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Research and Implementation on Model for High Availability of Enterprise Information System

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Abstract

As information technology is applied in the modern enterprise management such as financing, marketing, enterprise resource planning widely, the high availability of enterprise information systems is more and more important. The key point of designing an enterprise information system is to choose appropriate high availability implementation models. In this paper first we introduce some general design principles on high availability of enterprise information systems, and second propose set of high availability implementation models such as Check-Point (CP) model, Process-Pair (PP) model, Recovery-Process (RP) model, Alternative-Process (AP) model, etc.A comparative analysis is performed to identify the applicability of the CP, PP, RP, AP implementation models.

Keywords: High Availability; Realization Model; Enterprise Information System

1. Introduction

With in-depth application of IT in modern business management, corporate dependence on information systems is the increasing information system high availability (High Availability, HA) requirements are also increasing, many companies on some of the core information systems (such as finance, marketing, enterprise resource planning, etc.) even suggested that the requirements of reliable operation of the rate of 99.999%, equivalent to the system per year of unplanned downtime of no more than five minutes, usually on the availability of high The system, known as "high availability or high-reliability systems" [1].

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This article described the concept for high availability of enterprise information systems design, to discuss the implementation model of a variety of high availability systems, and various implementations of the applicability of the model in enterprise information systems are analyzed.

2. High-availability Design

2.1. Design goal

The nature of the enterprise information system is the digital business management business process through a variety of information systems continue to generate new information resources for all levels of the enterprise to grasp all the information in the various types of dynamic business to make enterprise rational resource allocation decisions, to enable enterprises to adapt to rapidly changing market environment, to obtain the maximum economic benefit.

High availability of enterprise information system design goals by the nature of the decision, that is, without human intervention, through the integrated use of redundant hardware and software technology to achieve the system is running the wrong automatic detection and correction to ensure that mission-critical or services, continuous accessibility [2].

2.2. Design method

May occur in the enterprise information systems run a variety of temporary, permanent or intermittent error is the most important factor to affect the high availability of the system, thereby achieving high-availability system design method [2-4], including:

Forecasting system error (Forecasting the Fault)

The prediction error generally refers to the use of mathematical models and empirical formula of the pre-analysis to determine the system errors that may occur and its adverse effects, change the conditions that caused the error occurred, as far as possible so that errors cannot occur to avoid and eliminate system errors (Avoiding and Removing the Fault)

Information systems with the robust hardware and software technology development to achieve accurate specifications and verification testing, as far as possible to avoid and eliminate errors before the system put into operation.

Table 1 shows the I construction of a large enterprise group involved in the design of the portal system P and directory system D system error occurred within a year, statistics.

Table 1 Large enterprise group within one year of system error statistics

Type of error / System Name	Platform system error	Applications errors	External error	Unexplained error
System P	2	9	2	1
System D	3	6	3	2

Seen from the statistics in Table 1, method (1) and method (2) to eliminate most of the system error, but it does not ensure that the system error does not occur, so the use of the method (3), assume that a system error will certainly occur, establish coping strategies, the use of hardware and software redundancy techniques to avoid or minimize the adverse effects of errors is a more efficient system in engineering practice, high-

availability design. Figure 1 describes the redundant design method can be used to improve system fault tolerance.

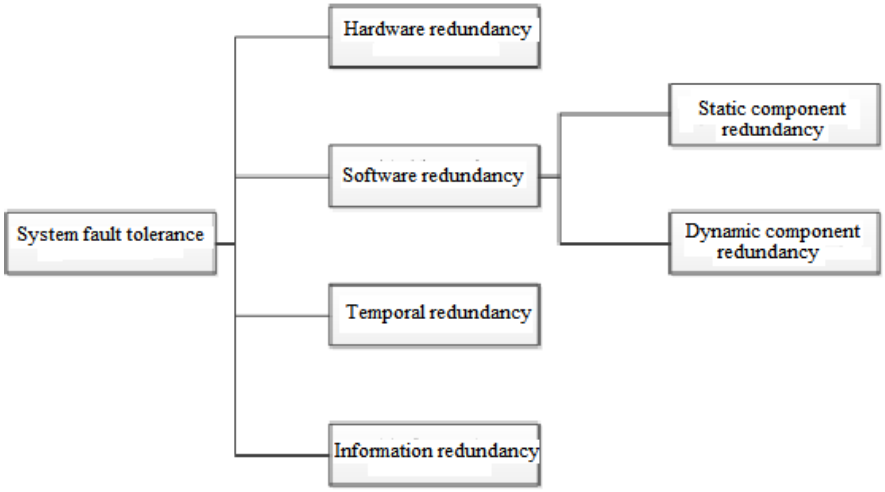

Figure 1 System fault-tolerant common redundant design

The key modules of the operating system of hardware redundancy hardware redundant, such as multi-CPU boards that double network channel, dual SCSI controller, dual power and radiator, called "N-Plexing design. Redundant modules commonly used "Fail Fast" or "Fail Stop" mode, in order to simplify the hardware error management decision-making process.

