

# *Using Overlays*

# *Overlay (shared library)*

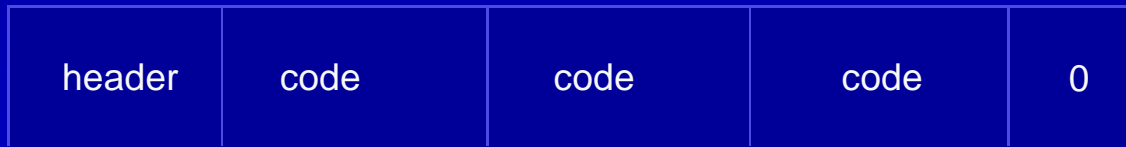
## *Overview*

# *Methods for reading and executing a program from a CD*

- ▶ Read an EXE file using CD function and Exec()
- ▶ Use LoadExec()
- ▶ Using Overlay(s)

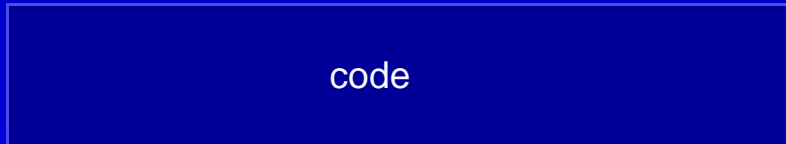
# *Execution file Format*

## .EXE file



- Launch from CD-ROM
- Length in multiples of 2048

## .BIN file

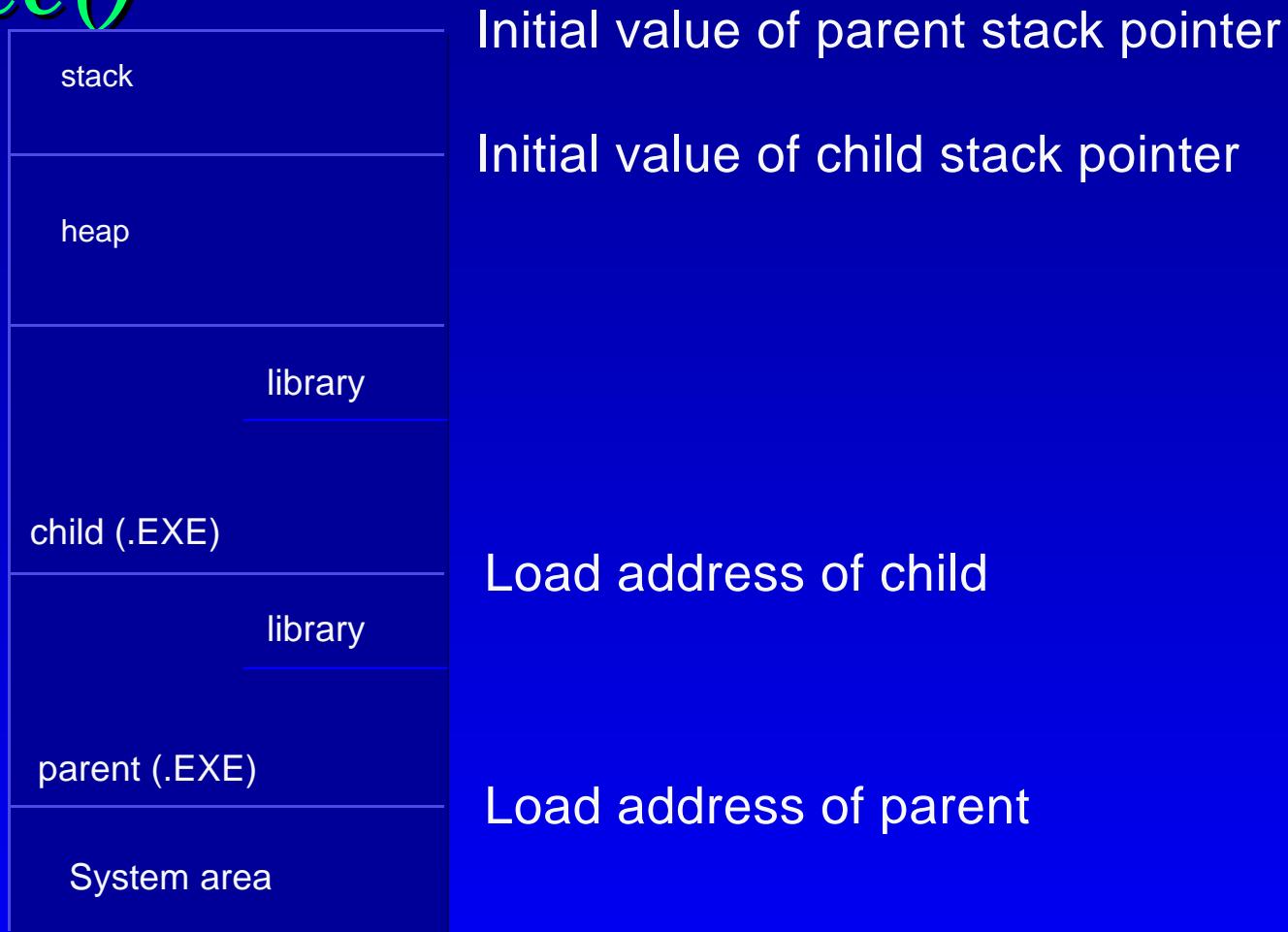


- Launch from CD-ROM
- Overlay

# *Read in an EXE file and then Exec()*

- ▶ Advantage:
  - ▶ Can be developed independently and run as a child program
- ▶ Disadvantages:
  - ▶ When control is transferred it is necessary to stop all interrupts.
  - ▶ Two copies of the Libraries reside in RAM

