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# Background System Design Document, v3

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#### Introduction

This system must load in the backgrounds, both scrolling and non-scrolling, keep track of which ones are in memory, and blit them to the display.

#### Requirements

This system must be fast on both systems, but use the same assets. We will be using run-length encoded strips of 64x480 pixels to composite the backgrounds.

We have 2 possible methods for doing the background compositing.

The first system requires a background buffer located in video memory and two additional buffers in video memory for the scrolling worlds. These are the Left and Right buffers. We will initially composite the base 640x480 image onto the background buffer and the strip to the left and right of the image in the Left and Right buffers, respectively. When the user scrolls, we will first blit the portion of the Background buffer that is still in view to the Back Buffer. The new portion would be blit from the Left or Right buffer to the Back Buffer. The Back buffer then gets blit to the Background buffer. This gives us 3 blits, one of (640-x)\*480 pixels, one of x\*480 pixels, and one of (640\*480) pixels. It is important to note that in this scenario we must use a power of two (divisor of 64) for the scrolling factor, x, so that the Left and Right buffer. On the Mac we can still use the Underlay buffer as the Background buffer, but the Left and Right buffers will not exist, as the strips will be in system memory already.

The second system requires us to put a full 12 strips in video memory, individually. The strips are then composited directly to the back buffer. As the user scrolls, the strips get shuffled to remove those that are not in use keeping a 1 strip buffer on either side. This gives us an average case of 11 blits: nine of 64\*480 pixels, one of x\*480 pixels, and one (64-x)\*480 pixels. Once again, it is important in this scenario to keep a power of two (divisor of 64) for the scrolling factor X. On the Mac, this scenario would have to be performed completely from system memory, however due to the RLE of the strips, could prove to be faster than the previous. For a non-scrolling background, the same system will be used of strips and buffers, with appropriate simplifications done to gain as much speed and memory savings as possible.

This system is frame rate critical to the product. We can not afford the scrolling background to cause a 1 frame decrease.

This system must be closely integrated with the graphics system, as it is dependent on this system so that it doesn't have to clear the back buffer. Also this system must have complete access to the back buffer.

## Structures/Classes

```
class CBackground {
    int XScrollPosition;
    LinkedList CBackgroundAssets; // Background
}
class CBackgroundAsset {
    pRLE
    pDDSurface
    int nID
    int Left, Right;
}
```

### Functions/Methods

```
class CBackground {
    Load(szLabel);
    Blit(DDSurface BackBuffer, int X); // Blit whole back buffer with arg for
world to screen offset
}
```

```
class CBackgroundAsset {
```

Blit(DDSurface\*); // Fast Blit RLE to DDSurface (for System to video) Blit(DDSurface\*, int X); // Fast blit, blits DDSurface to DDSurface at X Blit(DDSurface\*, int X, int L, int R); // Blits DDSurface rect with L and R to DDSurface at X

```
SetDDSurface(*DDSurface); // sets, clears DDSurface pointer.
SetRLE(void*); // sets RLE Buffer
```

```
}
```

### Diagrams

# Schedule Task List

Design Background system2 DaysDesign DocumentDesign Background Strip RLE tool1 DayDesign DocumentCode Background Strip RLE tool2 DaysRLE tool designedTest & Revise BG Strip RLE tool2 DaysBG Strip RLE tool codedCode Win32 CBackgroundAsset2 DaysBackground systemclass3 DaysWin32 CBackgroundAssetCode Win32 CBackground class3 DaysWin32 CBackground classCode Win32 CBackground &1 DayWin32 CBackground classCode Win32 CBackground &1 DayWin32 CBackground systemIntegrate Win32 CBackground &2 DaysWin32 Background systemBackground Asset2 DaysBackground systemBackground system2 DaysBackground systemGode Mac CBackground class2 DaysBackground systemCode Mac CBackground class2 DaysBackground system(both methods)2 DaysBackground systemCode Mac CBackground class2 DaysBackground system(both methods)1 DayMac CBackground classcoded1 DayMac CBackground classcoded1 DayBG Strip RLE tool completeTest, Optimize, & Revise Mac3 DaysMac Background systemBackground system1 DayBG Strip RLE tool completeTest & Revise BG Strip RLE tool1 DayBG Strip RLE tool completeTest & Revise BG Strip RLE tool1 DayBG Strip RLE toolRework #1Reworked #1Reworked #1Rework #2As Needed </th <th>Svetom Tacks</th> <th>Duration</th> <th>Dependent</th>	Svetom Tacks	Duration	Dependent	
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	Total	36 Days		

#### Memory

This system will require 64\*12\*480\*2 = 720K of video memory, out of the 848K available. Additionally, it will require in the scrolling world approximately 3 megs of system memory: 8 world areas \* 800 pixels wide \* 480 pixels tall \* 2 bytes per pixel \* 50% RLE compression = 3000 K.

Name	#	Size	Total		
Scrolling World Area	8	800*480*2	6144000		
Curriculum Backgrounds	4	640*480*2	2457600		
Clicky/Bricky Backgrounds	4	640*480*2	2457600		
Additional Backgrounds	3	640*480*2	1843200		
		TOTAL	12.3 Megs		

On the CD, the backgrounds will take up 12.3 megs of space:

#### **Risk Assessment**

Speed here is the biggest potential problem. We spend time optimizing the background to be as fast as possible. Coding our 2 best solutions and using the better one will preoptimize the code. There is an additional time allocated for optimizing.

The Mac has many more potential problems than the PC. Our research indicates that the Mac abstracts video memory and doesn't allow us to manage it and use it for the very fast video-to-video memory blits. Once again, we may need to call in the Mac consultant for help optimizing our Background system.

### QA & Test

If backgrounds are displayed properly, and the screen scrolls properly in the scrolling world, then this system works. If background graphics are garbled or pixels are repeated, or there is a noticiable chug in the game at regular intervals while scrolling, it is probably in this system.

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