## Acquire

Welcome to [Acquire](http://en.wikipedia.org/wiki/Acquire). You do **not** need to read anything at the link! It is provided in case you want to learn more after the code war is over.

In the booming city of Windwardville you have the opportunity to make a fortune by developing and then selling hotel chains. Yes, your goal is to boost and flip your properties, pocketing the profits.

There are 7 available hotel chains and you make money by purchasing stock when the hotel is priced low and then selling your stock as well as the majority bonuses when the chain is acquired. And unlike the real world, the value of your stock will never go down!

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## The Game

### Setup

There are 6 players in the game, you and 5 other AIs. If there are less than 6 teams at your school, the game will use the brian-dead AI for the remaining players.

At the beginning of the game, each player receives $6000 in cash and 6 tiles. The players will go in the order they joined the game. Each new game in a series it will rotate once to start with the next player.

### Playoffs

The playoff is a series of 10 games where the total score across all 10 games is used to determine the winner. With the rotating starting player, 4 players will start twice and 2 players will start once.

### Turn

A turn consists of 2 – 4 steps:

1. QuerySpecialPowerBeforeTurn – this gives you the opportunity to play the CARD.DRAW\_5\_TILES or CARD.PLACE\_4\_TILES special power. Return CARD.NONE to not play either. (Only 1 of these 2 cards per turn.)
2. If you played CARD.PLACE\_4\_TILES, then you will have QueryTileOnly() called 3 (not 4) times to place 3 tiles. For the 4th tile, QueryTileAndPurchase() will be called. You return:
	1. The tile to place.
	2. The chain to create if you are creating a chain
	3. The merge survivor if you are merging 2 or more equally sized chains. Any merges due to this will be resolved before the next card is played.
3. QueryTileAndPurchase - return what tile(s) to play and what stock(s) to purchase. At this point merges have not yet been processed. You return:
	1. The tile to place. (It is always 1 tile except for the single time you play the PLACE\_4\_TILES card.)
	2. The chain to create if you are creating a chain
	3. The merge survivor if you are merging 2 or more equally sized chains. Any merges due to this will be resolved before the next tile is played.
	4. The power-ups CARD.FREE\_3\_STOCK, CARD.BUY\_5\_STOCK, or CARD.TRADE\_2\_STOCK cards. Play CARD.NONE if you don’t wish to play a card. (Only 1 of these 3 cards per turn.)
	5. The stocks to purchase (including ones due to CARD.FREE\_3\_STOCK).
	6. The stocks to trade due to CARD.TRADE\_2\_STOCK.
4. QueryMergeStock – you are asked what to do for each chain being merged out of existence. If multiple chains are being acquired, you will be called once for each.

Tiles will be replensihed at the end of your turn as required.

If you do not return a turn in time, then one of your tiles will be randomly played, no stock will be purchased, and on a merge all shares will be sold.

### Placing Your Tile

Tile placement falls in one of four categories. The tile placed could be an orphan, adjacent to no other tile on the board. The tile could create a new chain of tiles, and the player who placed it on the board would have the opportunity to found a new chain. The tile could increase the length of an existing chain already on the board. Or the tile could link two or more chains, causing a merger of two or more chains. Since there are only seven hotel chains in the game, placing a tile that would create an eighth chain is not permitted.

When a player founds a chain, he receives one free share of stock in that chain. If, however, there are no shares left when the chain is founded, then the founding player does not receive the free share.

Chains are deemed "safe" if they have 11 or more tiles; placing a tile that would merge 2 safe chains is not permitted.

Tiles that are permanently unplayable (would merge 2 safe chains) are replaced in your tiles. Tiles that are temporarily unplayable (would create a new chain and 7 chains are on the board) remain in your tiles but cannot be played. If all 6 of your tiles are unplayable you cannot play a tile that turn, but you still can buy stock.

If you place a tile that connects to a chain and an orphan, then that chain has increased by 2 tiles.

### Creating Hotels

When 2 tiles are placed adjacent to each other (diaganol does not count), that creates a new chain. Each turn you first place 1 (or 4 if you play a power-up) tile. This tile may be an orphan (not adjacent to any), added to an existing chain, adjacent to multiple chains causing a merger, or adjacent to a single creating a chain.

When you create a new chain, you get a free share of stock. The value of that share is minimal, however that share gives you the ability to stay the first majority holder through subsequent purchases and that first majority is very valuable.