# *Read in an EXE file and then Exec()*



# *Method using LoadExec()*

- ▶ Advantages:
  - ▶ Can be developed independently and run as a child program
  - ▶ Can load over the parent
- ▶ Disadvantages:
  - ▶ When control is transferred it is necessary to stop all interrupts
  - ▶ `_96_init()` must be called
  - ▶ and the biggie...

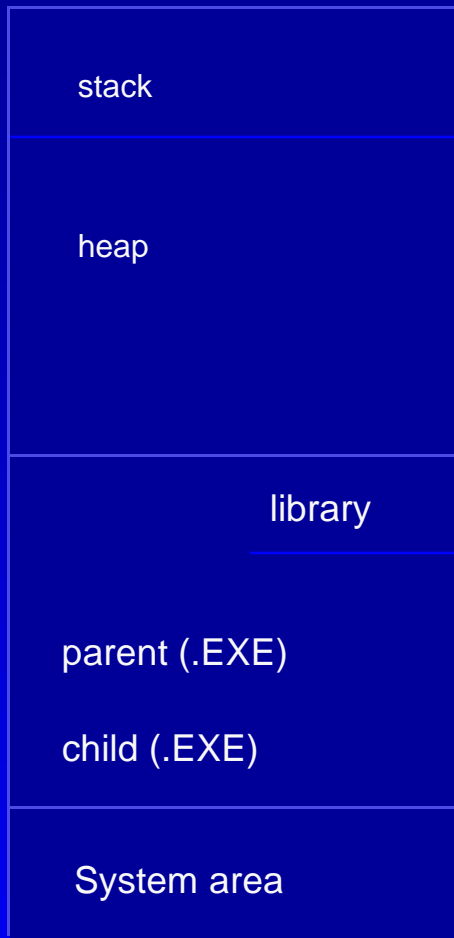
# *Method using LoadExec()*

- ▶ If LoadExec() fails:

**There is *NO* Recovery**



# Method using LoadExec()



Initial value of parent or child stack pointer

Load address of parent or child

# *Method using Overlay*

- ▶ Overlays are segments of code which can be manipulated so they “take turns” occupying the same memory location
- ▶ Possible examples:
  - animations, levels/scenarios, CD functions, memory card, menus