The key functional components of the system software of the software redundancy with redundant design, the software is generally more complex than the hardware, software design and implementation of technology will affect the software inherent number of defects and errors that may occur. Now redundant design of many software programs, software redundancy can be divided into static component redundancy and dynamic component redundancy, all redundant components at the same time known as the static component redundancy is active, such as software cluster model; only one component is active, the rest of the redundant components in a passive standby known as the dynamic component redundancy, such as software, hot standby model.

Time redundant system accidental error occurs; repeat the function module the error occurred, the time duration characteristics to eliminate errors, such as the network link layer data retransmission mechanism.

3. High-availability Implementation Model

3.1. Checkpoint (CP) model

Save the state of the system based on the concept of a transaction when the transaction began, called the "checkpoint" or "snapshot" of the transaction process when an error occurs, the system rollback to the checkpoint successfully saved contains an error transaction to be discarded , the system is restored to a consistent state, and continue running to provide services. CP model is the most basic high availability system model, but also many other model based model.

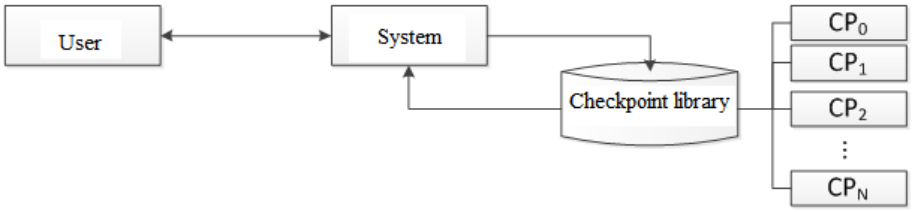

Figure 2 Achievement Model of Checkpoint (CP)

3.2. Process pairs (PP) model

The CP model was first applied in a stand-alone system, when a system error occurs, the rollback checkpoint slower. The PP model is the improvement of the CP model; the purpose is to speed up the recovery process, reducing system service interrupt time. A copy of the system to establish the main system, shared between the main system and a copy of the system or synchronize the checkpoint data, copy of the system to receive the main system through the regular heartbeat messages to determine the health status of the host system, when a copy of the system cannot receive the heartbeat message of the main system to meet certain rules (such as overtime), a copy of the system to automatically take over the main system to continue to provide services.

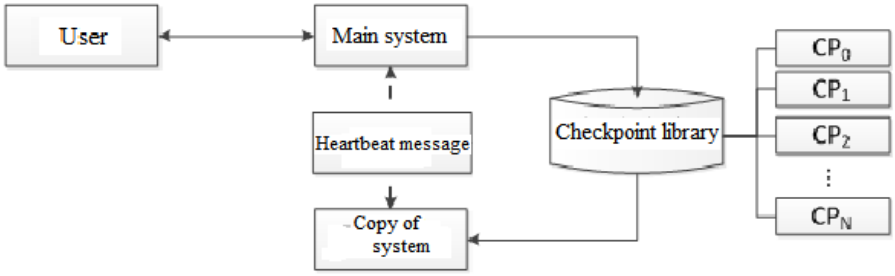

Figure 3 Process (PP) model

3.3. Recovery processing (RP) model

The RP model is based on the CP model for the key functions of the system, the establishment of N-independent algorithm for different treatment process {P0, P2, ..., PN-1}, one of the process-based process P0, P0 created prior to the checkpoint the CP0 after the P0, results tested RAT0 If the test fails, roll back to the CP0, and enter the process P1, and P1, after further results tested RAT1, until the test is successful completion of the processing functions.

3.4. Alternative processing (AP) model

AP models the key features of the transactional system, the establishment of two independent algorithms process P0 and P1. Under normal circumstances, the P0 processing algorithms complex and more accurate, P1 processing algorithm is simple and efficient, P1, the results of the P0 and acceptance testing, but also as an alternative process, P0 and P1 between the controls through the decision-making process.

4. Model Applicability Analysis

The applicability of the model from the applicable particle size, design complexity, implementation cost, resource requirements, dimensions. The granularity of application, including the system, module, process, respectively, with S {system}, M {module}, P {process}. Design complexity, cost and resource requirements, respectively, H (high), M (middle), L (low) and the three levels. CP, PP, RP, the AP model is applicable to analysis results shown in Table 2.

Table 2 Model Applicability Analysis

Analysis of dimensions / Name of Model	Applies to particle size	Difficult to design	Implementation cost	Resource requirements
CP	S,M,P	M	L	L
PP	S,M	M	M	H
RP	M	H	H	H
AP	M	M	M	M

5. Conclusions

Select high-availability model, the enterprise information system should take full account of the differences of the model in the applicable particle size, design complexity, implementation cost, resource requirements, according to the criticality of the system, the reliable operation of the rate requirements, the IT budget the actual situation, choose the most appropriate model to build a highly available system. The same time, virtualization, cloud computing and other technological developments, there have been based on virtualization technology, high-availability systems [5], compared with the traditional design, system reliability, fault recovery time, there is a definite improvement in the efficiency of resource use, etc. upgrade, should be concerned about the future in the field of high-availability technologies and research new direction.

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