UNIVERSITI MALAYA

Faculty of Computer Science and Information Technology

Technical Report

WIX1002 FUNDAMENTALS OF PROGRAMMING

PROJECT 1: TILL THE END

OCCURENCE: 2

LECTURER NAME:

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Contents

Project 1: Till the End

Introduction of the project

“Till the End” is a defence and attack game between the tower and the dragon. The player is the mayor of Kuala Lumpur to protect the city from dragon invasion. In the game, dragon is designed to attack the city by giving damage to city’s wall. During the invasion, the city is protected by wall and tower that can attack the dragon. The dragon will fly away after attacking the wall for 10 times. Player can claim tax from citizens to upgrade the tower and the wall. In the game, the events that occur in different seasons will trigger different emotions of citizens. Plus, the towers and walls could be upgraded too. Besides that, player will also have a chance to get gold to upgrade the features in the game. These will indirectly affect the game. The player will win the game if the dragon is being successfully killed. (the health of dragon reduces to 0). Otherwise, the player loses the game if the dragon succeeds in breaking the wall (the health of wall reduces to 0).

Basic requirements of the project

The project requires us to create a game with the content of attacking or protecting the city from invasion, in this case, which is the dragon. We have to create a Java abstract class named “SameBehaviour” with relevant data fields and abstract methods declared. At the beginning of the game, a level 1 dragon will attack the city. After attacking 10 times, the dragon will fly away. The game will continue from Year 1, Spring to next season with retaining wall’s health. The event will happen and tax will be collected from citizens. Player can use the gold to take different actions to protect the city such as upgrading wall and tower. The dragon will attack the city every season. We assign the condition in a loop. It will terminate until the player reach win condition or lose condition.

Extra Features

1. Hard mode

   We create a game mode which is harder than usual by increasing the difficulty of the game. For example, we reduce the amount of tax that can be collected from citizens. We also increase the dragon’s stats**.**
2. Diversity

   In hard mode of the game, we add some new events that will bring different effects to enhance the diversity of the game.
3. Save and Load System

   We create a system that allows user to save the current stage. User can continue the game at the saved stage without starting the game all over again.
4. Sound effects

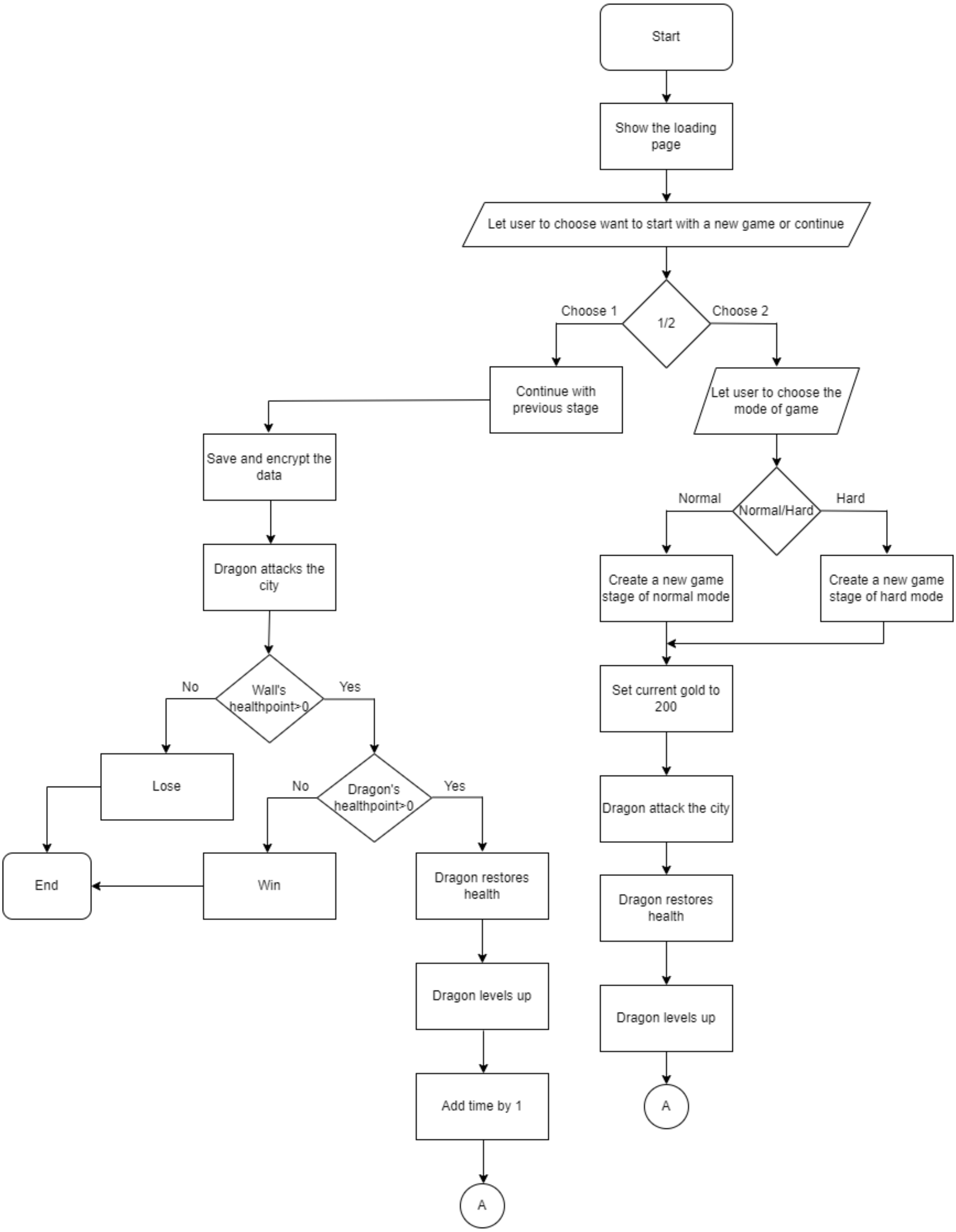
   We add sound effects at the start of the game, in the middle when tower and dragon are attacking each other to make the game more interesting. There are also sound effects added when the player wins or loses the game.

