Linux computers in the U of S Department of Computer Science, tuxworld. This usage will include running on physical machines with Linux in the computer labs as well as running it on tuxworld via a remote connection. It will require that a mouse, keyboard, and display be available on the user’s machine so that human Players can give mouse-based input, type in arguments for creating and joining games, and see the Client’s GUI.

3.3 Software Interfaces

The Hanabi Client is constrained to being written with Java 8; this necessitates that the user’s machine must have the Java Runtime Environment (JRE 8) installed for the Client to run. This is the Client’s only specific software requirement.

3.4 Communication Interfaces

To communicate with the pre-existing server component of the overall Hanabi system, the user’s system will need a network connection that can access the U of S network where the server resides. The specific network connection that exists for this purpose will not matter to the Hanabi Client, so long as server communication is possible.

4. System Features

With the Hanabi Client’s interfaces described, this section contains a list of the Hanabi Client’s features. Each feature is briefly described before the main sequence of actions for that feature is given, along with any alternative sequences that can occur when using it. Any preconditions, postconditions, and error sequences for the feature are also given.

4.1 Close Client

Description: At the Main Menu screen, the Player decides to close the Client and selects the “Quit Game” option. The Client then closes.

Preconditions:

* The Player is at the Main Menu screen

Postconditions:

* The Client is no longer running

Main Sequence:

1. The Player selects the “Quit Game” option
2. The Client closes and stops running

Alternative Sequences: None

Error Sequences: None

4.2 Create Game

Description: At the Main Menu screen, a Game Creator decides to create a new game and selects the “Create Game” option. A new “Game Settings” prompt appears where they give the number of total Players (from 2 to 5), the time-out period (in seconds, at least 1), and their own U of S NSID. The Game Creator selects the “Create” option in the “Game Settings” prompt. A new game is then made with the specified number of Player slots and time-out period.

While in an inactive game, the Main Menu screen changes to a Lobby screen that displays the Game ID and Token for the game along with the Player slots that have been filled. The Game Creator then gives these to any human Players who want to join the game and waits for them to join. Once enough Players have joined, the game starts and the screen changes to the Game screen.

Alternatively, the Game Creator can choose to create another game after making a game but before playing it and selects the “Create Different Game” option on the Lobby screen. They are given a prompt asking if they are sure they want to start a new game, where they select the “Yes” option. They then disconnect from the old game, the screen changes back to the Main Menu, and the process for starting a new game proceeds the same as creating a game from the Main Menu.

Preconditions:

* The Game Creator is at the Main Menu screen

Postconditions:

* A new game is created with a specified Player count and time-out period
* The Game Creator is in an inactive game

Main Sequence:

1. The Game Creator selects the “Create Game” option on the Main Menu screen
2. A new “Game Settings” prompt appears, displaying default values for game settings in text boxes:
   * Number of Players: 5
   * Time-out Period: 60 seconds
   * NSID: This is blank by default
3. The Game Creator types the Player count, time-out period, and their NSID into the corresponding text boxes
4. The Game Creator selects the “Create” option in the “Game Settings” prompt
5. The game is created
6. The Main Menu screen changes to the Lobby screen, which displays the Game ID and Token for the new game
7. The Game Creator creates any AI Players they want and make them join the game with the Game ID and Token
8. The Game Creator gives the Game ID and Token to other human Players and waits for them to join the game
9. When enough Players have joined the game, the game starts screen changes to the Game screen

Alternative Sequences:

* During Step 8, if the Game Creator selects the “Create Different Game” option on the Lobby screen before the game starts, then the following sequence occurs, after which the Main Sequence begins at Step 2:
  1. A prompt appears asking the Game Creator if they want to create another game
  2. The Game Creator selects the “No” option on that prompt
  3. The game is closed, and the Game Creator disconnects from the game
  4. The screen changes to the Main Menu screen
* If enough AI Players are made and join the game during Step 7, then Step 8 is skipped and the game starts as in Step 9.