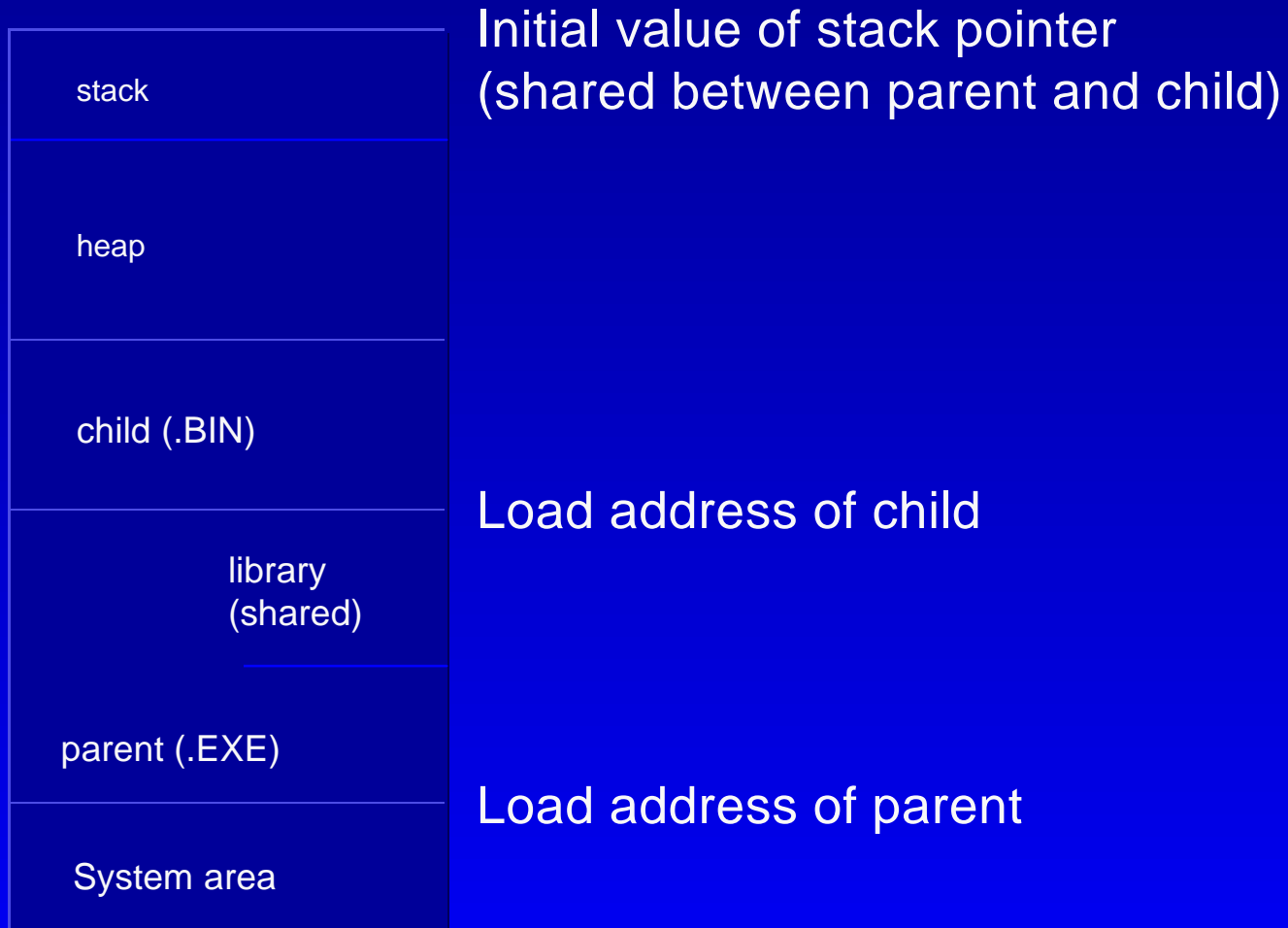
# *Method using Overlay*

- ▶ Advantages:
  - ▶ Library is shared between parent and child
  - ▶ Not necessary to stop interrupts
  - ▶ A separate process can be executed while the child is loading
  - ▶ Can utilize function parameters

# *Method using Overlay*

- ▶ Disadvantages:
  - ▶ The make operation is more complex
  - ▶ Libraries must be completely linked into the parent program
    - ▶ Size of the parent is larger

# Method using overlay



# *Overlay Programing*

# *Overlay programming*

- ▶ Makefile
- ▶ Link file
- ▶ Address file
- ▶ Parent/loader

# *Sample Program*

- ▶ Parent: Menu
  - ▶ Select the overlay and load it.
- ▶ Children:
  - ▶ balls(Sample sprite display)
  - ▶ rcube(Sample 3D display)
  - ▶ anim:(Sample movie)



# *Makefile*

- ▶ Using the link file with psylink  
**psylink /c /m @menu.lnk,menu.cpe,  
menu.sym, menu.map**
- ▶ Child compile options  
**-G0 -Wa,s[name]**  
**ccpsx -O3 -G0 -c -Wa,sballs balls.c**