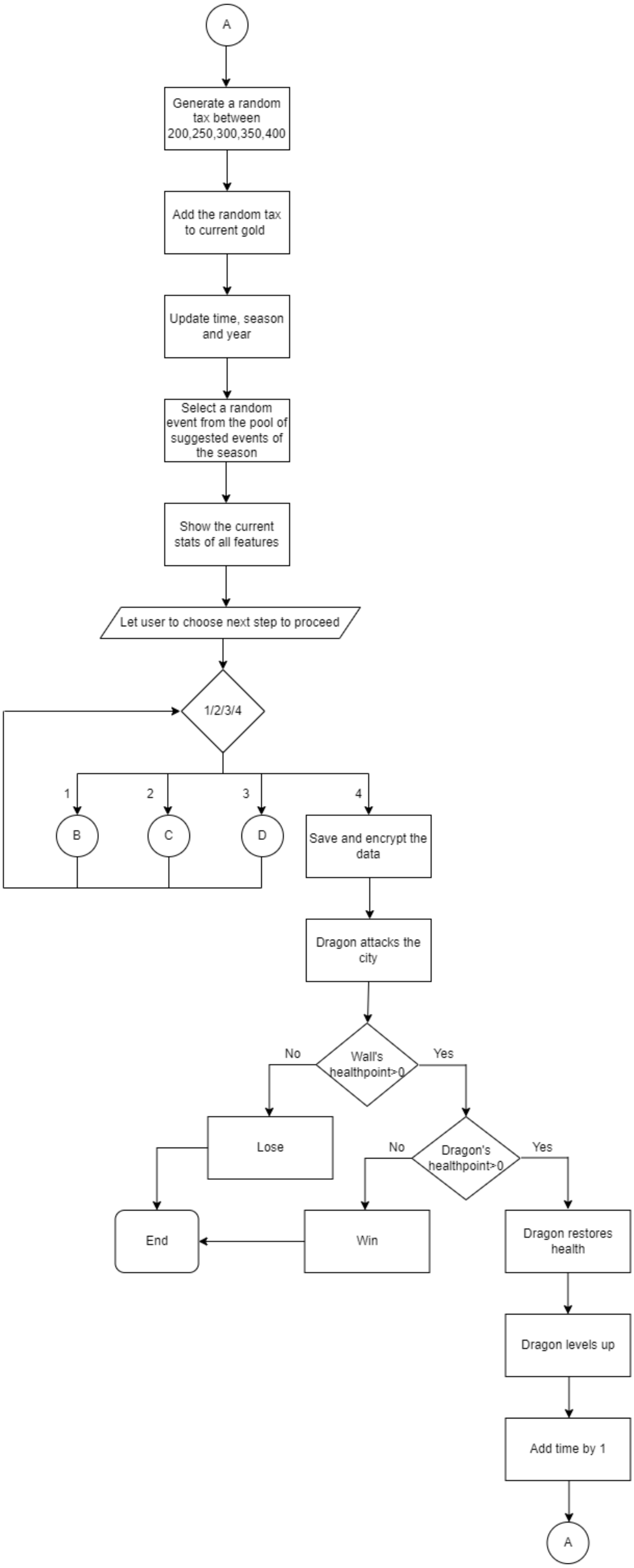
Approach taken to solve the task

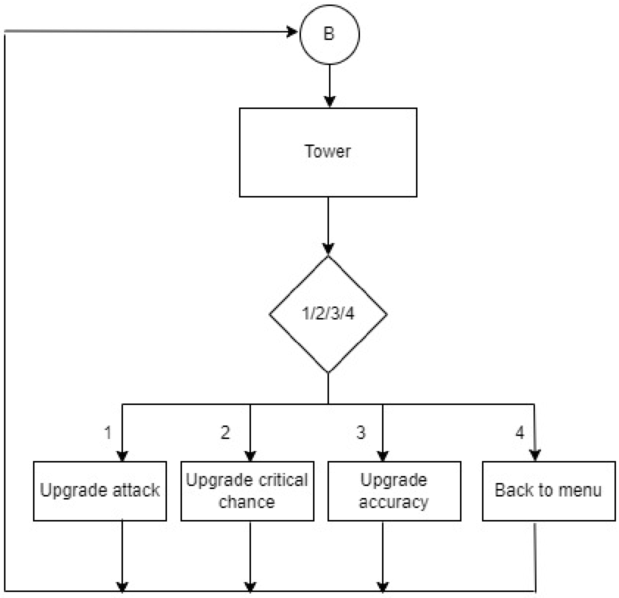
At first, we divided into few groups to complete the basic coding of each class. Then, we connected every class to make it work. In working on the extra features, we created another class and edit some method function for Hard mode, Diversity and Save and Load System. For the sound effects, we downloaded JLayer library from Internet to read the mp3 file and play it as sound effect. Other than that, we also added ascii artwork in our code to make our project more interesting and it showed our creativity. During the process, we discuss together when we faced problems. Besides that, we did a lot of searching on Internet on designing our coding to make the game work. In order to add in extra features in our game, we also ask for helps from some experts to modify our game.

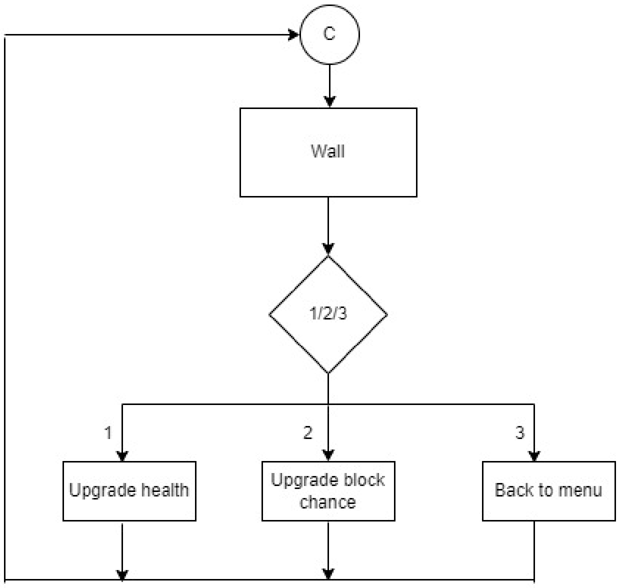
Detail Description of the Solution

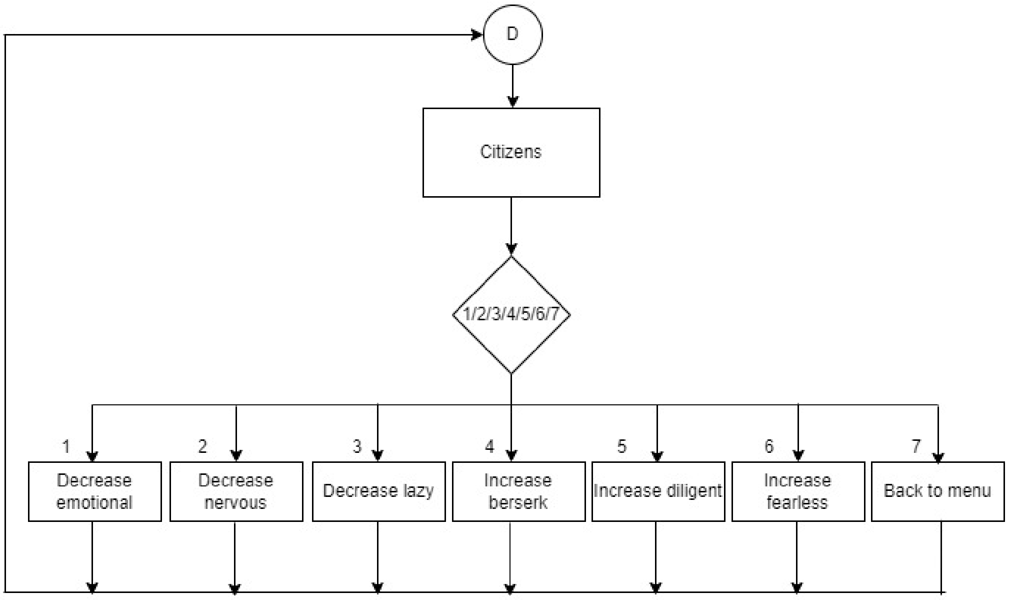
Flow Chart


Start
Show the loading page
Let user to choose want to start with a new game or continue
1/2
Choose 1
Choose 2
Continue with previous stage
Let user to choose the mode of game
Normal/Hard
Normal
Hard
Create a new game stage of normal mode
Create a new game stage of hard mode
Set current gold to 200
Dragon attack the city
Dragon restores health
Dragon levels up
A
Save and encrypt the data
Dragon attacks the city
Wall's healthpoint>0
No
Yes
Lose
Dragon's healthpoint>0
No
Yes
End
Win
Dragon restores health
Dragon levels up
Add time by 1
A


A
Generate a random tax between 200,250,300,350,400
Add the random tax to current gold
Update time, season and year
Select a random event from the pool of suggested events of the season
Show the current stats of all features
Let user to choose next step to proceed
1/2/3/4
1
2
3
4
B
C
D
Save and encrypt the data
Dragon attacks the city
Wall's healthpoint>0
No
Yes
Lose
Dragon's healthpoint>0
No
Yes
End
Win
Dragon restores health
Dragon levels up
Add time by 1
A


B
Tower
1/2/3/4
1
2
3
4
Upgrade attack
Upgrade critical chance
Upgrade accuracy
Back to menu


C
Wall
1/2/3
1
2
3
Upgrade health
Upgrade block chance
Back to menu


D
Citizens
1/2/3/4/5/6/7
1
2
3
4
5
6
7
Decrease emotional
Decrease nervous
Decrease lazy
Increase berserk
Increase diligent
Increase fearless
Back to menu

Modules

SameBehaviour class

This is an abstract class that contains abstract method:

- public abstract void level_up(Tax tax, int input)
- public abstract void attack_or_miss(int accuracy, int critical_total, int critical_chance)
- public abstract String toString(Season season, Tax tax)

Season class

public void spring_event() • To decide the event that will be happened in spring season • After choosing the event, the following consequences will be updated.
public void summer_event() • To decide the event that will be happened in summer season • After choosing the event, the following consequences will be updated.
public void autumn_event() • To decide the event that will be happened in autumn season • After choosing the event, the following consequences will be updated.
public void winter_event() • To decide the event that will be happened in autumn season • After choosing the event, the following consequences will be updated.
public void event_selector(Tax tax) • To show the season of current stage • To show the event that will be happened in the season
public void nextSesaon() • To update the timeframe
public void updateTime() • To proceed the game with next season or year
public void spring_event_diverse(int event_generator)

• To add new events in spring season **(Diversity)** • To decide the event that will be happened in spring season **(Diversity)** • After choosing the event, the following consequences will be updated. **(Diversity)**
public void summer_event_diverse(int event_generator) • To add new events in summer season **(Diversity)** • To decide the event that will be happened in summer season **(Diversity)** • After choosing the event, the following consequences will be updated. **(Diversity)**
public void autumn_event_diverse(int event_generator) • To add new events in autumn season **(Diversity)** • To decide the event that will be happened in autumn season **(Diversity)** • After choosing the event, the following consequences will be updated. **(Diversity)**
public void winter_event_diverse(int event_generator) • To add new events in winter season **(Diversity)** • To decide the event that will be happened in winter season **(Diversity)** • After choosing the event, the following consequences will be updated. **(Diversity)**
public void event_selector_hard(Tax tax) • To show the season of current stage **(Hard mode)** • To show the event that will be happened in the season **(Hard mode)**

Tax class

public void generateTax() • To decide the tax that will be collected
public void generateTax_hard() • To decide the tax that will be collected in hard mode
public void receiveTax() • To update the gold that user have

