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05/25/10

## Table of Contents

1 Introduction.....	2
2 Terminology.....	3
2.1 People terminology.....	4
3 32bit graphics development team.....	5
4 Project goals.....	6
5 Project-wide guidelines.....	7
5.1 Zoom levels.....	7
5.2 Base set conversion project.....	8
5.3 Releasing works.....	8
5.3.1 Standardisation of 32bit graphics releases.....	8
5.3.2 Standard tar format description and specification.....	9
5.3.3 32bit graphics development file repository.....	11
5.4 Collaborating on tt-forums.....	11
6 32bit base set conversion requirements.....	12
6.1 Visual.....	12
6.2 Spiritual.....	12
6.3 Licensing.....	12
6.4 Sources.....	13
7 32bit base set conversion guidelines.....	13
7.1 Camera position.....	13
7.2 Lighting & shadows.....	14
7.3 Colors.....	15
7.4 Standardised props and materials.....	15
7.5 Scale.....	16
7.6 Deliberate lack of national identity.....	17
7.7 Releasing works.....	17
8 32bit base set implementation and distribution.....	17
References.....	18

Juha Kohvakka (Jupix)

05/25/10

## 1 Introduction

During the half a decade that the 32bit graphics development project has been going, it has also been under constant public scrutiny. This is a fact which has resulted in multiple forum discussions about the organisation of the project.

These discussions have taken place most prominently in the so-called “Blender thread” [1] and the “Organizing 32bpp sprites” thread [2]. There was also a discussion started by Wasila, a fellow 32bpp enthusiast, which got merged into the “organization” thread. In addition to these, there has been discussion about project organisation and management as early as December 2006 [3], started by Korenn, fellow artist.

It is an assumption that can be derived from these discussions, and my opinion, that in order for the 32bit graphics development project to reach its full potential and the targets that have been set for it by the community, some structural work has to be done.

The project is missing clear, documented guidelines and real goals that, when reached, will be easy to see for anyone. It is also difficult to see what new art is aiming to do when it is released; replace old sprites or become a new entity. This document aims to address these problems with clear-cut definitions of two matters: project organisation and management, and graphics development guidelines.

Juha Kohvakka (Jupix)

05/25/10

## 2 Terminology

You are currently looking at the **32bit graphics development project**. This is an umbrella title that can be used to refer to development of 32bit graphics for any purpose related to OpenTTD.

**32bpp** is short for 32 bits per pixel. It is the color depth of the sprites we produce. For clarity's sake, it shall be for all intents and purposes an adjective, not a noun. By spec, we should refrain from using the term synonymously with "32bit" - we are in 32bit graphics development, not 32bpp graphics development. We do, however, create 32bpp graphics.

**Coding** means using PNGCodec to set the offsets on 32bpp sprites.

**z0, z1 and z2** denote the three closest levels of zoom in the game. z0, AKA **extra zoom** or **EZ**, is the closest and z2, AKA **standard zoom** or **SZ**, the farthest. z0 and z1 are implemented by the **32bpp-EZ patch**.

**Base set** is the collection of graphics, in the .grf format, that represent the original game's game items. 32bit sprites distributed in tar bundles overwrite sprites in the base set.

**Vanilla TT** means the Transport Tycoon game in its original form.

**NewGRFs** game graphics that are not implemented in vanilla TT. They are distributed in the .grf file format. At the time of writing, NewGRFs support 8 bit graphics only.

Juha Kohvakka (Jupix)

05/25/10

**Extras** are graphics for functionality that was introduced by any version of OpenTTD. They are managed by the **extras project**.

**Tars**, specifically standard tars (described in chapter 5.3.2), are the current distribution format for 32bit graphics.

**Bundles** are tars containing the contents of some of the currently available tars, possibly by multiple authors. They are compiled by individual community members and are not supported or defined by this document.

**Megapacks** are tars which aim to contain the contents of all the currently available tars, by all authors. They are compiled by individual community members and are not supported or defined by this document.

## ***2.1 People terminology***

We are all **32bit graphics developers**. That is our general title. There are different flavors, however.