# *Link file*

- ▶ General link file description
  - ▶ org setting
  - ▶ group setting
  - ▶ section setting
  - ▶ include file
  - ▶ inclib file
  - ▶ pc initial value setting

# *Link file*

- ▶ org setting
  - ▶ The target machine code location is made known to the assembler
    - ▶ Example: **org \$80010000**

# *Link file*

- ▶ group setting
  - ▶ A group is a collection of sections.
  - ▶ You can set attributes of each group
    - ▶ `bss` : uninitialized global data
    - ▶ `org(address)` : org setting address
    - ▶ `file(file)` : output binary as a file
    - ▶ `over(group)` : overlay to group

# *Link file*

## ▶ group setting example

text           group org(\$80010000)

bss            group bss

balls          group file("balls.bin")

rcube          group over(balls),file("rcube.bin")

anim           group over(balls),file("anim.bin")

# *Link file*

- ▶ section setting

- ▶ Allocate each section to a group
- ▶ Normally, the compiler creates a section in the six parts below

- ▶ .rdata      read only data
- ▶ .text      code
- ▶ .data      initialized data
- ▶ .sdata      initialized data (small)
- ▶ .sbss      uninitialized data (small)
- ▶ .bss      uninitialized data

# *Link file*

- ▶ Section setting example

```
section .rdata,text
```

```
section .text,text
```

```
section .data,text
```

```
section .sdata,text
```

```
section .sbss,bss
```

```
section .bss,bss
```

# *Link file*

- ▶ include file
  - ▶ Describes the file that is linked
    - ▶ Example: include main.obj
- ▶ inclib file
  - ▶ Describes the library file
    - ▶ Example: inclib "c:\psx\lib\libapi.lib"



# *Link file*

- ▶ pc initial value setting
  - ▶ Normally set to `__SN_ENTRY_POINT`
  - ▶ Example:

```
regs      pc=__SN_ENTRY_POINT
```