Error Sequences:

* During Steps 3-4, if the Game Creator instead selects the “Quit” option, then the prompt closes and the screen goes back to the Main Menu.
* When creating a game from the Lobby screen (see the first Alternative Sequence), if the Game Creator instead selects the “No” option on the confirmation prompt, the prompt closes and Step 8 of the Main Sequence continues.
* If the game settings that are given during Steps 3-4 are invalid (too few or too many Players, less than 1 second time-out period, or non-numeric values), then the “Game Settings” prompt stays, and a message appears saying that the game settings are invalid. Steps 3 and 4 are then repeated.
* If the new game fails to be created during Step 5, then the screen changes to the Main Menu screen and a prompt appears saying that the game could not be created.
* If it takes longer than 10 times the time-out period for enough players to join the game during Step 8, then the game is automatically closed, and the Game Creator is disconnected from the game. The screen changes to the Main Menu screen and a prompt appears saying that it took too long for enough Players to join.
* If any of the other Players disconnects from the game at any time, then the game is closed, and the Player is also disconnected from the game. The screen changes to the Main Menu screen and a prompt appears saying that a Player disconnected, and the game was closed.

4.3 Join Game (Human)

Description: A Player decides to join a game. They contact a Game Creator and get the Game ID and Token for the game they have created, and then select the “Join Game” option. A new “Specify Game” prompt appears where they enter the Game ID, Token, and their U of S NSID. The Player selects the “Join” option, and they are connected to the same game as the Game Creator. The Player then waits for enough other Players to join the game, whereupon the game starts and the screen changes to the Game screen.

Preconditions:

* The Player is at the Main Menu screen

Postconditions:

* The Player is in an inactive game

Main Sequence:

1. The Player gets the game’s Game ID and Token from the Game Creator
2. The Player selects the “Join Game” option on the Main Menu screen
3. A new “Specify Game” prompt appears, displaying blank text boxes for the Game ID, Token, and their NSID
4. The Player types the Game ID, Token, and their NSID into the corresponding text boxes
5. The Player selects the “Join” option in the “Specify Game” prompt
6. The Player is connected to the game
7. The screen changes to the Lobby screen
8. The Player waits for enough other Players to join the same game
9. When enough Players have joined the game, the game starts screen changes to the Game screen

Alternative Sequences: None

Error Sequences:

* During Steps 4-5, if the Player instead selects the “Quit” option, then the prompt closes and the screen goes back to the Main Menu.
* If the Player fails to connect to the game during Step 6, then the screen changes to the Main Menu screen and a prompt appears saying that they could not join the game.
* If it takes longer than 10 times the time-out period since the game’s creation for enough players to join the game during Step 8, then the game is automatically closed, and the Game Creator is disconnected from the game. The screen changes to the Main Menu screen and a prompt appears saying that it took too long for enough Players to join.
* If any of the other Players disconnects from the game at any time, then the game is closed, and the Player is also disconnected from the game. The screen changes to the Main Menu screen and a prompt appears saying that a Player disconnected, and the game was closed.

4.4 Join Game (AI)

Description: A Game Creator or Player decides to add an AI Player to their game. They open a command line terminal and start another Client process, giving the Game ID and Token of the game as arguments. An AI Player is then made and joins the game. The AI Player then waits for enough Players to join the game, when it starts, and the AI waits for and responds to requests for a move until the game ends.

Preconditions:

* The Game Creator or Player is in an inactive game

Postconditions:

* An AI Player is created and in an inactive game

Main Sequence:

1. The Game Creator or Player starts up a command line terminal
2. The Game Creator or Player, using the Game ID <gid> and Token <tok> starts another Client process with the following syntax
   * hanabiClient -g <gid> -t <tok>
3. In the new Client process, an AI Player is made and joins the game
4. The AI Player waits until enough Players have joined the game
5. When enough Players have joined the game, the AI Player waits for its turn

Alternative Sequences: None

Error Sequences:

* If the process fails to connect to the game during Step 3, then the process will end, and the game will not have an AI Player join in.
* If it takes longer than 10 times the time-out period since the game’s creation for enough players to join the game during Step 4, then the game is automatically closed, the AI Player is disconnected from the game, and its process closes.
* If any of the other Players disconnects from the game at any time, then the game is closed, the AI Player is disconnected from the game, and its process closes.

