

Software Architecture for Real-Time Applications

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Abstract

Real-time systems have been a major focus for a large number of critical applications for about 40 years, starting shortly after the advent of the digital computer. Many highly successful real-time systems have been developed for a wide variety of applications, including military systems(e.g., C₃I, Flight Control, Spacecraft Control, Global Positioning Systems), consumer products(e.g., microwave ovens, automobile engine controls), medical (e.g., radiography equipment), civil agencies(e.g., air traffic control, Internal Revenue Service), and Manufacturing (e.g., petrochemical production).

In this talk, the software and systems architectures of these systems will be examined, both for their similarities and their significant differences. The architecture of successful real-time systems fits into a small number of patterns, each with a set of critical characteristics. An understanding of these characteristics can make it possible not only to create predictably successful systems, but also to avoid some of the most important problems that have resulted in some notable system failures. A taxonomy of real-time architectures will be proposed and analyzed: Timeline i.e., cyclic executive, Event-driven (both periodic and aperiodic), Pipelined, and Client-Server.