Dragon class

public void level_up(Tax tax, int input) • To level up the dragon • To fully recover the health of dragon

public void level_up_hard() • To level up the dragon **(Hard mode)** • To fully recover the health of dragon **(Hard mode)** • The increase of stats of dragon of hard mode for every level up is twice of that for normal mode **(Hard mode)**
public void attack_or_miss(int dg_acc, int dg_critical_total, int dg_critical_chance) • To decide whether the dragon successfully launches an attack on the wall • To decide the dragon launches an attack with normal attack or critical attack.
public void dragon_round(Tower tower, Wall wall) • The dragon will start to attack the city • To show the damage caused by dragon on wall • To initialize the tower to attack the dragon during invasion
public void dragon_round_end(Tax tax, int input_command) • The dragon flies away • To show the updated stat of dragon • If user successfully kill the dragon, user win the game
public void dragon_round_end_hard() • The dragon flies away **(Hard mode)** • To show the updated stat of dragon **(Hard mode)** • If user successfully kill the dragon, user win the game **(Hard mode)**

Tower class

public void level_up(Tax tax, int input) • To upgrade the feature of tower according to the input of user
public void attack_or_miss(int tower_acc, int tower_critical_total, int tower_critical_chance) • To decide whether the tower successfully launches an attack on the dragon • To decide the tower launches an attack with normal attack or critical attack.
public void input_tower() • To allow user to select the feature of tower to upgrade
public void tower_choice(Tax tax)

• To check whether user have enough gold to upgrade the tower

Wall class

public void level_up(int gold, int ans1) • To upgrade the feature of wall according to the input of user
public void input_wall() • To allow user to select the feature of wall to upgrade
public void wall_choice(Tax tax) • To check whether user have enough gold to upgrade the tower

Citizens class

public void level_up(int gold, int ans2) • To confront the emotion of citizens according to the input of user
public void input_citizen() • To allow user to select the emotion of citizens to confront
public void citizen_choice(Tax tax) • To check whether user have enough gold to confront the citizens

Normal class

public void gameMethod() • To run the game
public String loading_page() • To show user the game is about to start
public void input_command() • To allow user to select the feature that he/she want to upgrade
public static void encryptDecrypt(String key, int cipherMode, File in, File out) throws InvalidKeyException, NoSuchAlgorithmException, InvalidKeySpecException, NoSuchPaddingException, IOException) • To encrypt and decrypt data in the file **(Save and Load System)**
private static void write(InputStream in, OutputStream out) throws IOException

• To save the encrypted data into a file **(Save and Load System)**
public static void SaveIntoFile(Season season, Tax tax, Tower tower, Wall wall, Citizen citizen, Dragon dragon) • To buffer save the stats into a file **(Save and Load System)**

Hard class

public void gameMethod() • To run the game of hard mode
public String loading_page() • To show user the game of hard mode is about to start
public void input_command() • To allow user to select the feature that he/she want to upgrade in hard mode
public static void encryptDecrypt(String key, int cipherMode, File in, File out) throws InvalidKeyException, NoSuchAlgorithmException, InvalidKeySpecException, NoSuchPaddingException, IOException • To encrypt and decrypt data in the file **(Save and Load System)**
private static void write(InputStream in, OutputStream out) throws IOException • To save the encrypted data into a file **(Save and Load System)**
public static void SaveIntoFile(Season season, Tax tax, Tower tower, Wall wall, Citizen citizen, Dragon dragon) • To buffer save the stats into a file **(Save and Load System)**

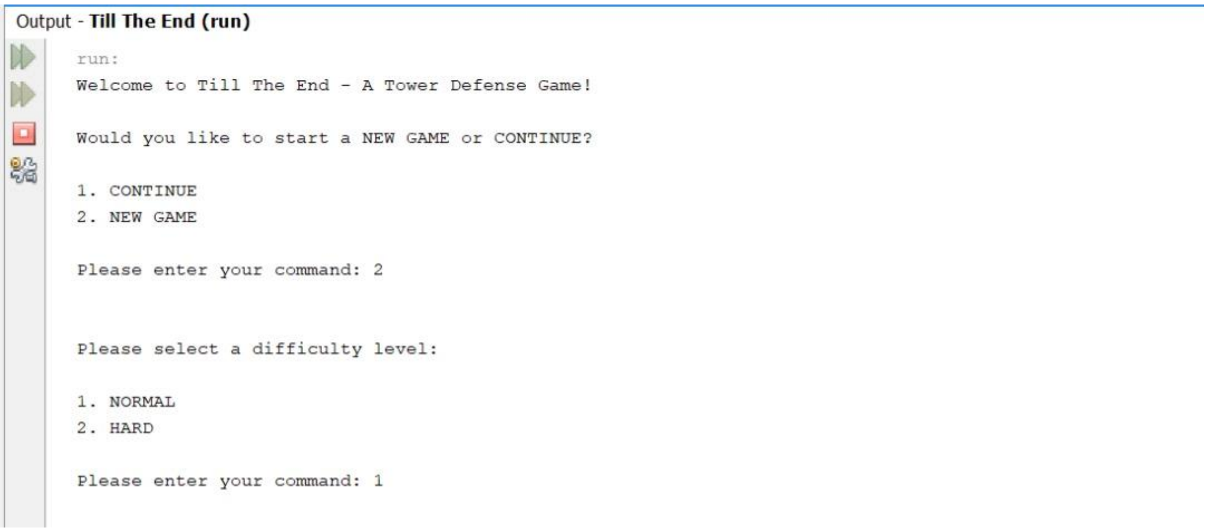
TillTheEnd class

public static void main(String[] args) • To call the method from other class
public static void encryptDecrypt(String key, int cipherMode, File in, File out) throws InvalidKeyException, NoSuchAlgorithmException, InvalidKeySpecException, NoSuchPaddingException, IOException • To encrypt and decrypt data in the file **(Save and Load System)**
private static void write(InputStream in, OutputStream out) throws IOException

