

# Product planning

WhySoSerious

May 4, 2016

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# 1 Introduction

Tygron is an online 3D multiplayer game engine for urban communities. A community can design and maintain a very detailed simulation of their area. In this simulation different stakeholders are able to interact and change the simulated environments to see how this effects the community. The local government of a city for example could use this simulation to see if their plan to renew the infrastructure would cause a significant change in noise pollution for the affected area's.

Just like in real life, the simulation contains a set of stakeholders each with their own goals and permissions. When one or more of these stakeholders is not willing or able to participate in Tygron's simulation the other stakeholders are required to fulfill those parts of the simulation. Since this is a lot of unnecessary work for them, Tygron has decided to simulate the actions of the missing stakeholders with artificial intelligence.

This is where we come in, we are a team of four students of Delft University of Technology. We are working together with 4 other groups from Delft University of Technology to create a simulation with different stakeholders who compete and cooperate with each other to fulfill their goals. Afterwards we will use the GOAL programming language<sup>1</sup> to create virtual humans that can simulate these stakeholders. These agents should be able to communicate with each other through the game to trade assets and reach certain compromises.

This document describes the planning of the development of our virtual human. It describes all the features we want to develop and gives estimates on how much time a feature costs to develop. In the last section we take a look at when the product is considered to be done.

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<sup>1</sup><http://ii.tudelft.nl/trac/goal>

## 2 Product

The result of this project will be a virtual human which can replace a stakeholder as explained in the introduction. The stakeholder we are going to replace is DUWO. DUWO is an organization that provides student accommodations. They currently have about 29.000 student houses, which makes them the largest provider of student accommodation in Holland.<sup>2</sup>

This section will outline the functions products needs to have. It also contains a description of what we plan to achieve with each sprint until the final product deadline.

### 2.1 High-level Product backlog

To describe the requirements of the product we use the MoSCoW method<sup>3</sup>. The MoSCoW method is a prioritization technique commonly used in software engineering. It defines four levels of prioritization:

- **Must have**  
These requirements have to be in the final product. If one of these requirements is missing from the final product, the project should be considered a failure.
- **Should have**  
These requirements are very desirable. If one of these requirements is missing the final product is still usable.
- **Could have**  
These requirements are desirable but are only implemented when there is enough time.
- **Would have**  
These requirements are nice to have but are also only implemented when there is enough time.

In the next three sections we present the requirements of the virtual human.

#### 2.1.1 Must have

- The virtual human must be able to build student housing.
- The virtual human must be able to trade land with other stakeholders.

#### 2.1.2 Should have

- The virtual human should consider trading land that is closer to the buildings of Delft University of Technology.
- The virtual human should be able to make sure it does not exceed its allocated budget.
- The virtual human should make sure that there are always enough houses available to students.
- The virtual human should be able to communicate with the other virtual humans.

#### 2.1.3 Could have

- The virtual human could differentiate between long term and short term solutions for student housing.

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<sup>2</sup><https://www.woningcorporaties.nl/woningcorporaties/zuid-holland/delft/stichting-duwo>

<sup>3</sup>[https://en.wikipedia.org/wiki/MoSCoW\\_method](https://en.wikipedia.org/wiki/MoSCoW_method)

## 2.2 Roadmap

In this section we discuss per week our release goals and what we want to implement.

- **Week 1 sprint**

In this sprint we will be collaborating with the other teams on what kind of game we want to build. Besides this we are going to explore the Tygron Engine and make sure we are familiar with it.

- **Week 2 sprint**

In this phase it should be clear what kind of game we want to build.  
We discuss with the other teams which team is going to implement which stakeholder.

- **Week 3 sprint**

Have an already working virtual human connected to the Tygron connector.  
Develop a way to buy/create student housing for the agent.

- **Week 4 sprint**

Add feature that our virtual human does not buy anything it can not afford.  
Finish the must haves.

- **Week 5 sprint**

Now it is time to show what we have developed so far. There is a demo where we connect all virtual humans and show the result to Tygron. If everything is working we start implementing trading pieces of land with other virtual humans.

- **Week 6 sprint**

We begin implementing the other features of the should haves found in Section 3.1.2. This includes consider trading land so that is is closer to Delft University of Technology.  
This week the our code is evaluated by our project managers from the university. This means that we will mainly focus on removing bugs, implementing useful patterns and making sure everything is properly tested.

- **Week 7 sprint**

We will focus on establishing communications with the other stakeholders. This means that our agent should be able to interpret and sent messages between other agents.

- **Week 8 sprint**

In this week there is a second demo of all virtual humans. Afterwards we can focus on our could haves (found in Section 3.1.2).

- **Week 9 sprint**

This is the last sprint which means we must deliver the final product. This also means delivering a final report on both the product and our development process.

### 3 Product Backlog

In this section we will introduce a prioritized list of all the work that we want to do. Apart from using the MoSCoW method to distinguish between must have, could have, should have and wont have requirements the user stories are also prioritized by the order in which they appear in they subsections. These user stories have also been given a time estimate to make it easier to plan which one's should be implemented first.

Finally we have included a release plan corresponding to both the required deliverables and the release of a completed new feature..

#### 3.1 Features

In section 3.1.1 we show the requirements of Tygron game and in section 3.1.2 we show the requirements of the virtual human.