Playing a tile, creating a chain, etc. does not directly gain you anything. In other words, there are no points, etc from doing so (aside from the free share). The tiles are a means to an end.

### Hotel Stock Price

The value of each share of stock in the hotel is as follows:

|  |  |  |
| --- | --- | --- |
| Number of Hotels in Chain on Board | Stock Buying/Selling Price per Block | Majority Holder’s Bonus |
| WindwardHP | JetBrainsSalesforceMicrosoft | AmazonGoogle | First | Second |
|  |  | 2 | $200 | $2,000 | $1,000 |
|  | 2 | 3 | $300 | $3,000 | $1,500 |
| 2 | 3 | 4 | $400 | $4,000 | $2,000 |
| 3 | 4 | 5 | $500 | $5,000 | $2,500 |
| 4 | 5 | 6-10 | $600 | $6,000 | $3,000 |
| 5 | 6-10 | 11-20 | $700 | $7,000 | $3,500 |
| 6-10 | 11-20 | 21 - 30 | $800 | $8,000 | $4,000 |
| 11-20 | 21 - 30 | 31 - 40 | $900 | $9,000 | $4,500 |
| 21 - 30 | 31 - 40 | 41+ | $1,000 | $10,000 | $5,000 |
| 31 - 40 | 41+ |  | $1,100 | $11,000 | $5,500 |
| 41+ |  |  | $1,200 | $12,000 | $6,000 |

You buy and sell stock at the price above based on the number

There is a total of 25 shares of stock for each chain.

### Buying (and Selling) Stock

After you place a tile, and the results of that placement have been handled, you may purchase up to three (5 if the power-up is played) shares of stock. A player may only purchase shares of stock in chains that are on the board. The price of a share depends on the size of the chain, according to the above table that lists prices according to size. A player may purchase shares in one, two, or three existing chains (assuming at least three chains are currently in play), in any combination up to a total of three shares.

You can only purchase, including when using power-ups, in chains that exist on the board and have available stock.

You can only sell stock when a company is merged out of existence or at the end of the game. You can not sell stock because you are low on cash and prefer to buy a different chain.

### Merging Chains

Chains merge when a player places the tile that eliminates the empty space between them. When a merger occurs, the larger hotel chain always acquires the smaller hotel chain. That is, the hotel chain with more tiles will continue to exist and now grows to include the smaller hotel chain (after bonuses have been calculated according to the steps outlined below). If a tile is placed between two hotel chains of the same size, the individual player who places the tile decides which hotel chain remains on the board and which is acquired.

Chains are deemed "safe" if they have 11 or more links; placing a tile that would cause such a chain to be acquired by a larger chain is also not permitted and those tiles will be removed from your list of tiles.

Mergers yield bonuses for the two players who hold, respectively, the largest and second-largest interests in a chain. Mergers also give each player who holds any interest at all in a chain a chance to sell their stock or to trade it in for shares of the acquiring chain. A merger takes place in three steps:

Bonuses for majority and minority shareholders. The player with the largest number of shares is the "majority" shareholder, and the player with the second-largest number of shares is the "minority" shareholder. If two players tie for majority, they will share both shareholder bonuses. If two players tie for minority, they will share the minority shareholder bonus. This bonus is immediately credited to each player.

Sell, trade, or hold shares. Starting with the player who caused the merger to happen, each player may either sell their shares in the acquired chain, trade in two shares of the acquired chain for one share of the acquiring chain, or hold on to their shares of the acquired chain. Shares are sold at the same price as the current cost of one share of stock in the acquired chain. A player may trade in as many shares as they own, but may not trade in one share of the acquired chain for half a share of the acquiring chain. If a player holds onto their stock, they run the risk that the acquired chain may not reemerge before the game ends. If that happens, then they will be holding worthless stock at the end of the game.

Defunct chain. The acquired chain then becomes defunct. It is eligible to be founded again if another player founds a chain again in a later turn.

If placing a tile causes three or four chains to merge, then the merger steps are handled between the largest and second-largest chain, then with the third-largest chain, and finally with the smallest chain.

When the game ends, majority bonuses are paid to the appropiate players holding stock in chains on the board.