- To save the encrypted data into a file **(Save and Load System)**

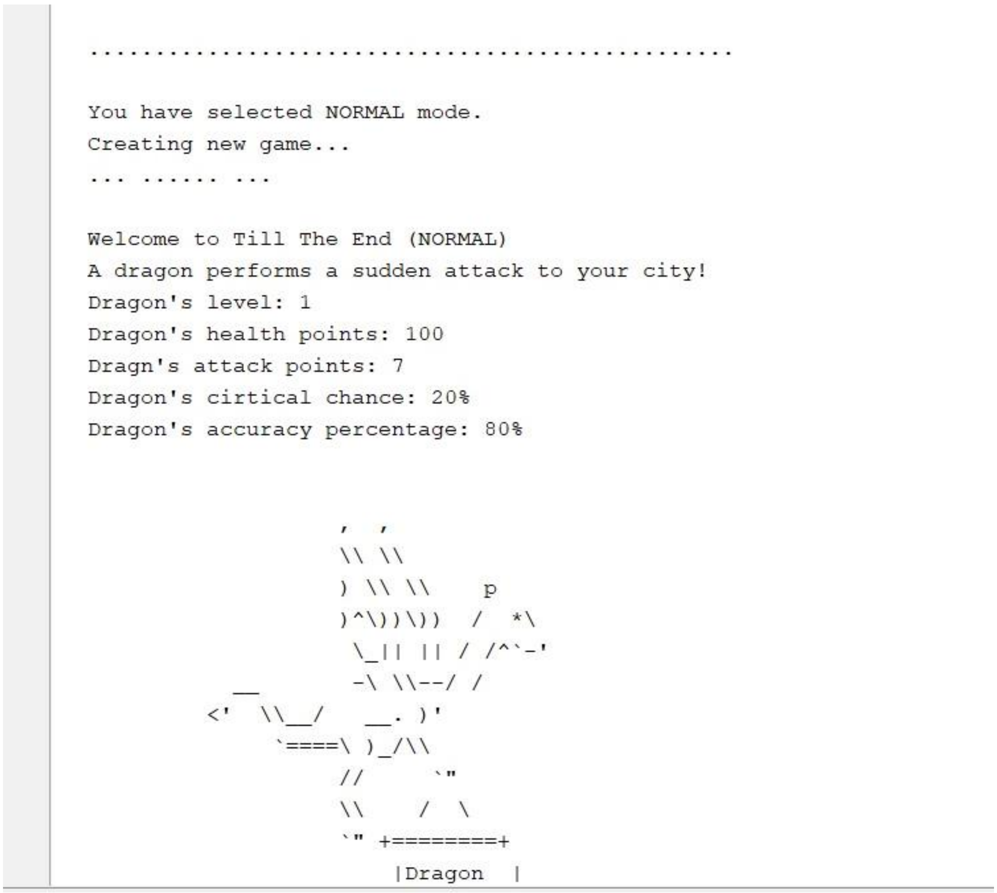
Sample Output

Normal mode



Output - **Till The End (run)**

```
run:
Welcome to Till The End - A Tower Defense Game!

Would you like to start a NEW GAME or CONTINUE?

1. CONTINUE
2. NEW GAME

Please enter your command: 2


Please select a difficulty level:

1. NORMAL
2. HARD

Please enter your command: 1
```



```
................................................

You have selected NORMAL mode.
Creating new game...
... ...... ...

Welcome to Till The End (NORMAL)
A dragon performs a sudden attack to your city!
Dragon's level: 1
Dragon's health points: 100
Dragn's attack points: 7
Dragon's cirtical chance: 20%
Dragon's accuracy percentage: 80%


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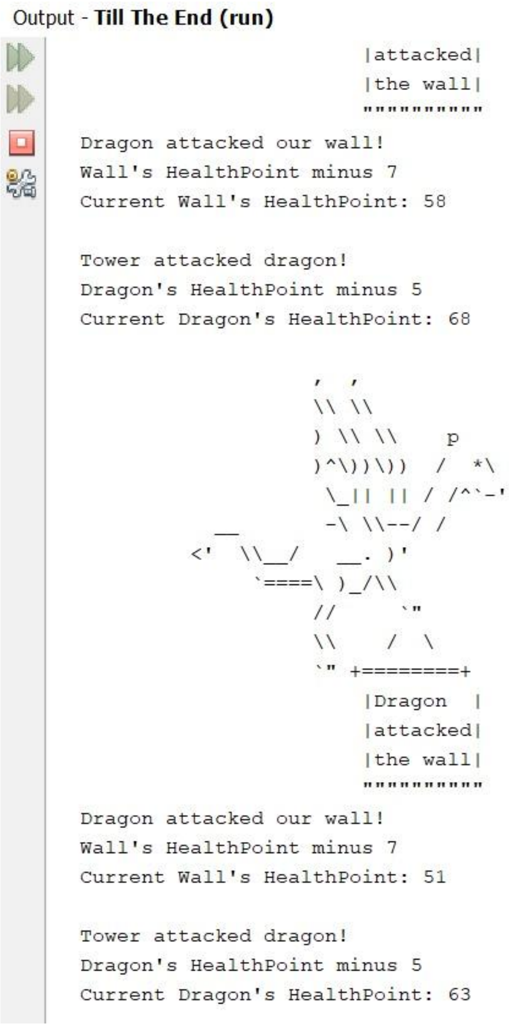

Output - **Till The End (run)**

```
                       |attacked|
                       |the wall|
                       """"""""""
Dragon attacked our wall!
Wall's HealthPoint minus 7
Current Wall's HealthPoint: 58

Tower attacked dragon!
Dragon's HealthPoint minus 5
Current Dragon's HealthPoint: 68


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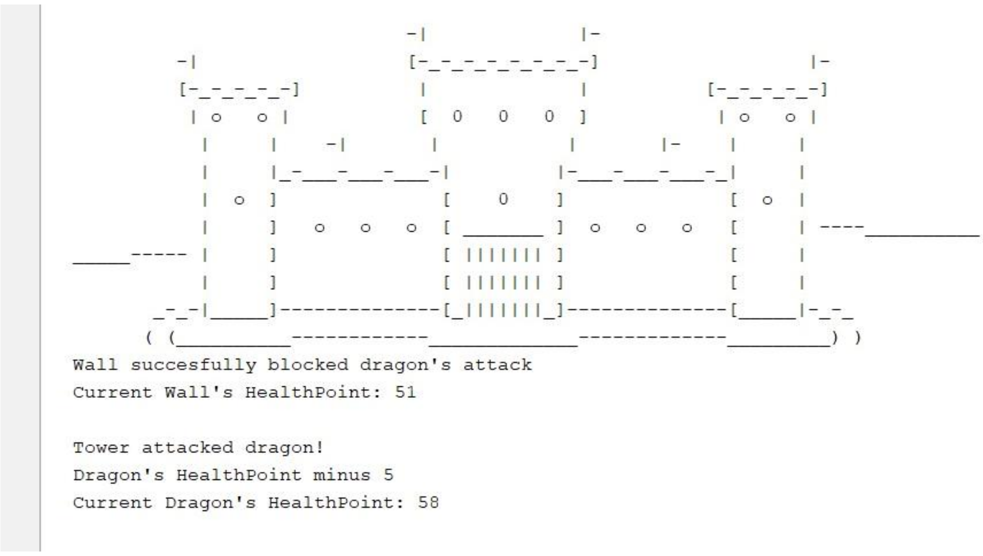
                       |Dragon  |
                       |attacked|
                       |the wall|
                       """"""""""
Dragon attacked our wall!
Wall's HealthPoint minus 7
Current Wall's HealthPoint: 51

Tower attacked dragon!
Dragon's HealthPoint minus 5
Current Dragon's HealthPoint: 63
```



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      ( (__________------------_____________-------------_________) )
Wall succesfully blocked dragon's attack
Current Wall's HealthPoint: 51

Tower attacked dragon!
Dragon's HealthPoint minus 5
Current Dragon's HealthPoint: 58
```

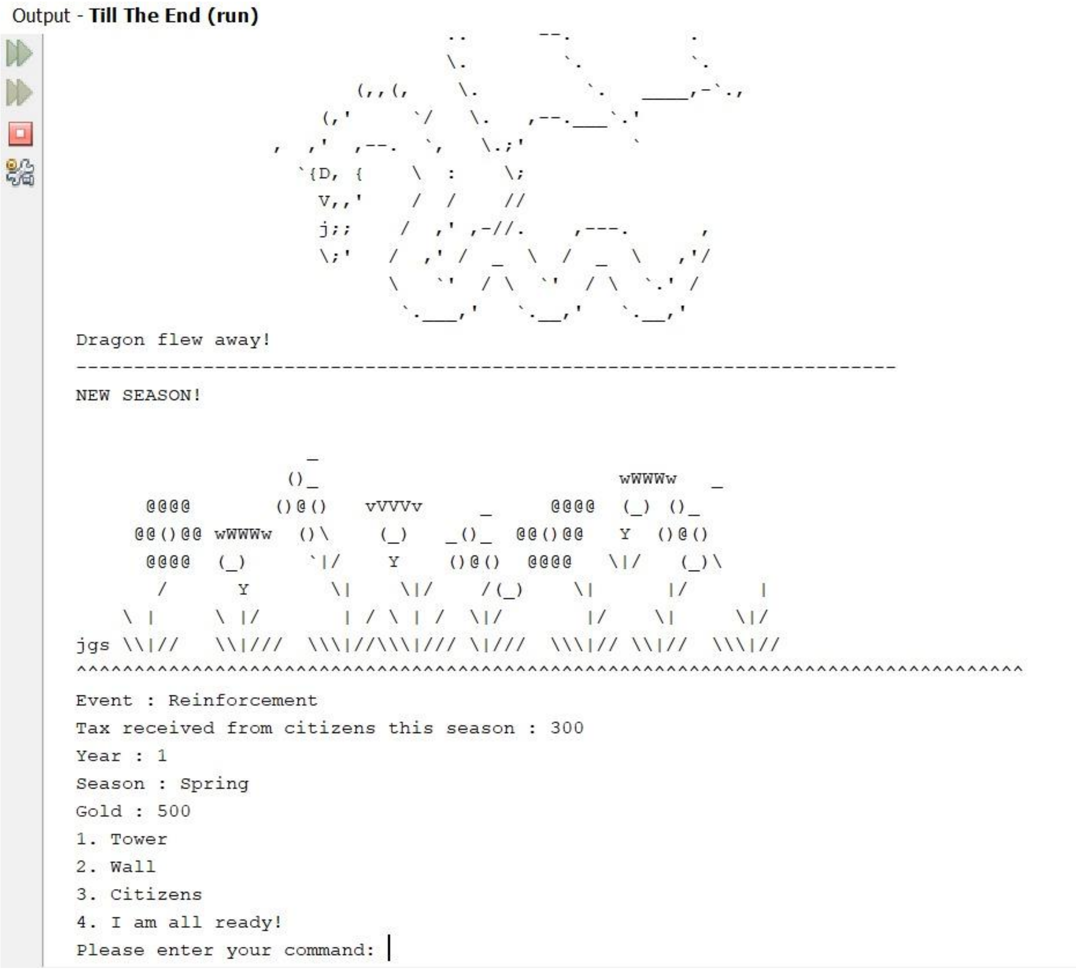

Output - **Till The End (run)**

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Dragon flew away!
-----------------------------------------------------------------------
NEW SEASON!


