Fault Tolerance Multi-Agents for MHAP Environment: FTMA

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Abstract. This paper describes the design and implementation of the FTMA (Fault Tolerance Multi-Agents), which is running on MHAP (MOM-based on Home Automation Platform) environment. FTMA has been designed and implemented in DOORAE environment for MHAP. The physical device and network layer consists of any network and physical device supporting any networking technology for MHAP. The infrastructure layer introduces infrastructure to provide service management and deployment functions for MHAP. DOORAE (Distributed Object Oriented collaboration Environment) is a good example of the foundation technology for a computer-based multimedia collaborative work that allows development of required application by combining many agents composed of units of functional module when user wishes to develop a new application field. It is a multi-agent system that is implemented with object oriented concept for MHAP.

Keywords: FTMA, MHAP, Fault-Tolerance Multi-agents, DOORAE, multimedia collaborative work.

1 Introduction

Since new education system must be developed in a way that combines various field of technologies, including group communication and distributed multimedia processing which are the basis of packet based videoconferencing systems, integrated service functions such as middleware are required to support it[1,2,3,4]. The requirement of distributed multimedia applications is the need for sophisticated quality of service (QoS) management. In terms of distributed multimedia systems, the most important categories for quality of service are a timeless, volume, and reliability [5]. In this paper, we discuss a method for increasing reliability through FTMA (Fault Tolerance Multi-agents), which is running on MHAP (MOM-based on Home Automation Platform) environment. FTMA is a fault-tolerance system running on distributed multimedia object oriented collaboration environment. The objective of this article is to propose multi-agents model that is a fault tolerance system with detection, classification, and recovery agents to detect, classify and recover an error
automatically. Section 2 describes the context: situation-aware middleware. Section 3 denotes FTMA. Section 4 describes simulation results. Section 5 concludes the paper.

2 The Context: Situation-Aware Middleware

A conceptual architecture of situation-aware middleware based on Reconfigurable Context-Sensitive Middleware (RCSM) is proposed in [6]. Ubiquitous applications require use of various contexts to adaptively communicate with each other across multiple network environments, such as mobile ad hoc networks, Internet, and mobile phone networks. However, existing context-aware techniques often become inadequate in these applications where combinations of multiple contexts and users’ actions need to be analyzed over a period of time. Situation-awareness in application software is considered as a desirable property to overcome this limitation. In addition to being context-sensitive, situation-aware applications can respond to both current and historical relationships of specific contexts and device-actions. However, it did not include fault tolerance system support in the architecture.

3 FTMA

In this paper, we focus on describing multi-agents model that is a fault tolerance system in situation-aware middleware for MHAP environment.

3.1 Overview of the MHAP Model

As shown in figure 1, MHAP has four layered architecture [7]. The physical device and network layer consists of any network and physical device supporting any networking technology. The infrastructure layer introduces infrastructure to provide service management and deployment functions for MHAP services. The MHAP layer consists of MHAP services and provides functionalities constructing HA, which includes event notification, appliance control, HA rule configuration and device management. It uses MOM to support event-driven HA in heterogeneous environment. Facilitating Home Automation needs many different kinds of applications. There are DOORAE agent layer between application layer and MHAP service layer.

Nowadays multi-agent systems establish a major research subject in distributed artificial intelligence. In particular, multi-agent modeling makes it possible to cope with natural constraints like the limitation of the processing power of a single agent or the physical distribution of the data to be processed and to profit from inherent properties of distributed system like robustness, fault tolerance parallelism and scalability [8].

3.2 FTMA for DOORAE Agent Layer in MHAP Model

Our proposed FTMA model aims at supporting adaptive fault tolerance of events occurred in application-level described by a set of objects by reserving, allocating, and reallocating necessary resources given dynamically changing situations. A high-level FTMA conceptual architecture to support adaptive fault tolerance of events is shown in Figure 2.