Magrathea Engine

Document :	**Development Plan**
Version :	1.0
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Date :	08/01/2006
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Abstract

The aim of this documentation is to give a development's description and planning of the Magrathea Engine project. And it covers aspects of this project's organization and describe his tasks. The Magrathea Engine is an environmental engine designed with powerful tools to provide a complete solution for managing realistic simulations.

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Table of content

1. PFE Reminder.....3
1.1 – Subject.....3
1.2 – Objectives of PFE.....3

2. Tasks description.....4
2.1 – Magrathea's tasks.....4
2.2 – osgDesigner's tasks.....6

3. Tasks planning.....7
3.1 – Magrathea's planning.....7
3.2 – osgDesigner's planning.....8

4. Group organization.....9

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1. PFE Reminder

1.1 – Subject

We want to develop a new solution of environmental engine, based on the open source philosophy to provide an engine and tools allowing to create a real alternative. It will be based around the OpenSceneGraph project, an open source, cross platform graphics toolkit for the development of high performance graphics applications.

1.2 – Objectives of PFE

The stakes of this project are multiples :

- First, we want to help the open source community by improving the OpenSceneGraph project with a environmental engine and powerful tools.
- We want to fill a current leak in open source engines by developing a fast, reliable and easy-to-use solution for realistic simulations.

This project will be composed of two main parts, an environmental engine Magrathea and a graphical tool osgDesigner used to edit 3D scenes. Here is the awaited results for each of them :

Engine objectives :

- Rendering realistic water comportments.
- Managing atmospheres and weather effects.
- Providing terrains without size limits, and with high zoom possibilities.
- Rendering realistic vegetation.

Tools objectives :

- Provide an universal platform for editing OpenSceneGraph elements.
- Provide a very flexible plug in system: plug in developpers will be able to improve and extend osgDesigner at need.
- Develop a minimal set of plug ins for editing each kind of OpenSceneGraph objects and objects exported by openSceneGraph-base libraries.

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2. Tasks description

2.1 – Magrathea's tasks

Research and preparation (phase 8)

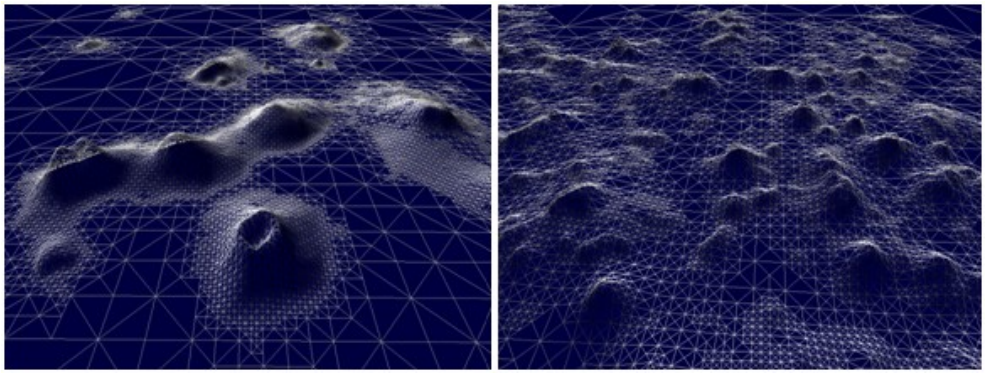
- Formation on the used technologies like OpenSceneGraph:
  OpenSceneGraph is a powerful and free open-source rendering engine. It is the main base of our work, so we need to learn how to use it.

- Development of the general engine's structure.

- Definition of the terrain's file format:
  The terrain is one of the biggest parts of this project and so the format is very important. It will allow us to load the terrain part by part with the level of detail required by the context. A terrain file must be quick to load and not too big in memory.

- Development on the streaming engine:
  The streaming engine will allow the user to load streamable objects in a specified thread, without disturb the render.

- Development on the terrain's LOD algorithm:
  LOD (Level Of Detail) is a way to optimize the rendering. Because computers can not show a 3D scene with all details, the LOD algorithm allows showing maximum details only in the visible part when the camera is close enough. This algorithm has to be implemented for the terrain.



Example of LOD algorithm

- The engine will draw geometry with a lot of vectors if the camera is close and with fewer vectors if the camera is far because the eye could not see the differences on the screen.

