

Analysis of Embedded Real-Time System Security

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Abstract. Embedded real-time systems are facing more and more security problems. Malicious attacks on the system from suspicious or malicious code and the change of system hardware state could lead to system exception, resulting in system reliability and security deteriorated. This paper summarizes the characteristics of embedded real-time system and its special requirements for security, analyses security problems faced by embedded real-time system and defects of programming languages. And then put forward methods to improve the safety of embedded real-time system, providing a new security idea for solving the embedded Real-time system security.

Keywords: Security, embedded system, real-time system, RTOS.

1 Introduction

Embedded systems are becoming increasingly large and complex as software complexity increases, more and more software defects, resulting in system reliability and security is getting worse. Embedded real-time systems often arise in the implementation process issues, such as some common suspicious or malicious code on the system caused by malicious attacks and other anomalies. Hardware state changes may also lead to system abnormalities. For example, equipment failure and high temperature, vibration and other factors may cause the system to know what to do. In an increasingly widely used in real-time computing aerospace, defense, transportation, nuclear energy and health, and many other safety critical systems (SCS) in the context, to reduce or prevent the occurrence of catastrophic accidents, the need to improve real-time operating system, SCS reliability and security.

Currently, the researchers embedded real-time systems for the analysis of the security system is often not enough, the safety of embedded real-time system analysis and solution remains at the local, the lack of total system solutions. Based on this, this study will focus on the special requirements of embedded real-time systems, a detailed analysis of the system and summarizes the impact of insecurity embedded systems, embedded real-time systems to solve security issues basis.

2 Special Requirements of Embedded Real-Time Systems

Real-time systems generally refers to a class of highly time-sensitive application requirements. Such as industrial process control (such as steel making, continuous chemical process, etc.), spacecraft control systems, weapons guidance systems, strategic defense systems. These systems often require multiple computers to the

information collected in order of priority in a number of seconds, respectively, a number of milliseconds, or even within several microseconds to process and respond appropriately.

Real-time system is a timely response to external random events occur, and fast enough to complete the event handling computer applications. In real-time systems, system correctness depends not only on the correctness of the results system, but also on the correct results to time. Therefore, system designers need to care about embedded real-time behavior of the system uncertainty.

2.1 Characteristics of Embedded Real-Time System

Although the argument for embedded real-time systems vary, the main meaning is the same. Embedded real-time system has the following characteristics:

(1) embedded real-time systems are often a computer or microprocessor core, with other machinery, electronic equipment, one complete certain specific features, is a computer application system.

(2) embedded real-time systems is usually a reactive system. Links with other parts of the computer through the appropriate combination of sensors and actuators to complete, the system inside and outside the state an important way to report the event was modeled to the computer;

(3) embedded real-time systems often have real-time requirements. Real-time refers to the function of the system depends not only on the correctness of the logic of generating the correct results, but also on the results to time. That is, the system must be scheduled within the time limit to respond to some input. "In the book (or required) time to complete", which is the key to understanding real-time requirements. Real-time requirements can be divided into: strong (hard) real-time and weak (soft) real-time two. Strong real-time is the real time requirement of the system can not be satisfied if, it may lead to catastrophic consequences (such as nuclear reactor control, aircraft control, etc.); weak real-time is the real time requirement of the system can not be satisfied if only will make the system performance degradation, and will not lead to serious consequences (such as laser printer control, etc.);

(4) embedded real-time systems must meet stringent reliability and safety requirements;

(5) embedded real-time systems are often subject to application environments in the size, shape, weight, heat dissipation and power consumption constraints, etc.;

(6) embedded real-time systems typically have a distributed structure, and may be heterogeneous;

(7) embedded real-time system must have sufficient flexibility to meet the rapid expansion of the upgrading needs of even the running function.

2.2 The Special Requirements of Embedded Real-Time Systems

Embedded real-time system is an important class of computer applications. In contrast, such a system, for the time characteristics, reliability, and security has a high, and even the requirements of load moment: