Chapter 2

A PERFORMANCE EVALUATION OF THE ACORN ARCHITECTURE

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Abstract ACORN (Agent-based Community Oriented Retrieval Network) is a multi-agent system which uses agents to provide information across internet/intranet networks. In this report, we adapt the ACORN architecture for its performance evaluation on single and multiple servers, running on single and multiple machines. In order to evaluate the performance of ACORN, we introduce a novel concept of multiple autonomous virtual users. The concept of multiple autonomous virtual users and our testing philosophy is applicable to the performance evaluation of other client/server based multi-agent systems. The modified ACORN architecture has been ported to different machines and experimental results on single processors obtained. The processing time required by ACORN is found to be a nonlinear function of the number of agents.

2.1. INTRODUCTION

The explosive growth of the online information makes it increasingly difficult for users to locate and exploit the information available worldwide. Autonomous agents allow a radically new approach that makes information access easy and efficient. Rather than the user having to go and track down information (the ‘pull’ model), the agents provide a unique ability to profile, target and help their customers. Information filtering algorithms, for example, automated collaborative filtering used
in the Firefly products (fire) and the artificial neural networks (ANNs) used in the Autonomy products (auto), are central to the development of intelligent agents that search the very large number of databases and compare the profiles of millions of users.

In order to satisfy the real-time response requirements of complex learning algorithms and exploit the capabilities of high performance multiprocessor web servers, we carried out a performance evaluation of the ACORN Multi-Agent Information (marsh1; marsh3; marsh4). ACORN is a system developed at the Interactive Information Group, NRC, Ottawa. ACORN uses agents to provide active information across networks. ACORN promises to be a very useful technology for many companies involved in the development of information search and dissemination products. However, there are many issues that need to be studied further before ACORN can be integrated into commercial products: testing with a large number of users, testing over geographically distributed networks, and scalability of ACORN on multiprocessor web servers. Testing of ACORN with large numbers of human users is an almost insurmountable task. In order to tackle this problem we have taken a novel approach which uses multiple autonomous virtual users.

This report describes the work carried out as a part of a C3.ca Association Inc. pioneer project. The next section describes the ACORN architecture in brief, including related work. Section 3 discusses the concept of multiple autonomous virtual users, and Section 4 provides a discussion of the changes made to ACORN for the purpose of allowing the creation and use of multiple autonomous virtual users to facilitate the performance evaluation of ACORN on single and multiple (sequential and parallel) servers. Section 5 presents details of our experimental design and some initial results. Conclusions and ideas for future work are given in Section 6.

2.2. ACORN

ACORN is a multi-agent architecture using autonomous agents to do the work of disseminating and searching for information in internet/intranet networks. While ACORN has been discussed and described more fully elsewhere (marsh1; marsh3; marsh4), we will briefly discuss it here, along with related work.

2.2.1. BACKGROUND

Information is hard to work with, particularly if there is a lot of it and it is disorganized, such as on the Web. Current solutions are straining at the seams, and a new paradigm is required to handle the volume and