### Power-Ups

You get a bunch of power-ups. You can play these on any turn. The icons displayed on each are what will be displayed on your status window when you have not yet played it (ie still in your hand)

*  3 FREE – The stock you get this turn are free. You can take up to 3 and this is your “purchase” for this turn.
*  BUY 5 – You can purchase up to 5 shares of stock this turn. This is your “purchase” for this turn.
*  TRADE 2 – Trade 2 blocks of stock you presently hold for 1 share of an available chain. You can have up to 3 trades. For each trade the 2 shares traded in must be in the same chain. This card is in addition to the 3 shares you can purchase.
*  TAKE 5 TILES – Before you place your tile for this turn, you draw 5 (if available) additional tiles. When you do this you will not receive any new tiles until the tiles in hand drops down to 5.
*  PLACE 4 TILES – Place 4 tiles this turn. For the first 3 tiles, if you create a chain you will get a free share of stock and if you merge chains the merge will be handled. But there is no purchasing of stock. On the 4th tile, that’s a normal move including purchasing stock.

### Game End

The game ends when either all chains on the board are safe or a chain has 41+ tiles. When the game ends:

1. All stock in chains on the board is sold and the holding players are credited for the sale.
2. The majority holder bunuses are paid to the majority holders of all chains on the board.

## The challenges you face are:

1. Early in the game you have limited cash. The only way to get significantly more cash is to have chains you get a majority bonus from merged out of existence.
2. Middle to end of the game (if you received majority bonuses) you are cash rich, and so is everyone else. So you’re in a race for stock.
3. Oftentimes the game will end with one large chain. Holding the majority in that chain is very valuable, both for the sale of the stock and the majority bonus.

## What Information you are provided

1. The map.
2. Full player info except you do not know the tiles other players hold.
	1. You do know the stock & money the other players have on hand.
3. The hotel chains including who is holding how much stock in each.

# Programming Environment

The provided code has the server (C# application running on Windows) and 4 sample clients (C#, Microsoft C++, Java, & Python). You will use the server and one client.

You can run the server and client both on a single computer or the server on one and the client on a second.

* **Disable the firewall on your computers.** If running both on a single computer, you need to disable when running for the school semi-final.
* **Again, disable the firewall, especially on the computer running the server component.** 60% of the support calls we received last year were because people did not disable the firewall.
* If running on 2 computers, the clients will connect to the provided IP address. So you can run “PlayerCSharpAI 123.456.789.000” and it will connect to the server at that IP address. If you do not pass an IP address it uses 127.0.0.1 (the local machine).

Start with the sample AI program and revise that for your AI. You generally will only need to edit the MyPlayerBrain class, plus any additional classes you create. The other classes in the sample you should be able to use as is.

The sample AI code is bad. Really, really bad. Do **not** depend on any of that code to be effective.

## Programming Environment

* C# & C++ - Microsoft Visual Studio 2013. Note that the C++ client is Microsoft C++, not generic C++. We recommend [ReSharper](http://www.jetbrains.com/resharper/) on top of VisualStudio.
* C++ - your avatar must be in the working directory for your code.
* Java – JDK 1.6 or 1.7. We recommend [IntelliJ](http://www.jetbrains.com/idea/).
* Python – 2.7. We recommend [PyCharm](http://www.jetbrains.com/pycharm/).
* Server component – Windows 7 or 8. You can just run the .exe. However, if you want to run the server part under a debugger, you need to use Visual Studio 2013.

# Our Hints

1. [Turn off every distraction](http://blogs.windward.net/davidt/2012/04/22/want-to-be-a-better-developer-cheat/).
2. Random numbers are your friend. If your calculation scores tile A as a 95 (scale 1 – 100) and tile B an 89, don’t always play tile A. Instead get a random number between 0 and 184 (89 + 95) and select based on the returned value.
3. Set the server logging level to INFO and your client to DEBUG. A lot of the time you will need to review the logs to find out what went wrong. By the time you see the problem, the game has moved well beyond that point and so the debugger is useless.
4. Implement your approach quickly and then test. Testing will show you what works well and what does not.
5. Test against other teams early (we suggest 1:30, 3:00, & 4:30). Other AIs will be very different and much better than the brain-dead AI provided. You’ll face different problems. Because of the power-ups, other players can have a significant impact on your AI.

## Using the web

You can look on the web for information. And anything you can find you can use. What you may not do is ask anyone for help. So no posting questions, emailing friends, etc.