# *Address file*

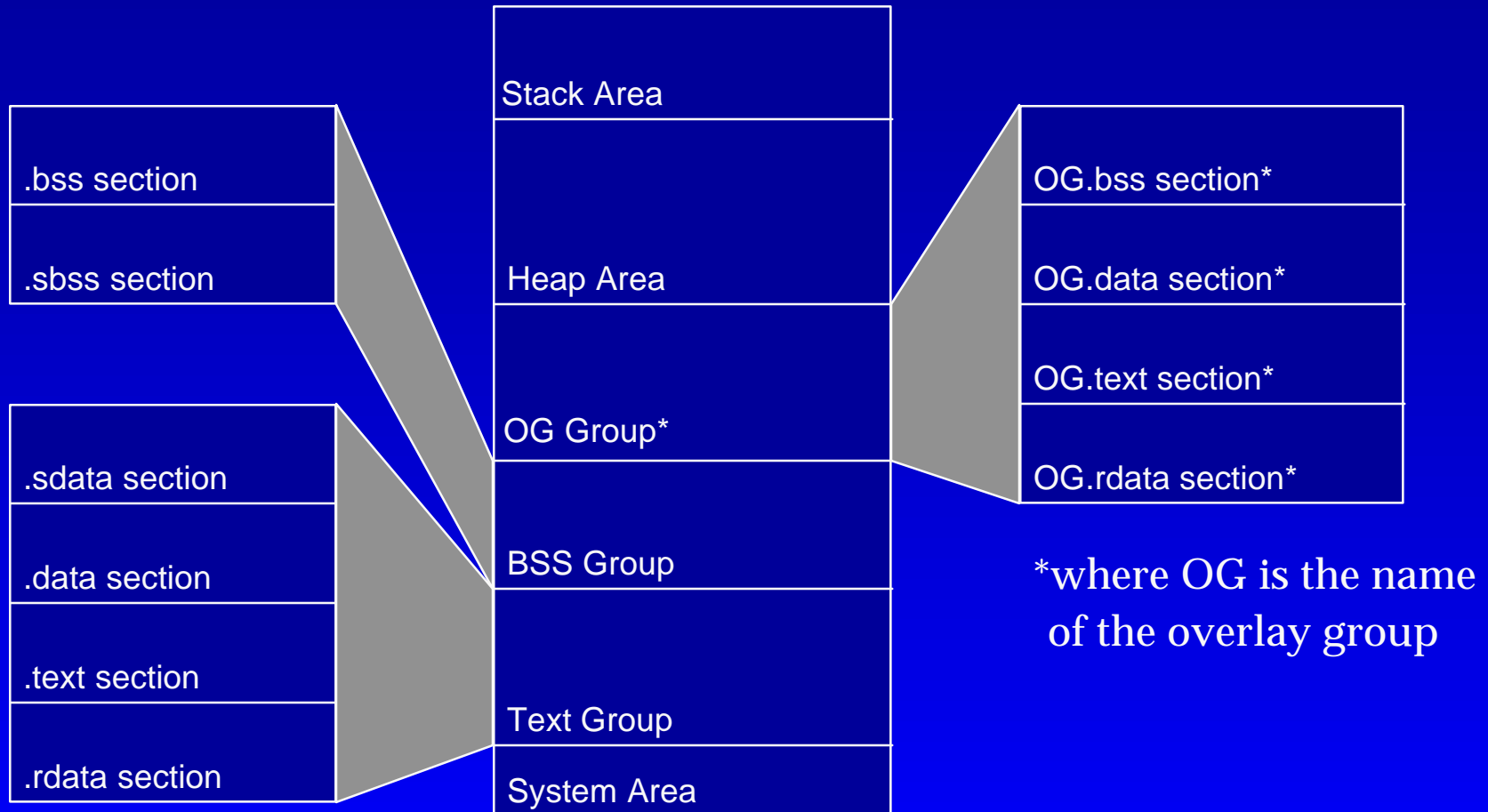
- ▶ Set load address of child program

	opt	c+
balls	group	
	xdef	LoadAddress
	section	.rdata
LoadAddress dw		group(balls)

# *Parent loader description*

- ▶ As needed, read the BIN file to the LoadAddress and call the module as a function