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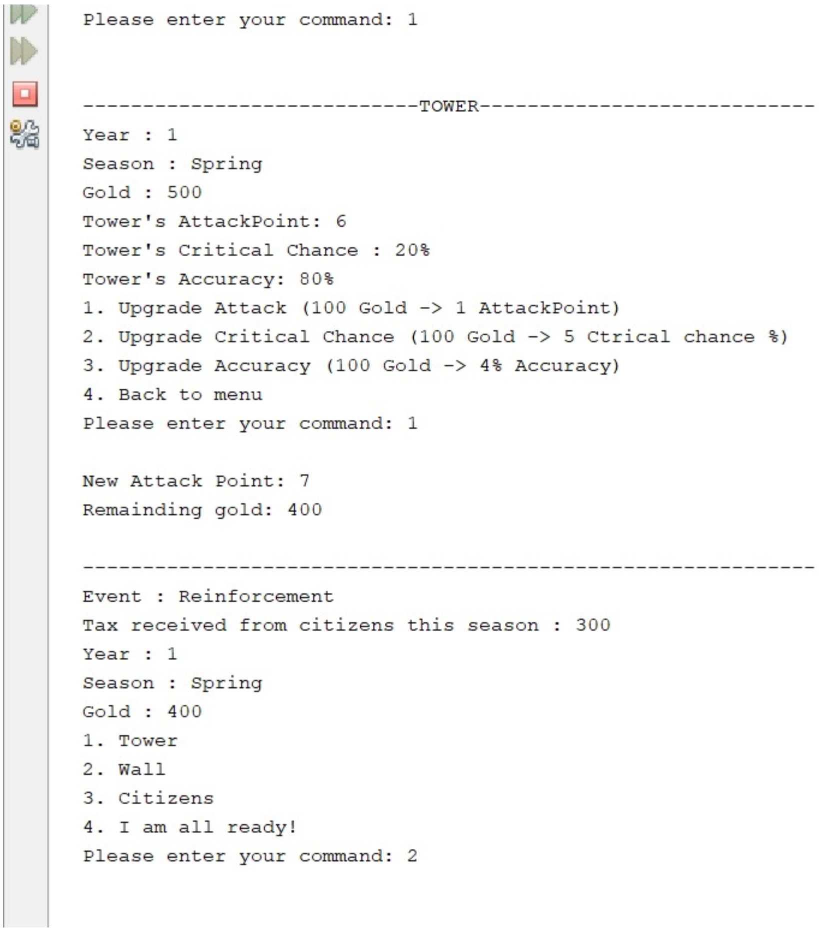
jgs \\|//   \\|///  \\\|//\\\|/// \|///  \\\|// \\|//  \\\|//
^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
Event : Reinforcement
Tax received from citizens this season : 300
Year : 1
Season : Spring
Gold : 500
1. Tower
2. Wall
3. Citizens
4. I am all ready!
Please enter your command: 
```

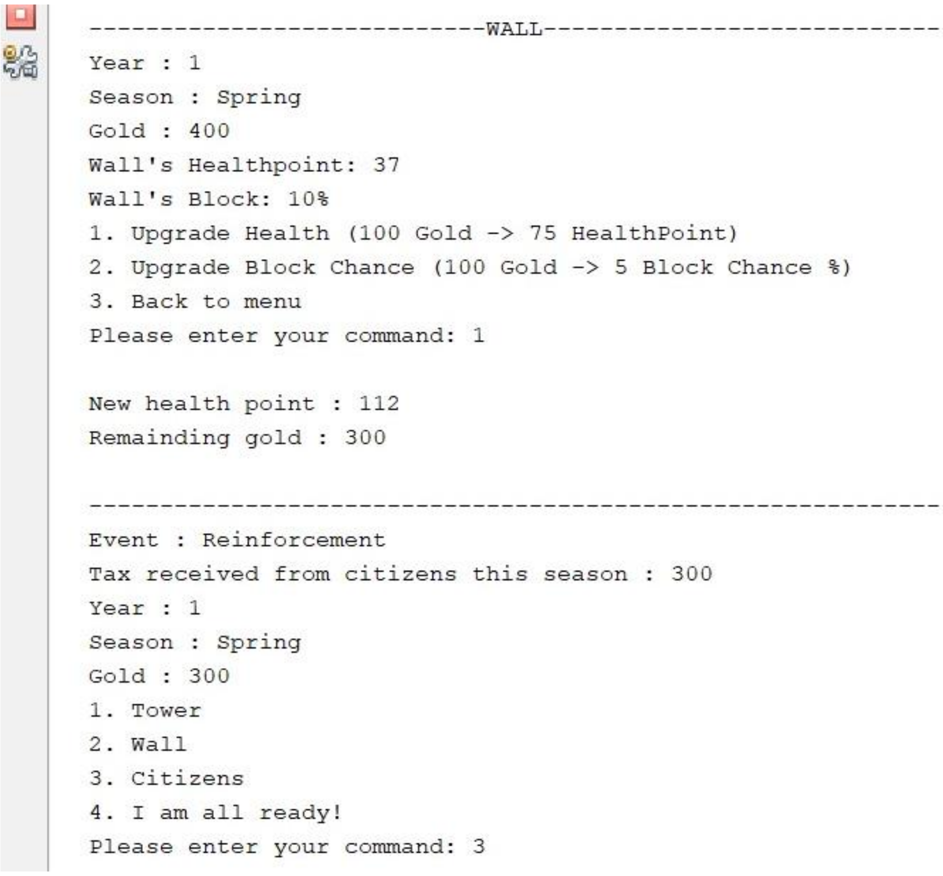


```
Please enter your command: 1


----------------------------TOWER---------------------------
Year : 1
Season : Spring
Gold : 500
Tower's AttackPoint: 6
Tower's Critical Chance : 20%
Tower's Accuracy: 80%
1. Upgrade Attack (100 Gold -> 1 AttackPoint)
2. Upgrade Critical Chance (100 Gold -> 5 Ctrical chance %)
3. Upgrade Accuracy (100 Gold -> 4% Accuracy)
4. Back to menu
Please enter your command: 1

New Attack Point: 7
Remainding gold: 400

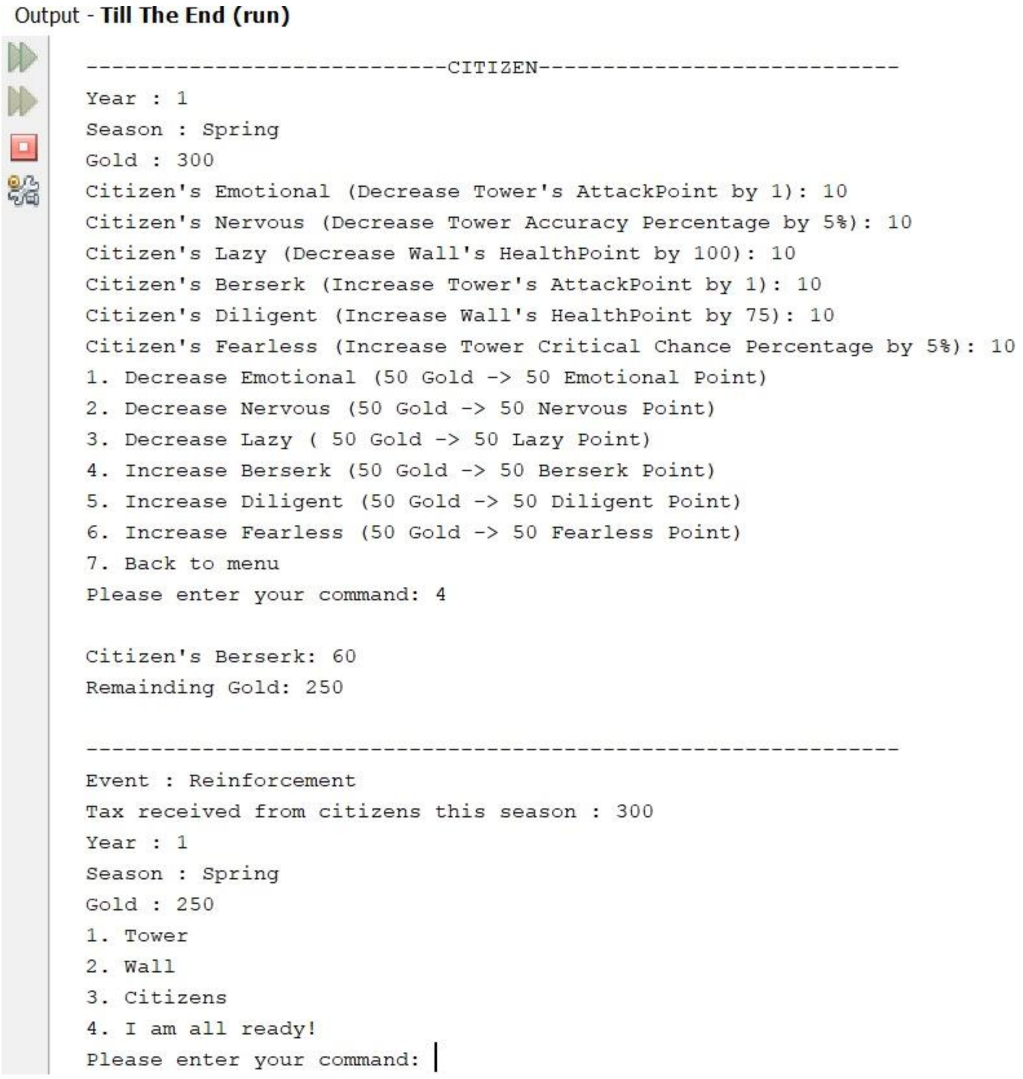
-------------------------------------------------------------
Event : Reinforcement
Tax received from citizens this season : 300
Year : 1
Season : Spring
Gold : 400
1. Tower
2. Wall
3. Citizens
4. I am all ready!
Please enter your command: 2
```