**Artists** are the contributors who create graphics using 3D modeling software, image editing software etc.

**Coders** are those who code graphics as defined above.

**Administrators** are those who do the grunt work in organisational tasks, such as keeping bundles, the repository, the wiki and our progress trackers up to date, and participate in conversations about or vote on matters related to 32bit graphics development.

Juha Kohvakka (Jupix)

05/25/10

### 3 32bit graphics development team

It has been suggested[3] and concluded by myself and Ben Robbins that the project needs a small group of people to manage the development process by setting the development guidelines and requirements and by offering their years worth of experience with the project to others as a foundation to build better graphics upon.

There shall therefore be from now on a small team, consisting of some senior community members and myself who are already quite vocal in the project. This team is known as the 32bit graphics development team, or GD32 for short.

In addition, now that there is to be a well-defined project for building the 32bit base set, the graphics development team will oversee the fulfillment of the requirements for items, set below.

The following is a list of the founding members, along with a list of their perspectives.

**Juha Kohvakka (Jupix)** - file standards and organisation.

**Ben Robbins** - visual standards for graphics.

**GeekToo** - code standards.

The graphics development team is not connected to the OpenTTD developer team. Their authority extends only over matters of data inclusion and management in the base set conversion project.

Juha Kohvakka (Jupix)

05/25/10

## 4 Project goals

We are attempting to implement in 32 bits per pixel the culture of OpenTTD gaming which happens in 8 bits elsewhere in the forum. In addition to converting the 8bpp base set to 32bpp, this includes NewGRF development.

It shall be the goal of this project that

- 1) Graphics developers are not confused by incomplete, incoherent or unclear instructions, and the path of an item from conception to an ingame asset is as straightforward as is humanly possible.
- 2) OpenTTD supports z0, z1 and z2.
- 3) All major 32bit graphics development happens at all these zoom levels.
- 4) A new user who downloads the game client from openttd.org can download a free, high quality 32bpp base set, consisting of sprites at all the zoom levels defined above, using either the ingame content delivery system or some other method.
- 5) Users can download and play with NewGRFs implemented in 32 bits using the ingame content delivery system.
- 6) Any user is able to download sources to graphics in order to make changes.

Juha Kohvakka (Jupix)

05/25/10

## 5 Project-wide guidelines

These guidelines cover all 32bit graphics work. For the base set conversion project, there exist more rigorous requirements and guidelines. They are listed in chapters 6-8.

### ***5.1 Zoom levels***

All graphics developed are to include z0, z1 and z2 level sprites. There is no longer “extra zoom” and “standard zoom” - as far as the project is concerned, z0, z1 and z2 are all standard zoom levels.

Firstly, this guideline aims to encourage the inclusion of the extra zoom levels functionality into official OpenTTD versions. The more developed the 32bit graphics ecosystem gets, the more seriously it can be taken by the official game developers. Secondly, it is expensive performance-wise to rescale graphics on the fly, and in terms of resulting graphics quality, automatic rescaling is the worst option of all.

In order to prevent degradation of image quality, it is recommended that all sprites are prepared and rendered separately for all zoom levels. To avoid a messy and/or busy look in lower levels of zoom, the preparation stage may include LOD (level of detail) work, changes to lighting or shadowing settings, etc.

More or less manual rescaling in bitmap editing software can be done but extra measures have to be taken in order to avoid quality degradation. Rescaling bitmaps should usually be avoided because it can very easily lead to bad quality graphics.

Juha Kohvakka (Jupix)

05/25/10

## ***5.2 Base set conversion project***

32bit graphics development consists of two flavors of development:

- (1) the base set conversion project, and
- (2) everything else, which can constitute one or many tar bundles or NewGRFs, and which this document or GD32 will not attempt to organise or control.

The base set conversion project is what the graphics development project started as: an effort to convert TT graphics to 32 bits per pixel. It is our intention that these graphics are eventually bundled with OpenTTD, like the OpenGFX package. Therefore it will be under tremendous public scrutiny. As a result, it will have to be controlled by stricter guidelines and individual entries into it will have stricter requirements for inclusion. These guidelines and requirements will be enforced by GD32, who will also make the call on which implementation of an ingame item will go into the set. The guidelines and requirements are detailed below.

