

# Failure Prediction And Detection In Cloud Datacenters

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**Abstract:** Cloud computing is a novel technology in the field of distributed computing. Usage of Cloud computing is increasing rapidly day by day. In order to serve the customers and businesses satisfactorily, fault occurring in datacenters and servers must be detected and predicted efficiently in order to launch mechanisms to tolerate the failures occurred. Failure in one of the hosted datacenters may propagate to other datacenters and make the situation worse. In order to prevent such situations, one can predict a failure proliferating throughout the cloud computing system and launch mechanisms to deal with it proactively. One of the ways to predict failures is to train a machine to predict failure on the basis of messages or logs passed between various components of the cloud. In the training session, the machine can identify certain message patterns relating to failure of data centers. Later on, the machine can be used to check whether a certain group of message logs follow such patterns or not. Moreover, each cloud server can be defined by a state which indicates whether the cloud is running properly or is facing some failure. Parameters such as CPU usage, memory usage etc. can be maintained for each of the servers. Using these parameters, we can add a layer of detection where in we develop a decision tree based on these parameters which can classify whether the passed in parameters to the decision tree indicate failure state or proper state.

**Index Terms:** Cloud computing; failure prediction; failure detection; cloud datacenters; probability and statistics; Bayesian probability; machine learning

## 1 INTRODUCTION

Cloud computing is one of the new buzzwords in the world of computer science and engineering. One of the main features that cloud service providers offers its customers is the ability to pay per use. Cloud computing also incorporates self-service and thus aiming at Autonomic computing. It also aims at providing businesses with a scalable and adaptive environment. Businesses are provided with various deployment models to choose from. Some of the deployment models include public cloud, Public cloud hosts all the data and resources on public servers which can be accessed by everyone. Private cloud is another type of model where the data is hosted on datacenters located on premise locations. Community cloud is another type of model where a set of organizations or businesses share a cloud datacenter. Hybrid model is a solution to insufficient capacity of the private cloud. Organizations are provided with an ability to subscribe to public cloud services when facing insufficient resources. This is termed as "cloud bursting" [1]. According to [1], cloud provides myriad of advantages which the local data centers cannot. These includes scalability, data security, fault tolerance, pay per use, dynamic resource allocation and much more. As a result, many giant organizations and local businesses are opting to migrate the local data in datacenters onto the cloud. It provides a level of abstraction and thus obviates the need for the users to manage the complex hardware and infrastructure. Being said that, there are many Quality of Service (QoS) parameters which the cloud service providers (CSPs) need to provide as per the Service Level Agreements (SLAs) with their customers. One important parameter is availability of resources [2].

## 2 LITERATURE SURVEY

Yukihiko Watanabe, Hiroshi Otsuka, Masataka Sonoda, Shinji Kikuchi and Yasuhide Matsumoto	Online Failure Prediction in Cloud Datacenters by Real-Time Message Pattern Learning	2012	Various types of message logs communicated between components.	In the future, accuracy can be improved by including more parameters.
Qiang Guan, Ziming Zhang and Song Fu	Ensemble of Bayesian Predictors and Decision Trees for Proactive Failure Management in Cloud Computing Systems	2012	Assumption that training dataset is labeled.	In future, integrating two failure management approaches will lead to better dependability.
Huanbin Panmu, Janguo Liu, Qiang Guan and Song Fu	AFD: Adaptive Failure Detection System for Cloud Computing Infrastructure	2012	The runtime performance data is usually unlabeled and thus a prior failure history is not always available.	Integrating the proactive and reactive failure management approaches like check, pointing and redundant execution can increase the fault detection accuracy.

Author Name	Paper Name	Year Published	Problems	Open Research Issues
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