4.5 Discard a Card

Description: During their turn of a game, a Player decides to discard a card and then chooses which of their own cards to discard. That card is discarded, an information token is earned, and a new card is drawn for the Player. The other Players are told which card was discarded before play passes to the next Player.

Preconditions:

* The Player has the current turn
* There are less than 8 information tokens

Postconditions:

* The Player is waiting for their next turn
* There is at least 1 information token
* The discard pile has 1 more card

Main Sequence:

1. The Player is prompted to take an action
2. The Player selects one of their cards to discard
3. A prompt appears asking the Player whether they will Play or Discard that card
4. The Player selects the “Discard” option
5. The other Players are told about which card was discarded
6. The game state changes:
   1. The Player’s hand loses their discarded card
   2. The discard pile has the discarded card placed on top
   3. The information token count is increased by 1
   4. The Player draws a card and their hand gains the drawn card
   5. The draw pile has the top card removed
7. The Player waits for their next turn, and the next Player takes their turn

Alternative Sequences:

* If the Player takes longer than the time-out period (specified by the Game Creator) to do Steps 1-4, then an AI will make an action for the Player. They will select one of the Player’s cards to discard and discard it for them, thereby skipping Steps 2-4.
* During Step 4, if the Player instead selects the “Cancel” option, then the prompt disappears, and the Main Sequence returns to Step 1.
* If the draw pile is empty after drawing a card, then all Players get 1 more turn before the game ends.
* If the draw pile is empty before drawing a card, then no card is drawn, and Steps 6.D and 6.E are skipped. The Player will get no more turns before the game ends.
* After Step 6, if all Players have taken their last turn, then the game ends. The sequence from Step 7 then becomes:

7. The screen changes to the “Game Over” screen, displaying the game’s score in a prompt

8. The Player selects the “Quit” option in the prompt

9. The Player leaves the game, going back to the Main Menu screen

Error Sequences:

* If another Player disconnects from the game at any point during the main sequence, then the game ends prematurely. The sequence will then jump to Step 7 of the last alternative sequence.

4.6 Play a Card

Description: During their turn of a game, a Player decides to play a card and then chooses which of their own cards to play. If the played card starts the new firework pile for its color or continues its color’s firework pile, then it goes on that pile and the Player draws a card; otherwise it is discarded, a fuse token is lost, and the Player still draws a card. The other Players are told about this action before play passes to the next Player.

Preconditions:

* The Player has the current turn
* There is at least 1 fuse token

Postconditions:

* The Player is waiting for their next turn
* One of the fireworks piles or the discard pile has 1 more card

Main Sequence:

1. The Player is prompted to take an action
2. The Player selects one of their cards to play
3. A prompt appears asking the Player whether they will Play or Discard that card
4. The Player selects the “Play Card” option on the Game screen
5. The other Players are told about which card was played
6. The game state changes:
   1. The Player’s hand loses their played card
   2. The played card is placed on top of its color’s firework pile
   3. The Player draws a card and their hand gains the drawn card
   4. The draw pile has the top card removed
7. The Player waits for their next turn, and the next Player takes their turn

Alternative Sequences:

* If the Player takes longer than the time-out period (specified by the Game Creator) to do Steps 1-3, then an AI will make an action for the Player. They will select one of the Player’s cards to play and play it for them, thereby skipping Steps 2-4.
* During Step 4, if the Player instead selects the “Cancel” option, then the prompt disappears, and the Main Sequence returns to Step 1.
* In Step 6.B, if the played card was a 5 and there weren’t 8 information tokens at the start of the action, then another step is added in changing the game state:

6.E. The information token counter is increased by 1

* If the played card doesn’t start a new firework pile (i.e. it is not a 1 in a color that doesn’t have a firework pile yet) and doesn’t continue an existing firework pile (i.e. isn’t the next number of its firework pile), then Step 6.B becomes:

6.B.i. The discard pile has the played card placed on top

6.B.ii. The fuse counter is decremented by 1

* If the draw pile is empty after drawing a card, then all Players get 1 more turn before the game ends.
* If the draw pile is empty before drawing a card, then no card is drawn, and Steps 5.D and 5.E are skipped. The Player will get no more turns before the game ends.
* After Step 6, if all Players have taken their last turn or there are 0 fuses left, then the game ends. The sequence from Step 7 then becomes:

7. The game’s score is calculated and displayed to the Player in a prompt

8. The Player selects an “OK” option in the prompt

9. The Player leaves the game, going back to the Main Menu screen

Error Sequences:

* If another Player disconnects from the game at any point during the main sequence, then the game ends prematurely. The sequence will then jump to Step 6 of the last alternative sequence.