## ***5.3 Releasing works***

### **5.3.1 Standardisation of 32bit graphics releases**

Until there is support for 32bit GRF/NewGRF files, sprites should be released in the standard tar format, as detailed below. A template is available at the wiki. [7]



Juha Kohvakka (Jupix)

05/25/10

### 5.3.2 Standard tar format description and specification

The standard tar format for 32bit graphics releases is a regular tarball file (an uncompressed archive of directories and/or files, like a ZIP file but without the compression), originally laid out by GeekToo, with a standardised tree of contents. Using this format ensures the graphics will work at least to some extent on all OpenTTD configurations (DOS base set, Windows base set, OpenGFX base set, unpatched, EZ-patched).

Releases may or may not be immediately accompanied by sources and licensing information. In any case, it is heavily recommended that aforementioned information be made available at the 32bit graphics development file repository.

In a standard tar, there should be at least the following contents: readme.txt which should list at least the following:

- who created the work and who was involved in its release
- if sources are in non-universal formats, what software was used
- where the release originated (URL to original release)
- when the content was released
- what license the content was assigned at the time of release
- known issues, if any,

a sources/ directory for source files, as detailed in chapter 6, with any included non-compressed files like 3D models compressed in the ZIP format, a sprites/ directory containing subdirectories for all parts of the OpenGFX base set, and symlinks to the sprite directories, named respectively with the directory names of the vanilla TT base set parts. A template for making standard tar releases can be downloaded at the wiki: [http://wiki.openttd.org/32bit\\_standard\\_tar\\_format](http://wiki.openttd.org/32bit_standard_tar_format)

A content listing for the standard tar format follows.

Juha Kohvakka (Jupix)

05/25/10

./readme.txt	<plain text file> Author information, license, etc.
./sources/	<directory> Models, bitmaps, instructions, etc.
./sprites/	<directory>
./sprites/ogfx1_base/	<directory> Temperate sprites.
./sprites/ogfx1_arctic/	<directory> Sub-arctic sprites.
./sprites/ogfx1_tropical/	<directory> Sub-tropical sprites.
./sprites/ogfx1_logos/	<directory>
./sprites/ogfx1_toyland/	<directory> Toyland sprites.
./sprites/trg1	<symlink>
./sprites/trg1r	<symlink> Symlinks to /sprites/ogfx1_base
./sprites/trgc	<symlink>
./sprites/trgcr	<symlink> Symlinks to /sprites/ogfx1_arctic
./sprites/trgh	<symlink>
./sprites/trgh	<symlink> Symlinks to /sprites/ogfx1_tropical
./sprites/trgi	<symlink>
./sprites/trgir	<symlink> Symlinks to /sprites/ogfx1_logos
./sprites/trgt	<symlink>
./sprites/trgtr	<symlink> Symlinks to /sprites/ogfx1_toyland

Juha Kohvakka (Jupix)

05/25/10

### 5.3.3 32bit graphics development file repository

There is an official repository for 32bit graphics content, started by me in early 2009. All content should go there, including playable releases and their source files, works in progress, etc. For normal 32bit graphics content uploading copies to the repository is recommended, for base set items it is mandatory.

The repository is located at <http://jupix.info/openttd/gfxdev-repo/>.

For more information on policies and usage, read the wiki articles **32bit Graphics Development File Repository** [8] and **32bit Graphics Development File Repository User Manual** [9].

### 5.4 Collaborating on tt-forums

The standard media for public communication between 32bit graphics developers, players and GD32 is the forum software running at [www.tt-forums.net](http://www.tt-forums.net), and more specifically the OpenTTD 32bit graphics development subforums.

The 32bit base set development thread shall be used for releasing, developing and discussing works that aim to be included in the 32bit base set. The 32bit graphics general development thread (AKA “Blend thread”) shall be used for everything else; it is assumed items posted there are NewGRFs. For matters of organisation and management there is the 32bit graphics organisation thread (AKA “Organising sprites” thread). Creating new threads is advisable when developing sets or troubleshooting.

It is recommended that files pertaining to active discussions be attached using the attachment feature while everything else be uploaded to the 32bit graphics development file repository.