Core development (phase 14)

- Starting the atmosphere and the weather's file format:

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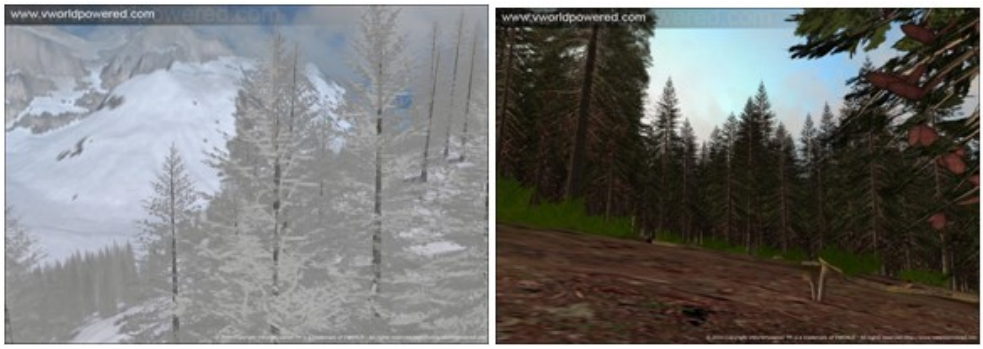
Because we want to create planets, we need to have an atmosphere managing temperature, to allow weather like snow, rain, clouds, sunny day, nights, etc... So we have to determine a file format to do it.



Weather and atmosphere

- Development on the terrain's procedural generation algorithm. With the osgDesigner, we will provide a way to create giant planet in a very simply way, and to generate the terrain, we have to use procedural algorithm.

- Definition of the vegetation's and fluid's files formats:
  To become a living planet, we need to create vegetation like forests, and water zones like oceans, seas and rivers. So we have to determine a format to save them.



Water and vegetation

Rendering development (phase 18)

- Development on cloud rendering:
  Clouds can be seen from space like from a mountain, so very far and very near.

- Texturing and starting vegetation rendering:
  Show textures on the terrain and vegetation.

- Starting development on fluid's rendering:
  Show water zones.

- Development on engine specifics edition plug-ins:

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Start the plug-in to generate terrain.

Finalization (phase 23)

- Development on weather effects:
  Show weather effects like rain, snow or storm.
- Advanced vegetation: Show trees but grass too.
- Working on fluid's flow rendering: We will manage the movement of the water (for a river).
- Edition plug-ins functional: Finalize the plug-in for Magrathea engine.
- Tuning
- Optimization
- Tests

2.2 – osgDesigner's tasks

Starting and implementation (phase 12)

- Implements the system base and the main classes of the project, like main Window, plugins manager and the instrospection system.

Finalizing the core (phase 17)

- Finalizing the main interface, and implement one context plugin and the node editor plugin.

Editor plugins development (phase 23)

- Optimization of the main interface and the system and developpment of the set editor plugins. Realisation of some tests.

Magrathea plugin realization (phase 28)

- Realization of the Magrathea context plugin.

Documentation and final tests (phase 31)

- Redaction of the users and technical documentation. Optimization and tests.

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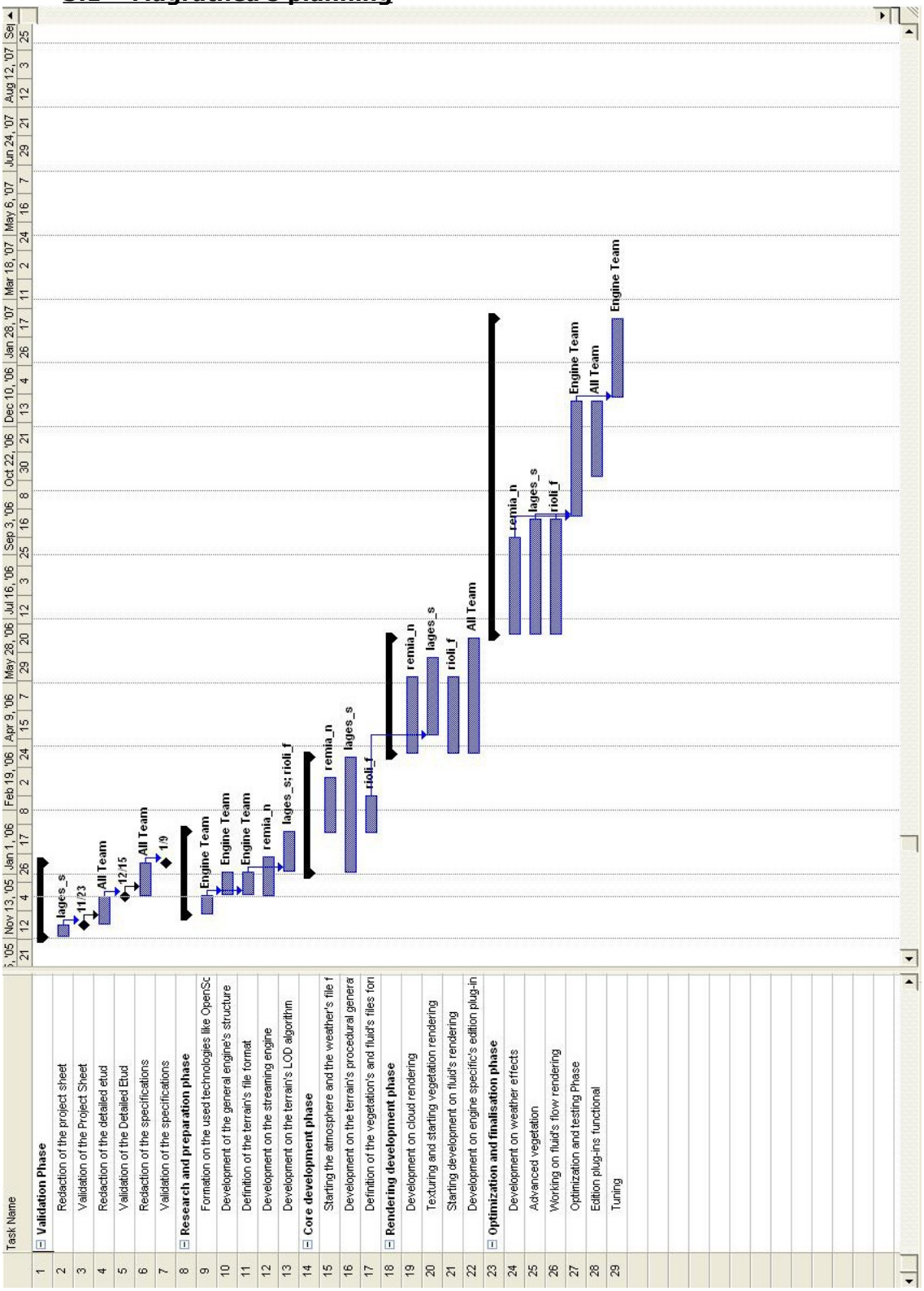
3. Tasks planning