4.7 Give Information

Description: During their turn of a game, a Player decides to give information about another Player’s cards, and then selects both the Player and the card property (either a color or a number) to tell them about. One information token is used up and the given property is revealed to the other Player about their hand. The other Players are told about which Player was given information and what that information was. Play then moves to the next Player.

Preconditions:

* The Player has the current turn
* There is at least 1 information token.

Postconditions:

* The Player is waiting for their next turn
* There is 1 less information token

Main Sequence:

1. The Player is prompted to take an action
2. The Player selects one of the other Player’s cards to give information about
3. A prompt appears asking the Player whether to give information about the Color or Number of the selected card
4. The Player selects either the “Color” or “Number” option in the prompt
5. The other Players are told about which Player was given information and what that information was
6. The game state changes:
   1. The information token count decreased by 1
7. The Player waits for their next turn, and the next Player takes their turn

Alternative Sequences:

* If the Player takes longer than the time-out period (specified by the Game Creator) to do Steps 1-4, then an AI will make an action for the Player. Instead of giving information, they will select one of the Player’s cards to discard and discard it for them, thereby jumping to Step 5 of the “Discard a Card” Main Sequence (in Section 4.5).
* During Step 4, if the Player instead selects the “Cancel” option, then the prompt disappears, and the Main Sequence returns to Step 1.
* After Step 6, if all Players have taken their last turn, then the game ends. The sequence from Step 6 then becomes:

7. The game’s score is calculated and displayed to the Player in a prompt

8. The Player selects an “OK” option in the prompt

9. The Player leaves the game, going back to the Main Menu screen

Error Sequences:

* If another Player disconnects from the game at any point during the main sequence, then the game ends prematurely. The sequence will then jump to Step 7 of the last alternative sequence.

4.8 Leave Game

Description: Anytime during a game, a Player decides to leave the game and selects the “Leave Game” option. They are disconnected from the game and are taken back to the Main Menu screen

Preconditions:

* The Player is in an inactive or active game
* The Player is not an AI Player

Postconditions:

* The Player is no longer in a game
* The Player is on the Main Menu screen

Main Sequence:

1. The Player selects the “Leave Game” option on the Game screen
2. The Player disconnects from the game
3. The Player is taken to the Main Menu screen

Alternative Sequences: None

Error Sequences: None

4.9 View Discard Pile

Description: Anytime during a game, a Player decides to view the cards in the discard pile and selects the Discard Pile. A prompt appears with a listing of the cards discarded so far in the game. The Player then selects “OK” in the prompt to close it.

Preconditions:

* The Player is in an active game
* The Player is not an AI Player

Postconditions:

* None

Main Sequence:

1. The Player selects the Discard Pile on the Game screen
2. A new prompt appears with the current list of discarded cards displayed
3. The Player selects the “OK” option, closing the prompt

Alternative Sequences: None

Error Sequences:

* If the game ends while the prompt is open, it will close automatically before the screen changes to the Game Over screen.

4.10 View Action Log

Description: Anytime during a game, a Player decides to view the actions taken during the game and selects the “Log” option. The Action Log then expands on the Game screen and displays a list of all the actions taken so far in the game. The Player then selects the “Log” option again to minimize the Action Log again.

Preconditions:

* The Player is in an active game
* The Player is not an AI Player
* The Action Log is not already expanded

Postconditions:

* None

Main Sequence:

1. The Player selects the “Log” option on the Game screen
2. The Action Log expands within the empty space around it on the Game screen, displaying the current list of game actions
3. The Player selects the “Log” option again, minimizing the Action Log

Alternative Sequences: None

Error Sequences: None