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Memory Model

2.1 Introduction

A processor may support any combination of memory models ranging from pure physical addressing to complex demand paged virtual memory systems. **RTEMS** supports a flat memory model which ranges contiguously over the processor's allowable address space. **RTEMS** does not support segmentation or virtual memory of any kind. The appropriate memory model for **RTEMS** provided by the targetted processor and related characteristics of that model are described in this chapter.

2.2 Flat Memory Model

RTEMS supports applications in which the application and the executive execute within a single thirty-two bit address space. Thus **RTEMS** and the application share a common four gigabyte address space within a single space. The PA-RISC automatically converts every address from a logical to a physical address each time it is used. The PA-RISC uses information provided in the page table to perform this translation. The following protection levels are assumed:

- *a single code segment at protection level (0) which contains all application and executive code.*
- *a single data segment at protection level zero (0) which contains all application and executive data.*

The PA-RISC space registers and associated stack -- including the stack pointer **r27** -- must be initialized when the **initialize_executive** directive is invoked. **RTEMS** treats the space registers as system resources shared by all tasks and does not modify or context switch them.

This memory model supports a flat 32-bit address space with addresses ranging from 0x00000000 to 0xFFFFFFFF (4 gigabytes). Each address is represented by a 32-bit value and memory is addressable. The address may be used to reference a single byte, half-word (2-bytes), or word (4 bytes).

RTEMS does not require that logical addresses map directly to physical addresses, although it is desirable in many applications to do so. **RTEMS** does not need any additional information when physical addresses do not map directly to physical addresses. By not requiring that logical addresses map directly to physical addresses, the memory space of an **RTEMS** space can be separated from that of a ROM monitor. For example, a ROM monitor may load application programs into a separate logical address space from itself.

RTEMS assumes that the space registers contain the selector for the single data segment when a directive is invoked. This assumption is especially important when developing interrupt service routines.