

Linker

Linker

- The linker combines input object files into a single executable output file
- Each object file has a list of sections
 - Each section has a name and a size
 - Most sections have an associated block of data, called content
- Sections are loaded in memory at runtime
 - Section content is loaded in memory
 - Sections with no content are allocated in memory

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- Each object file has a list of symbols
 - Symbols can be defined or undefined
 - Defined symbols have an address and size
- Every function and variable in the code has a symbol
- Symbols are placed into sections

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- Linking is controlled by a linker script (*.ld file)
- Linker script describes how memory sections should be mapped into the memory regions
 - Select the place and type of memory where sections are located at runtime

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- Memory map

Cell	Slave Interface	Base Name	Offset Address	Range	High Address
▼  processing_system7_0					
▼  Data (32 address bits : 0x40000000 [1G])					
❏ axi_bram_ctrl_0	S_AXI	Mem0	0x4000_0000	8K ▼	0x4000_1FFF
❏ axi_gpio_0	S_AXI	Reg	0x4120_0000	64K ▼	0x4120_FFFF

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- Memory map

Cell	Base Addr	High Addr	Slave I/f	Mem/Reg	
ps7_intc_dist_0	0xf8f01000	0xf8f01fff		REGISTER	
ps7_gpio_0	0xe000a000	0xe000afff		REGISTER	
ps7_scutimer_0	0xf8f00600	0xf8f0061f		REGISTER	
ps7_slcr_0	0xf8000000	0xf8000fff		REGISTER	
axi_gpio_0	0x41200000	0x4120ffff	S_AXI	REGISTER	
ps7_scuwdt_0	0xf8f00620	0xf8f006ff		REGISTER	
ps7_l2cachec_0	0xf8f02000	0xf8f02fff		REGISTER	
ps7_scuc_0	0xf8f00000	0xf8f000fc		REGISTER	
ps7_qspi_linear_0	0xfc000000	0xfcffffff		FLASH	
ps7_pmu_0	0xf8893000	0xf8893fff		REGISTER	
ps7_afi_1	0xf8009000	0xf8009fff		REGISTER	
ps7_afi_0	0xf8008000	0xf8008fff		REGISTER	
ps7_qspi_0	0xe000d000	0xe000dfff		REGISTER	
ps7_usb_0	0xe0002000	0xe0002fff		REGISTER	
ps7_afi_3	0xf800b000	0xf800bfff		REGISTER	
ps7_afi_2	0xf800a000	0xf800afff		REGISTER	
ps7_can_0	0xe0008000	0xe0008fff		REGISTER	
ps7_globaltimer_0	0xf8f00200	0xf8f002ff		REGISTER	
ps7_dma_s	0xf8003000	0xf8003fff		REGISTER	
ps7_iop_bus_config_0	0xe0200000	0xe0200fff		REGISTER	
ps7_xadc_0	0xf8007100	0xf8007120		REGISTER	
ps7_ddr_0	0x00100000	0x3fffffff		MEMORY	
ps7_ddrc_0	0xf8006000	0xf8006fff		REGISTER	
ps7_ocmc_0	0xf800c000	0xf800cfff		REGISTER	
ps7_pl310_0	0xf8f02000	0xf8f02fff		REGISTER	
ps7_uart_1	0xe0001000	0xe0001fff		REGISTER	

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- Linker script – available memory regions

Name	Base Address	Size	
axi_bram_ctrl_0_Mem0	0x40000000	0x2000	
ps7_dds_0	0x100000	0x3FF00000	
ps7_qspi_linear_0	0xFC000000	0x1000000	
ps7_ram_0	0x0	0x30000	
ps7_ram_1	0xFFFF0000	0xFE00	

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- Linker script
 - Section to memory mapping

Section Name	Memory Region
.text	ps7_ddr_0
.init	ps7_ddr_0
.fini	ps7_ddr_0
.rodata	ps7_ddr_0
.rodata1	ps7_ddr_0
.sdata2	ps7_ddr_0
.sbss2	ps7_ddr_0
.data	ps7_ddr_0
.data1	ps7_ddr_0
.got	ps7_ddr_0
.ctors	ps7_ddr_0
.dtors	ps7_ddr_0
.fixup	ps7_ddr_0
.eh_frame	ps7_ddr_0
.eh_framehdr	ps7_ddr_0
.gcc_except_table	ps7_ddr_0
.mmu_tbl	ps7_ddr_0
.ARM.exidx	ps7_ddr_0
.preinit_array	ps7_ddr_0
.init_array	ps7_ddr_0
.fini_array	ps7_ddr_0
.ARM.attributes	ps7_ddr_0
.sdata	ps7_ddr_0
.sbss	ps7_ddr_0
.tdata	ps7_ddr_0