3.1 – Magrathea's planning



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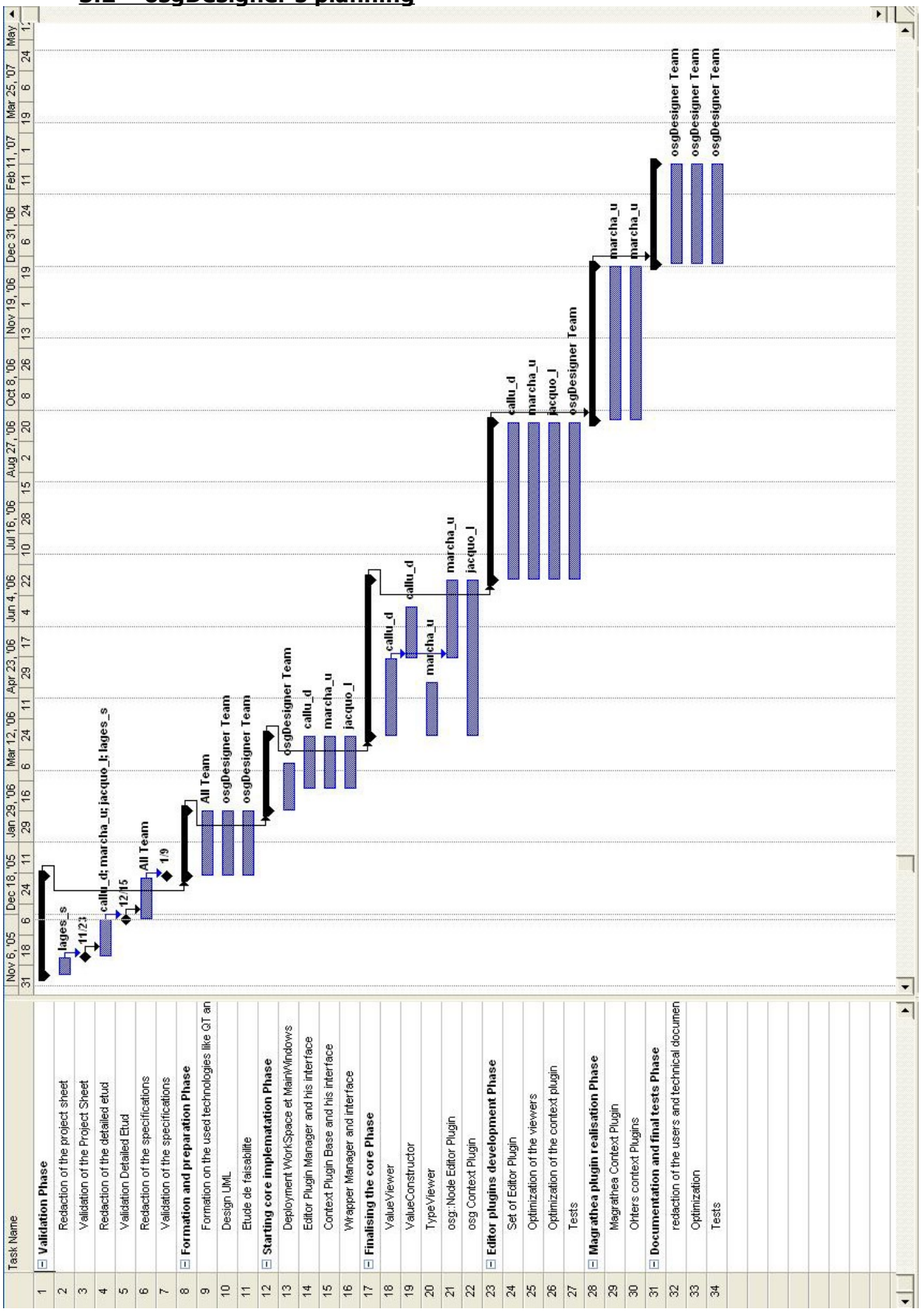
3.2 – osgDesigner's planning