Juha Kohvakka (Jupix)

05/25/10

## **6 32bit base set conversion requirements**

### ***6.1 Visual***

Visual compatibility of the item to the rest of the set has to be ascertained before inclusion into the conversion set. This compatibility consists of lighting, color, detail props, ground textures and sprite edges. If the visual compatibility is disputed, the call is made by GD32.

### ***6.2 Spiritual***

We are aiming to reimplement OpenTTD in 32 bits per pixel - not to create a new universe. Therefore we must protect the spirit of the original game world. This is an overall look that cannot be defined, but which must be achieved in order for an item to qualify for inclusion. The final call on this is made by GD32.

### ***6.3 Licensing***

All graphics to be included must be licensed under the GNU General Public License version 2 or a compatible license.

Juha Kohvakka (Jupix)

05/25/10

## **6.4 Sources.**

Partly because it is a GPL requirement, but mainly because it is a goal of this project for users to be able to make changes to the graphics, sources must be available in the graphics development file repository. Sources include any possible 3D models and related textures, photographs, bitmap sources (for example, Photoshop work files), notes, and if applicable, necessary manual manipulation steps for achieving the same overall look for a modified sprite as the unmodified one.

# **7 32bit base set conversion guidelines**

## ***7.1 Camera position***

Like with 8bpp sprites, our graphics use isometric projection with the camera at a 26 degree downward angle, with up in the game world being north. We have camera & lighting templates for 3DSMax (by Ben Robbins), Lightwave and Blender (by Aracirion).

Juha Kohvakka (Jupix)

05/25/10

## ***7.2 Lighting & shadows***

In our graphics, the sun is shining from the east with no cloud cover. Objects are well-lit on all sides. Where there are shadows, they are sharp-edged and medium opacity. Brightness and shadow opacity may vary depending on zoom level in order to make the game element easier for the player to recognise.



Juha Kohvakka (Jupix)

05/25/10

### **7.3 Colors**

Like vanilla TT, our graphics have deep, vibrant colors and all colors are used. Where applicable, company colors are used brightly and clearly. Company colors rendered on models must match the colors in the color selector of the company properties window.



### **7.4 Standardised props and materials**

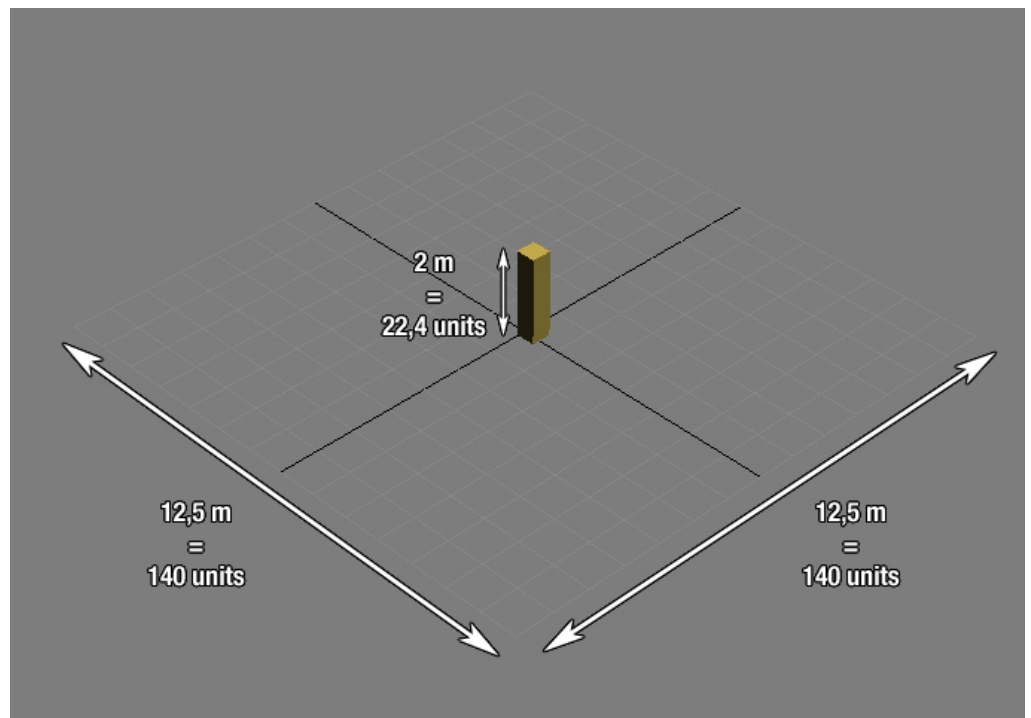
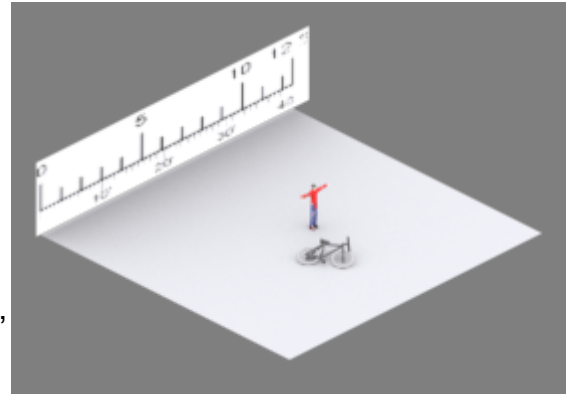
The wiki features a list of standardised props[4] and materials[5] that are to be used instead of original work where applicable. Suggestions should be made to GD32, who will approve or decline them depending on whether they find inclusion necessary.