```
----------------------------WALL----------------------------
Year : 1
Season : Spring
Gold : 400
Wall's Healthpoint: 37
Wall's Block: 10%
1. Upgrade Health (100 Gold -> 75 HealthPoint)
2. Upgrade Block Chance (100 Gold -> 5 Block Chance %)
3. Back to menu
Please enter your command: 1

New health point : 112
Remainding gold : 300

-------------------------------------------------------------
Event : Reinforcement
Tax received from citizens this season : 300
Year : 1
Season : Spring
Gold : 300
1. Tower
2. Wall
3. Citizens
4. I am all ready!
Please enter your command: 3
```

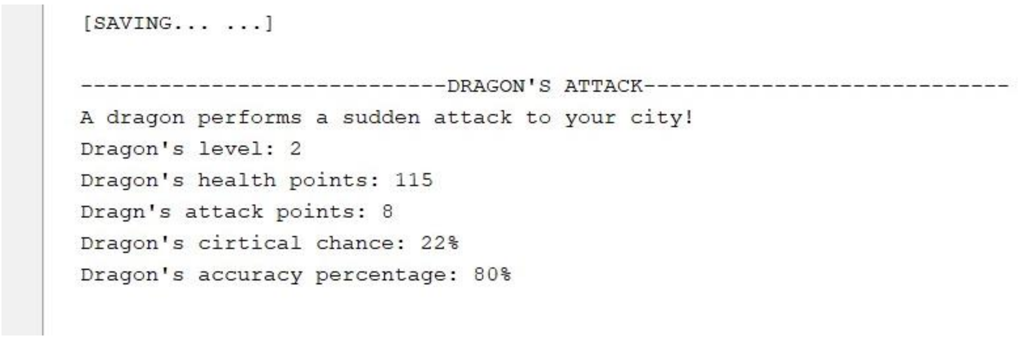


Output - **Till The End (run)**

```
----------------------------CITIZEN----------------------------
Year : 1
Season : Spring
Gold : 300
Citizen's Emotional (Decrease Tower's AttackPoint by 1): 10
Citizen's Nervous (Decrease Tower Accuracy Percentage by 5%): 10
Citizen's Lazy (Decrease Wall's HealthPoint by 100): 10
Citizen's Berserk (Increase Tower's AttackPoint by 1): 10
Citizen's Diligent (Increase Wall's HealthPoint by 75): 10
Citizen's Fearless (Increase Tower Critical Chance Percentage by 5%): 10
1. Decrease Emotional (50 Gold -> 50 Emotional Point)
2. Decrease Nervous (50 Gold -> 50 Nervous Point)
3. Decrease Lazy ( 50 Gold -> 50 Lazy Point)
4. Increase Berserk (50 Gold -> 50 Berserk Point)
5. Increase Diligent (50 Gold -> 50 Diligent Point)
6. Increase Fearless (50 Gold -> 50 Fearless Point)
7. Back to menu
Please enter your command: 4

Citizen's Berserk: 60
Remainding Gold: 250

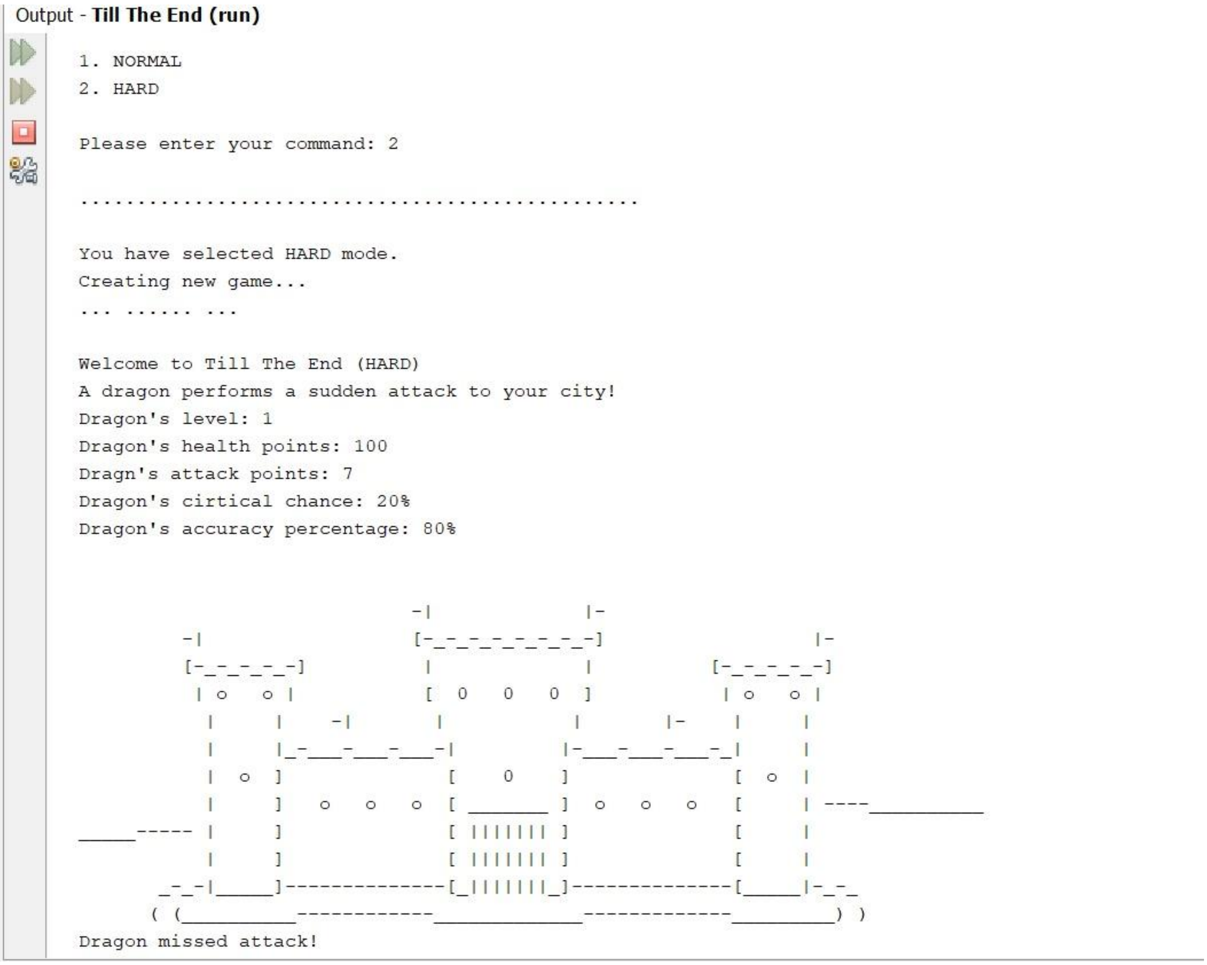
---------------------------------------------------------------
Event : Reinforcement
Tax received from citizens this season : 300
Year : 1
Season : Spring
Gold : 250
1. Tower
2. Wall
3. Citizens
4. I am all ready!
Please enter your command: 
```



```
[SAVING... ...]

----------------------------DRAGON'S ATTACK----------------------------
A dragon performs a sudden attack to your city!
Dragon's level: 2
Dragon's health points: 115
Dragn's attack points: 8
Dragon's cirtical chance: 22%
Dragon's accuracy percentage: 80%
```

Hard mode



```
1. NORMAL
2. HARD

Please enter your command: 2

.................................................

You have selected HARD mode.
Creating new game...
... ...... ...

