

基于龙芯 1E 的嵌入式 Linux 实时性的优化与可靠性设计

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摘 要: 为了满足航天领域对嵌入式操作系统实时性需求, 采用实时抢占补丁的方法来优化 Linux 系统的实时性, 并对移植了 RT-preempt Linux 系统的龙芯 1E 平台进行实时性测试, 分别测试了系统进程切换上下文时间、中断响应时间、中断恢复时间以及系统延时. 结果表明实时抢占补丁能满足航天任务对操作系统实时性的需求. 为了实现航天领域对嵌入式操作系统的可靠性, 通过为每个异常设计异常处理策略对 MIPS CPU 的异常处理机制进行优化, 最后通过对典型的异常处理程序进行测试, 验证了该方法的有效性.

关键词: 龙芯; Linux; 实时抢占补丁; 系统可靠性

Real-time optimization and reliability Realization of embedded

Linux based on Loongson 1E

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Abstract: In order to meet the real-time requirements of the embedded operating system in the aerospace field, the RT-preempt patch method is adopted to optimize the real-time performance of the Linux system, and test the real-time performance of the Loongson 1E platform transplanted with the RT-preempt Linux system. The system process switching context time, interrupt response time, interrupt recovery time, and system delay are tested separately. The results show that the RT-preempt patch can meet the real-time requirements of the aerospace mission. In order to realize the reliability of the embedded operating system in the aerospace field, the exception handling mechanism of the MIPS CPU is optimized by designing an exception handling strategy for each exception. Finally, the effectiveness of the method is verified by testing typical exception handling procedures.

Key words: loongson; Linux; RT-preempt; reliability

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