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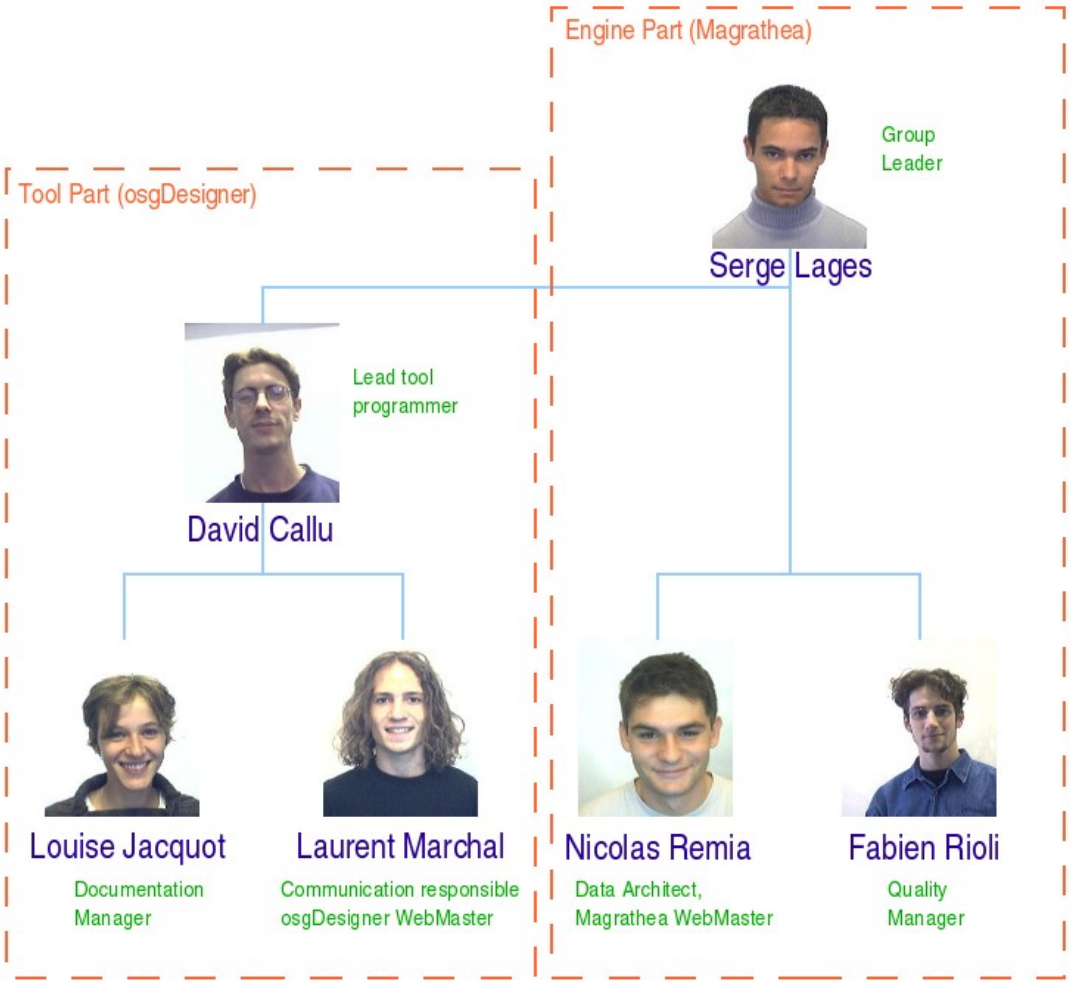
4. Group organization



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