Welcome to Till The End (HARD)
A dragon performs a sudden attack to your city!
Dragon's level: 1
Dragon's health points: 100
Dragn's attack points: 7
Dragon's cirtical chance: 20%
Dragon's accuracy percentage: 80%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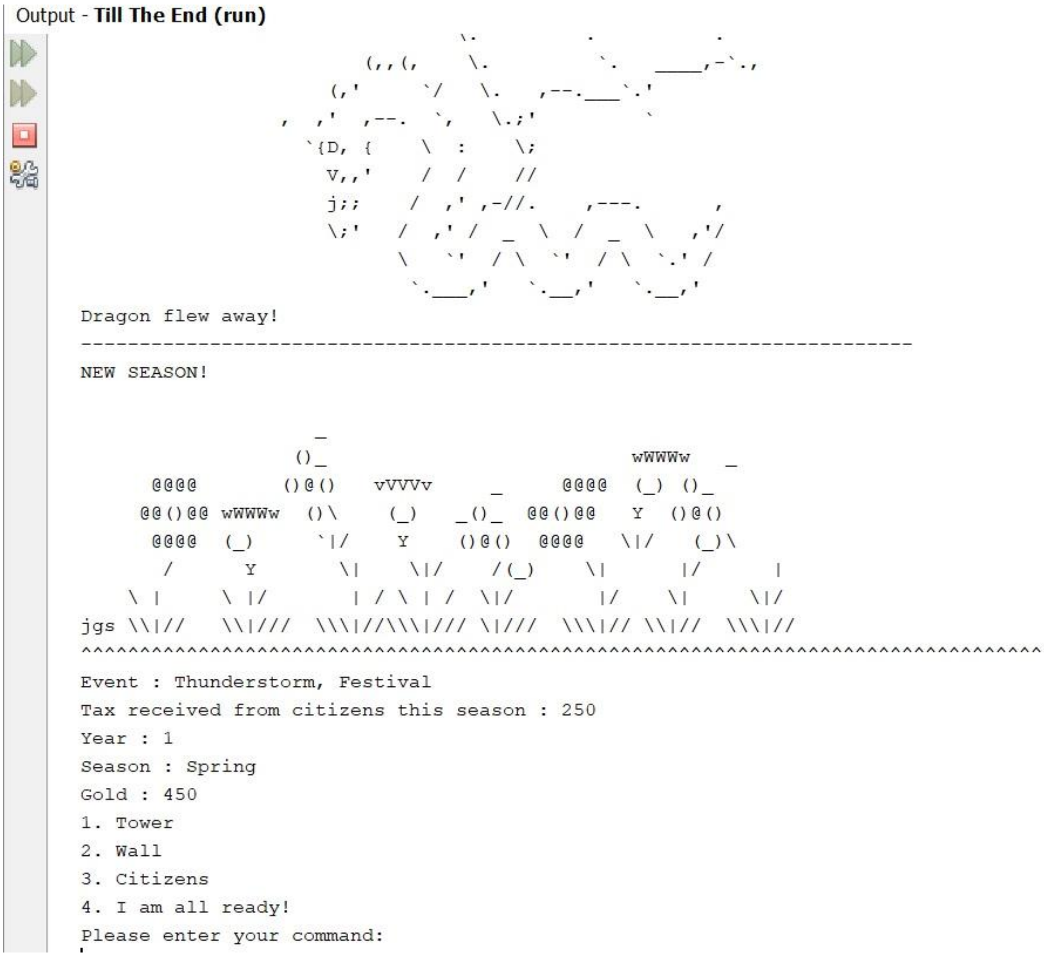
Dragon missed attack!
```

The procedure of hard mode is similar with normal mode.

Diversity



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Dragon flew away!
-----------------------------------------------------------------------
NEW SEASON!


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Event : Thunderstorm, Festival
Tax received from citizens this season : 250
Year : 1
Season : Spring
Gold : 450
1. Tower
2. Wall
3. Citizens
4. I am all ready!
Please enter your command:
```
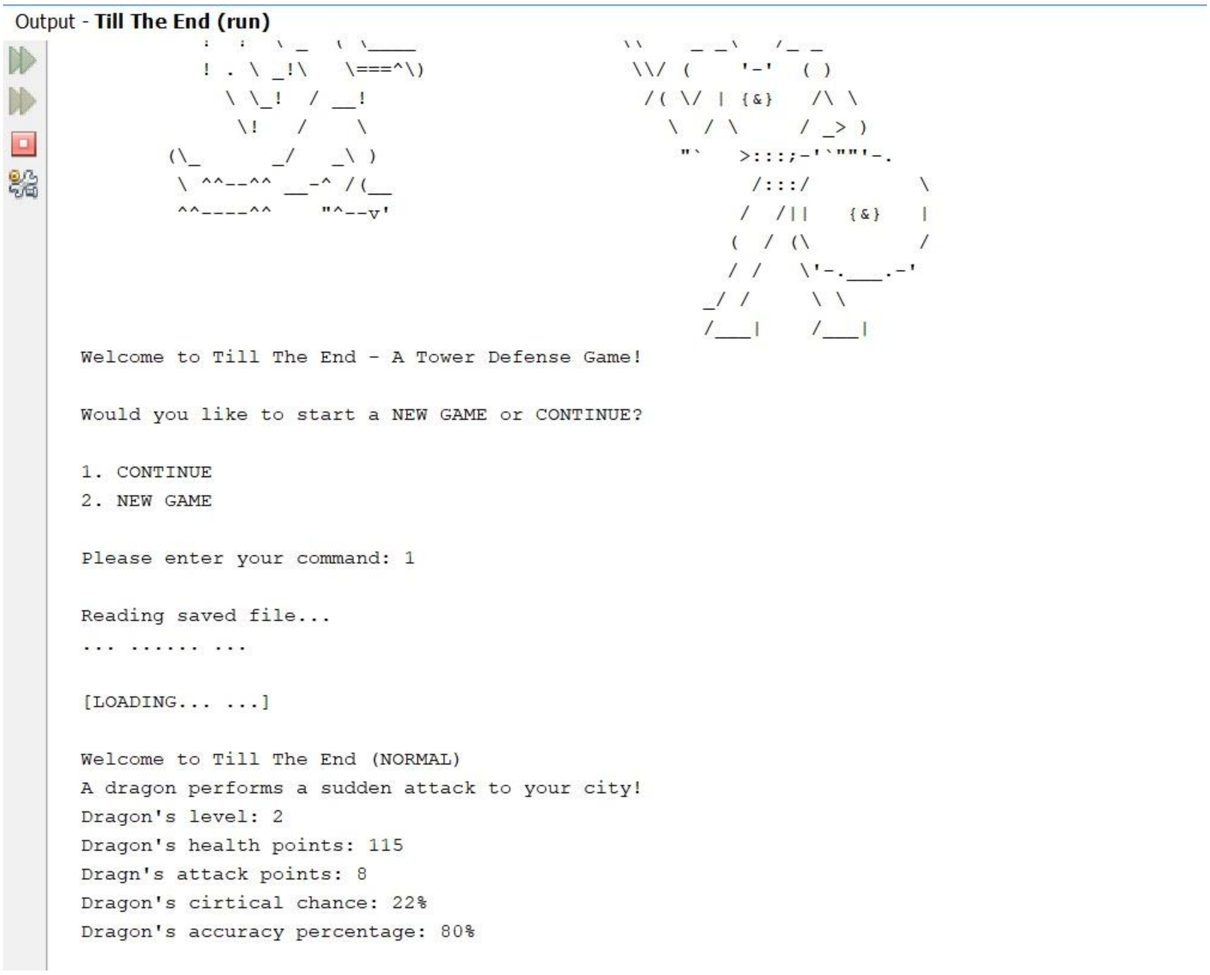

New season starts with two events.

Save and Load System



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                                                    /___|    /___|
Welcome to Till The End - A Tower Defense Game!

Would you like to start a NEW GAME or CONTINUE?

1. CONTINUE
2. NEW GAME

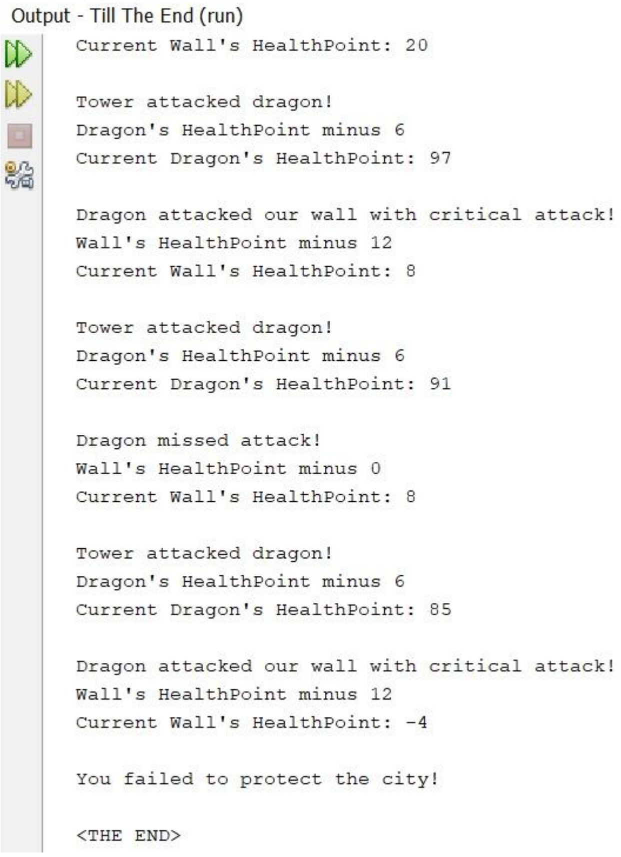
Please enter your command: 1

Reading saved file...
... ...... ...

[LOADING... ...]