Juha Kohvakka (Jupix)

05/25/10

## 7.5 Scale

In z0, one square equals 12,5 x 12,5 meters, and 512 x 512 pixels. For practical and gameplay reasons vanilla TT has inconsistent scale between buildings and vehicles, for example, and the same must apply for the base set conversion graphics. As a result, buildings and other large objects can be scaled down to a size that makes sense in the context.





Juha Kohvakka (Jupix)

05/25/10

## ***7.6 Deliberate lack of national identity***

In vanilla TT, the temperate climate is set in the British Isles, the home of game creator Chris Sawyer. The sub-tropical climate is set in Central South America and the sub-arctic climate possibly in Canada, northern Scandinavia or Eurasia.

Those locations are identified by distinct properties of landscape, nature and architecture, not by national or cultural symbols such as flags or writing. We, while creating artwork, must also refrain from including such national or cultural fingerprints, while still retaining the look and feel of these locations.

## ***7.7 Releasing works***

All releases are to be made available at the 32bit graphics development file repository. The following requirements are in effect:

1. Tar is based on the official tar template[7].
2. Tar contains a text file describing the work's authors and licensing.
3. Tar includes all necessary sources for the work(s).

# **8 32bit base set implementation and distribution**

As with all base sets [6], the 32bit base set will consist of five GRF files (temperate, arctic, tropical, toyland and logos) and one OBG file.

The releases will be compiled by GD32 and distributed through the ingame content delivery system. Information on individual assets, including sources, will be available at the 32bit graphics development file repository.

Juha Kohvakka (Jupix)

05/25/10

## References

- [1] <http://www.tt-forums.net/viewtopic.php?f=36&t=14549>
- [2] <http://www.tt-forums.net/viewtopic.php?f=36&t=46667>
- [3] <http://www.tt-forums.net/viewtopic.php?f=36&t=29264>
- [4] [http://wiki.openttd.org/Props\\_%28New\\_Graphics%29](http://wiki.openttd.org/Props_%28New_Graphics%29)
- [5] [http://wiki.openttd.org/Standardised\\_materials\\_%28New\\_Graphics%29](http://wiki.openttd.org/Standardised_materials_%28New_Graphics%29)
- [6] [http://wiki.openttd.org/Base\\_graphics#Creating\\_a\\_base\\_graphics\\_set](http://wiki.openttd.org/Base_graphics#Creating_a_base_graphics_set)
- [7] [http://wiki.openttd.org/32bit\\_standard\\_tar\\_format](http://wiki.openttd.org/32bit_standard_tar_format)
- [8] [http://wiki.openttd.org/32bit\\_Graphics\\_Development\\_File\\_Repository](http://wiki.openttd.org/32bit_Graphics_Development_File_Repository)
- [9] [http://wiki.openttd.org/32bit\\_Graphics\\_Development\\_File\\_Repository\\_User\\_Manual](http://wiki.openttd.org/32bit_Graphics_Development_File_Repository_User_Manual)