

A Petri Net Model for High Availability in Virtualized Local Disaster Recovery

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Abstract. Effective business continuity strategies need to have both high availability (HA) and disaster recovery (DR). Traditional high availability and disaster recovery solutions require a great deal of duplicate hardware and software. Virtualization affords significant cost and performance advantages over more traditional disaster recovery options. In this paper, the virtualized local disaster recovery is proposed in order to provide a higher level of availability for business continuity. Effective way to use the resources at both primary site and disaster recovery site, active-active clustering architecture is employed in this virtualized local DR. The software failure due to software aging problem which can decrease the availability of the system is considered. The software rejuvenation methodology and virtualization technology is combined to counteract the software aging problem. To get higher level of availability in local disaster recovery, virtualization, clustering and software rejuvenation technology are integrated. A stochastic Petri net model is constructed to describe the behavior of virtualized local DR. To analyze the availability of the proposed model, numerical derivation is presented. The numerical derivation results are validated with the evaluation through SHARPE simulation tool.

Keywords: availability, clustering, local disaster recovery, stochastic Petri nets, virtualization.

1. Introduction

Organizations today face a tough challenge in choosing an appropriate high availability solution in order to minimize the amount of downtime that meets their business requirements. As a result, disaster recovery has gained great importance in IT. There are two broad categories such as natural or man-made disaster which can cause site failures. The disaster recovery is designed to ensure the continuation of vital business processes in the event that the disaster occurs [1].

Availability has long been a critical issue for online computer systems whose failure can halt business processes [2]. The need for high availability (HA) and disaster recovery (DR) in IT environment is more importance than other sectors of enterprises. Traditional high availability and disaster recovery solutions require a great deal of duplicate hardware and software.

Virtualization technology is changing the face of disaster recovery. Virtual machine technologies require availability solutions that provide protection against data loss and downtime for the entire environment.

A cluster is a collection of computer nodes: independent, self-contained computer systems working together – to provide a more reliable and powerful system than a single node alone. Therefore, clustering is a key server function in HA and DR environment. Active-active clustering is a high availability (synchronous) DR solution. The architecture is maximizing the performance of the applications, and providing more cost-effective use of the resources. The benefit of shared storage is that the nodes simultaneous own the shared resources [3].

Disaster and its recovery processes involve unplanned interruption of service. Unplanned downtime is mainly caused by computer failure, network failure, software failure and local or regional disaster. As business becomes increasingly dependent on information and computing technology, continuous availability is a universal concern. Failures of computer systems are more often due to software faults than due to