Welcome to Till The End (NORMAL)
A dragon performs a sudden attack to your city!
Dragon's level: 2
Dragon's health points: 115
Dragn's attack points: 8
Dragon's cirtical chance: 22%
Dragon's accuracy percentage: 80%
```

Lose condition



Output - Till The End (run)

```
Current Wall's HealthPoint: 20

Tower attacked dragon!
Dragon's HealthPoint minus 6
Current Dragon's HealthPoint: 97

Dragon attacked our wall with critical attack!
Wall's HealthPoint minus 12
Current Wall's HealthPoint: 8

Tower attacked dragon!
Dragon's HealthPoint minus 6
Current Dragon's HealthPoint: 91

Dragon missed attack!
Wall's HealthPoint minus 0
Current Wall's HealthPoint: 8

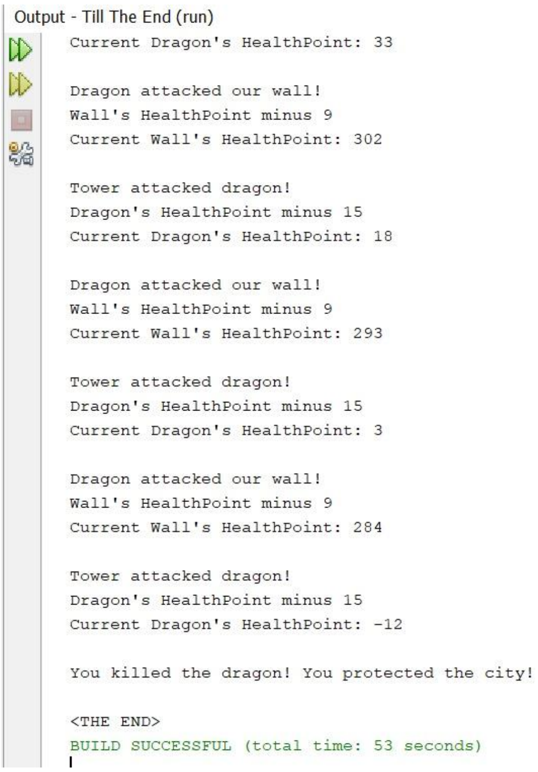
Tower attacked dragon!
Dragon's HealthPoint minus 6
Current Dragon's HealthPoint: 85

Dragon attacked our wall with critical attack!
Wall's HealthPoint minus 12
Current Wall's HealthPoint: -4

You failed to protect the city!

<THE END>
```

Win condition



Output - Till The End (run)

```
Current Dragon's HealthPoint: 33

Dragon attacked our wall!
Wall's HealthPoint minus 9
Current Wall's HealthPoint: 302

Tower attacked dragon!
Dragon's HealthPoint minus 15
Current Dragon's HealthPoint: 18

Dragon attacked our wall!
Wall's HealthPoint minus 9
Current Wall's HealthPoint: 293

Tower attacked dragon!
Dragon's HealthPoint minus 15
Current Dragon's HealthPoint: 3

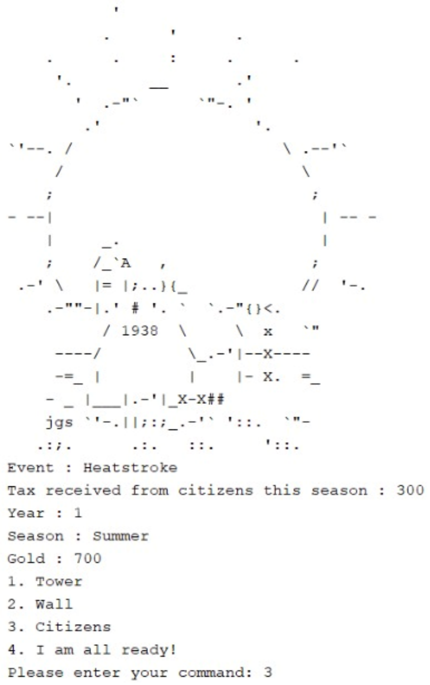
Dragon attacked our wall!
Wall's HealthPoint minus 9
Current Wall's HealthPoint: 284

Tower attacked dragon!
Dragon's HealthPoint minus 15
Current Dragon's HealthPoint: -12

You killed the dragon! You protected the city!

<THE END>
BUILD SUCCESSFUL (total time: 53 seconds)
```

ASCII Artwork



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Event : Heatstroke
Tax received from citizens this season : 300
Year : 1
Season : Summer
Gold : 700
1. Tower
2. Wall
3. Citizens
4. I am all ready!
Please enter your command: 3
```

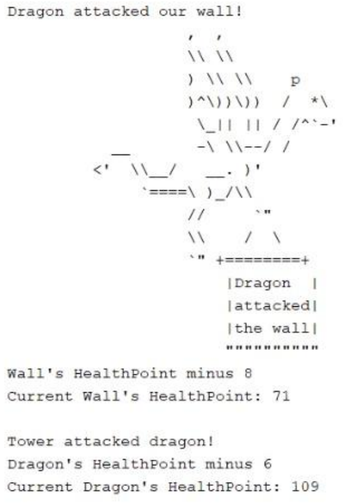

```
Dragon attacked our wall!
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                       |Dragon  |
                       |attacked|
                       |the wall|
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Wall's HealthPoint minus 8
Current Wall's HealthPoint: 71

Tower attacked dragon!
Dragon's HealthPoint minus 6
Current Dragon's HealthPoint: 109
```

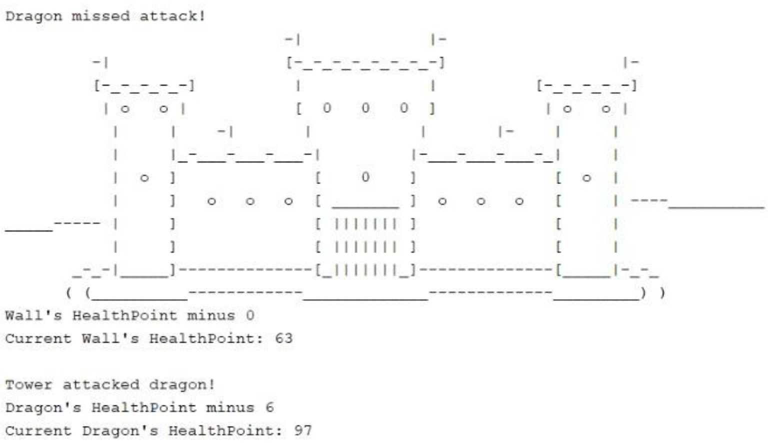

```
Dragon missed attack!
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Wall's HealthPoint minus 0
Current Wall's HealthPoint: 63

Tower attacked dragon!
Dragon's HealthPoint minus 6
Current Dragon's HealthPoint: 97
```

```
 Dragon flew away!
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 [SAVING... ...]


Tower attacked dragon!
Dragon's HealthPoint minus 8
Current Dragon's HealthPoint: 92

Dragon attacked our wall with critical attack!
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Wall's HealthPoint minus 10
Current Wall's HealthPoint: 83

Tower attacked dragon with critical attack!
Dragon's HealthPoint minus 12
Current Dragon's HealthPoint: 80
```

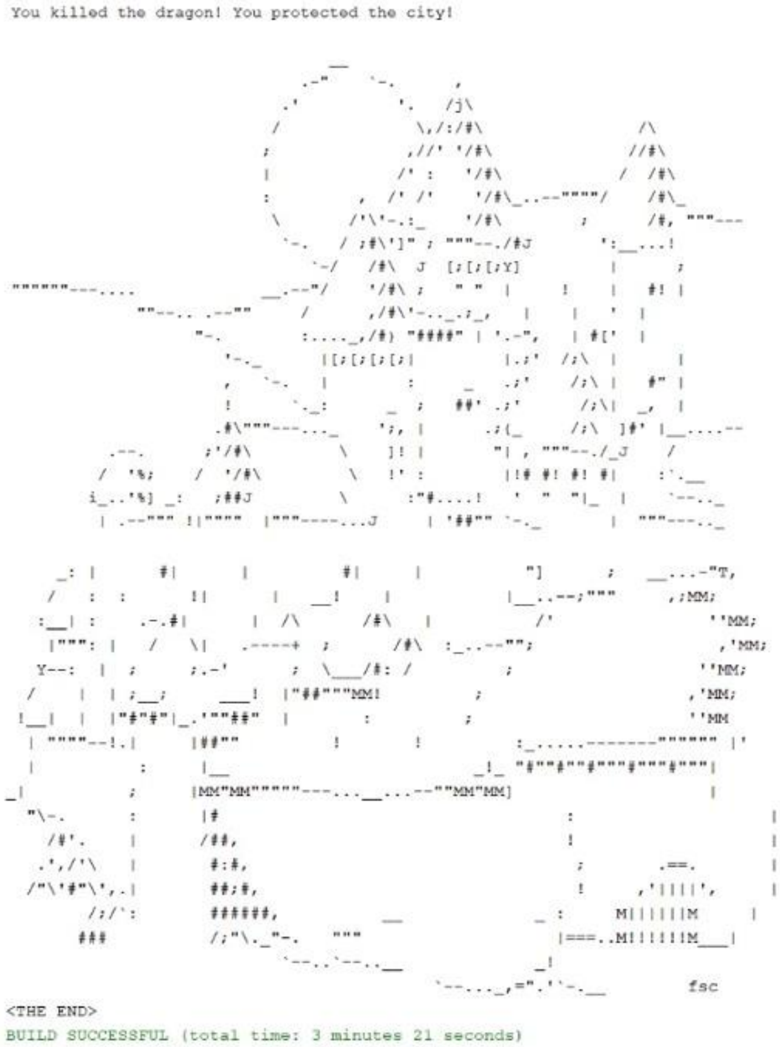

```
You killed the dragon! You protected the city!
```

```
<THE END>
BUILD SUCCESSFUL (total time: 3 minutes 21 seconds)
```