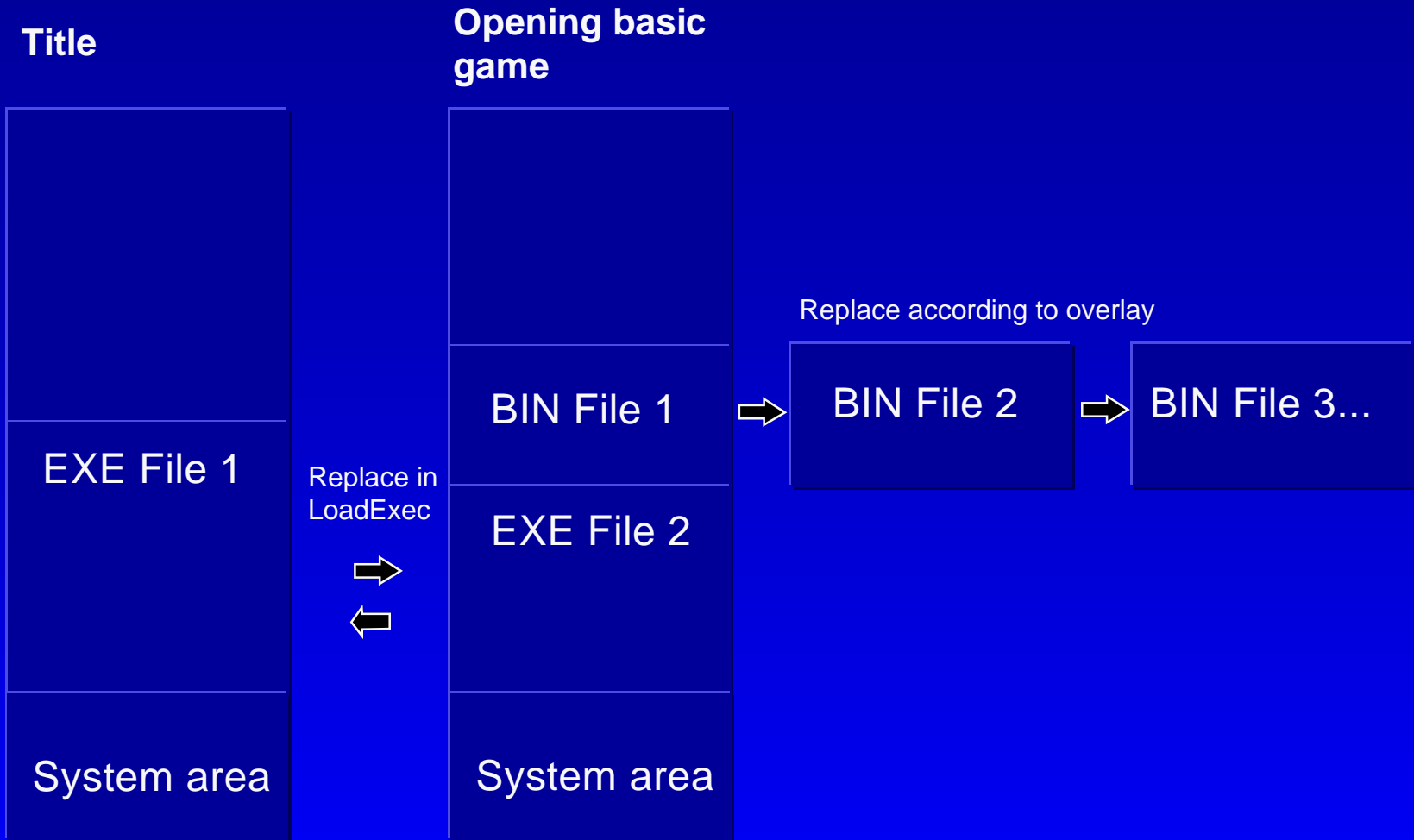
# Typical Memory Map



# *Overlay module debugging*

- ▶ Compile option -g
  - ▶ Necessary for source level debugging
- ▶ Linker option /v
  - ▶ Necessary for overlay debugging

# Overlay application

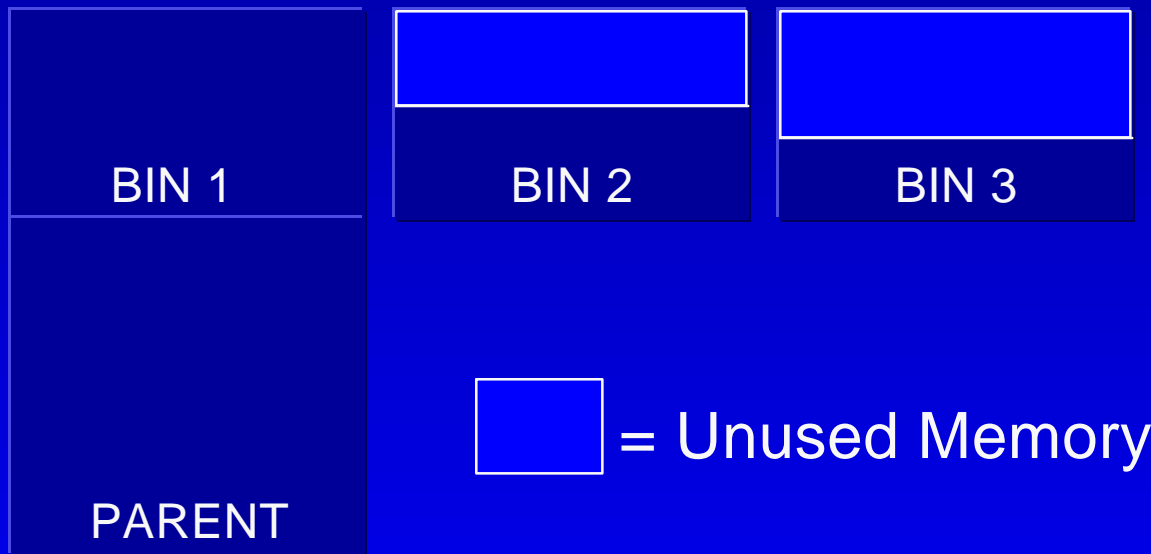


# *Things to Know About Overlays*

# *Overlay memory usage*

Memory reserved for largest overlay

“Lose” memory on smaller overlays





# *Size and number of overlays*

- ▶ Smaller overlays:
  - ▶ Load faster
  - ▶ Require less memory
- ▶ Larger overlays can be more complex
- ▶ Linker on latest tools CD supports up to 256 overlays

# *Pitfalls*

- ▶ Be sure to compile overlays with the -G0 option
- ▶ Flush I-cache when loading an overlay
- ▶ Keep heap base clear of overlay space
- ▶ Overlays can not be interdependent

*THE END*