You can look up on the web how to play Acquire. (We assume some contestants will regardless of what we say so this is the only way to make this fair). With that said, a lot of the advice out there about how to best play is really awful. And most does not take into account the cards, which are very powerful.

# The Server Program

## Running the server

Run acquire.exe.

* Make sure the files acquire.exe.config and log4net.dll are in the same directory.

There are two command line modes for the server. Normally you will run it as a Forms app and use the menu. However you may find these modes useful.

acquire.exe /t “Anders Hejlsberg”

The /t stands for test
The server will run, wait for your client to start, send the setup command to your client, wait for the ready reply, then send an exit to your client and exit with a code of 0.
This is used by our game server to test clients when they are uploaded for the final.
Replace “Anders Hejlsberg” with your team name.

acquire.exe /a 3 c:\temp\game.xml "Anders Hejlsberg"

The /a means automatic.
3 means run 3 games.
game.xml is where the scores will be written.
Then list 1 - 10 names of the players you want run.
When the client AIs listed have all connected to the server, it will then run at full speed, for the specified number of games, write the scores to the specified XML file, tell the client(s) to exit, and then exit with a return code of 0.
This is used to run all games in the world-wide final.

# The User Interface

## Main Window



* Join – Drop all A.I. players and wait for new players to join.
* Lock – Set game ready to start. No new AI players can join and internal AI players will be added as needed to raise the total to 10.
* Play – Starts or continues the game.
* Step – Executes 1 tick of the game.
* Stop – the game is ended. Additional games may be run for the players joined.
* Speed – set how many ticks/second to run the game. Values are 1 (slowest) to 1,000. However faster speeds are also limited by the speed of the computer.
* View – set:
	+ The map zoom level
	+ Coordinate numbering on the top and left
* Turn sound effects on/off.
* Player stats window (see below)
* System messages window.
* Debug Window (see below).
* Debug Start – if checked (will have the green triangle) then as soon as a remote A.I. joins, the game will start.
* Debug Reset – click to end the game, drop all players, and open for joining.
* Full speed – will run at full speed and not update the map. It will update the player status window once per second.
* Play Card – you can select any power-up card to be played by the player whos turn it is. The card will be played when you step to through the next turn. This can only be used when single stepping in debug mode.

## Player Stats



* Avatar – if one is not set you will get a care bear.
* Score – your score for this game. Scores across all games are listed below the status bar part.
* Team name
* The stock you have a 1st majority bonus in.
* The stock you have a 2nd majority bonus in.
* The stock you have no majority bonus in.
* The power-ups you have not played.

## Debug Window



This is a live list of the tiles each player holds.

# Uploading to Windward

If you are one of the finalists at your school, you then need to zip up your client program and email it to codewars@windward.net. If you have any libraries or other files your client uses (normally you will not), include those. Include a cell phone number we can reach you at all evening in case we can’t run your client.

# Key Points

These are the issues commonly tripped over when we did play testing at Windward.

1. You have 2 programs – the server and the one client you will use. You need to run both programs.
2. You start with the sample client code and revise it

# FAQ

* Turns are processed in order. Player A is called for their turn and that is fully processed, then player B is called.
* You can play either one of the power-ups CARD.DRAW\_5\_TILES or CARD.PLACE\_4\_TILES in QuerySpecialPowerBeforeTurn() and play ony one of CARD.FREE\_3\_STOCK, CARD.BUY\_5\_STOCK, or CARD.TRADE\_2\_STOCK in QueryTileAndPurchase() in the same turn.
* You cannot discard a tile. If a tile is permanently unplayable (would merge 2 safe chains), then it will be removed from your tiles by the game. But any other tiles you’re stuck with until you play them. And if all your tiles are unplayable because they would create a chain and there are no available chains, you’re unable to play tiles until a chain becomes available.
* The game’s bank has unlimited funds so there is no issue with a total limit of money.
* You cannot trade with other players.
* If there are 2 single tiles placed diaganol to each other, then when you place a tile joining them and creating a hotel, that hotel starts with 3 tiles. It is possible for a chain to start with 5 tiles if there are tiles at the 4 sides of the tile you place.
* The logs will be filled with messages for illegal moves by the dumb player AI. It randomly picks stocks to buy, including stocks of chains not on the board and stocks with no available shares.