##### 3.1.1 Tygron

For the Tygron game we have the following requirements:

###### Must have:

- As a user, I want the Tygron game to represent a part of Delft containing the Delft University of Technology and its campus so that we have an interesting piece of land to simulate. Estimated time: less than one hour
- As a user, I want the Tygron game to have multiple competing stakeholders each with its own goals so that each group in the context can develop their own agent. Estimated time: 6 hours
- As a user, I want the Tygron game to have multiple competing stakeholders each with its own permissions so that each agent has permission that correspond to their roles in the game. Estimated time: 2 hours

###### Should have:

- As a user, I want the Tygron game to have the goals and permissions of the stakeholders defined in such a way that it is necessary for each stakeholder to communicate with other stakeholders to achieve its goal so that creating a functioning agent will be a challenge. Estimated time: 4 hours

##### 3.1.2 Virtual human

For the virtual human we have the following requirements:

###### Must have:

- As a user, I want the virtual human to be able to build student housing on owned land so that it can fulfill its goals. Estimated time: 4 hours
- As a user, I want the virtual human to be able trade land with other stakeholders so that it can gain more (valuable) land. Estimated time: 8 hours

###### Should have:

- As a user, I want the virtual human to consider trading land so that it is closer to the buildings of Delft University of Technology so that it can achieve its goals. Estimated time: 6 hours

- As a user, I want the virtual human to make sure it doesn't exceed its allocated budget so that the simulation is more challenging. Estimated time: 5 hours
- As a user, I want the virtual human to make sure that it always has enough houses available to students so that it can achieve this goal. Estimated time: 4 hours
- As a user, I want the virtual human to be able to communicate with the other virtual humans representing stakeholders in the game so that it can plan its actions to maximize its goals. Estimated time: 15-20 hours

**Could have:**

- As a user, I want the virtual human to consider the difference between long and short term student housing so that the simulation is more interesting. Estimated time: 6 hours

### **3.2 Technical work**

- As a developer, I need to have the latest version of GOAL installed so that I can develop a virtual human. Estimated time: 2 hours
- As a developer, I need to have our repository set up properly (with continuous integration) so that I follow good coding practices. Estimated time: 2 hours
- As a developer, I need to have the Tygron engine preview installed so that I can experiment with the engine and get familiar with it. Estimated time: less than one hour

### **3.3 Know-how acquisition**

- As a developer, I need to know how the Tygron EIS Connector works so that I can extend the Tygron EIS Connector. Estimated time: 4 hours
- As a developer, I need to know the GOAL language and its new features so that I can develop a virtual human. Estimated time: 4 hours
- As a developer, I need to create a detailed plan for the Tygron game with the other vh-context teams so that I can simulate an interesting game. Estimated time: 6 hours

### **3.4 Initial release plan**

In the second week we would like to release the game. In the game it should be clear what kind of stakeholders there are and what they care about.

After this it is time to create a virtual human. From this moment we want to release a working virtual human every sprint (thus every week). Every sprint we want to add new features.

In week five and eight there is a demo of all virtual humans. This demo will be held at Tygron. In week ten we release our final version of our virtual human. Apart from these major releases we will also release a working version at the end each week with the following features:

- **Week 2:** A working Tygron game as described in section 3.1.1.
- **Week 3:** An Tygron agent prototype capable of buying and selling land.
- **Week 4:** The Tygron agent will now manage its budget.
- **Week 5:** The agent will be able to run in a simulation with other agents

- **Week 6:** The agent will try to keep its buildings as close to Delft University of Technology as possible. It will also make sure that it has enough houses available to students.
- **Week 7:** The agent will be able to communicate with other other agents.
- **Week 8:** The agent will be able to differentiate between long and short-term student housing.
- **Week 9:** The agent will have all the required features without any bugs.



## 4 Definition of Done

In this section we will be taking a close look at when the product is considered to be done. To determine this we will discuss when backlog items and sprints are considered to be done. After this we will conclude when a release is done.

A backlog item (or a feature) is considered done when the code has been tested and has been reviewed by at least two other developers. A feature is tested when it meets the following requirements:

- It meets the requirements given in section 3.1.
- Reacts in a acceptable time.
- Reacts correctly to different input.

Since we use two different programming languages, we use different kind of testing methods for each language. For GOAL we use the Unit Testing Framework and for Java we use unit testing, regression testing and integration testing.

The code should also be properly documented. This means that every module has to have comments about this module, the purpose of it, a small description and the author.

A sprint is considered done when of course all the tests of all backlog items do not fail. A system test should also pass. This should make sure our product is still working properly. Besides this all documentation should be updated/reviewed to see if it is still correct.

A release is considered done if as first all the tests pass (including a system test). As second the behavior of the agent is correct.

All code of a release can be found at our repository<sup>4</sup>, the code should also be properly documented as explained above.

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<sup>4</sup><https://github.com/Denpeer/VirtualHumansContext>

## 5 Glossary

- Stakeholder

A stakeholder in the simulation is one of the following: municipality, Delft University of Technology, DUWO (student housing), companies and housing cooperation.

- Virtual human

Virtual human is another term for the agent that we are creating.

- TU Delft

Delft University of Technology<sup>5</sup>

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<sup>5</sup><http://tudelft.nl/>