Parallel and Context Based Search in Cloud Using Multi Agent System

Ronak C Patel, Hiren V Mer

*Abstract— **Cloud** Computing is one of the fast growing Technology. Cloud computing support large scale infrastructure used to increase performance of computing. This technology support agents and with the help of integration of the agents that is Multi Agent System (MAS) which is capable of intelligent behavior. They run in an environment where they communicate with each other using message passing technique. Each agent has its own set of behavior and they run independent of each other. When a message arrives each agent shows their own behavior and hence an agent shows their coordination. The use of MAS in cloud computing help us for searching context with better performance. The JADE is a platform which supports agent. This paper discusses about Cloud computing models and architectures, information retrieving technique and the use of MAS that improve the performance of big data search from Distributed File System (DFS) which is difficult to achieve using single agent or thread.*

Index Terms— Cloud Computing, Distributed File System, JADE, MAS.

I. INTRODUCTION

1.1 Cloud Computing

Cloud computing provide elastic services, high performance and scalable storage of data to a large and on a daily basis increasing number of users. Cloud computing enlarged the arena of distributed computing systems by providing advanced Internet services that complement and complete functionalities of distributed computing provided by the Web, Grid computing and peer-to-peer networks. Even Cloud computing systems provide major infrastructures for high-performance computing with dynamism adapt to user and application needs.[1]

Cloud computing can be defined on the basis of many aspects like processing, storage resources, the service-oriented interface and the exploitation of virtualization techniques etc. [2] The National Institute of Standards and Technology (NIST) have given a complete reference definition. NIST defined "Cloud computing is a pay-per-use model for enabling available, convenient, on-require network access to a shared group of configurable computing resources (e.g., networks, servers, storage, applications, services) that can be quickly provisioned and released with nominal administration effort or service provider interaction."

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Moreover, "Cloud model promotes availability and is comprised of five key characteristics, three delivery models, and four deployment models."

-Five essential elements of cloud computing are:

- On-demand self-service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured Service

-Three main service model of cloud computing are:

- *Software as a Service (SaaS)*

Cloud consumers release their applications on a hosting environment, which can be accessed through networks from a variety of clients (e.g. web browser,PDA,etc.) by application users. Examples of SaaS include SalesForce.com, *Google Mail, Google Docs, and so* forth.

- *Platform as a Service (PaaS)*

PaaS is a development platform supporting the full software Lifecycle which allows cloud consumers to develop cloud services and applications (e.g. SaaS) directly on the PaaS cloud. Hence the difference between SaaS and PaaS is that SaaS only hosts completed cloud applications whereas PaaS offers a development platform that hosts both completed and under progress cloud applications.Eg. Google App Engine.

- *Infrastructure as a Service (IaaS)*

Cloud consumers can use IT infrastructures (processing, storage, networks, and other fundamental computing resources) provided in the IaaS cloud. Virtualization is extensively used in IaaS cloud in order to integrate/decompose physical resources in an ad-hoc manner to meet growing or shrinking resource demand from cloud consumers.
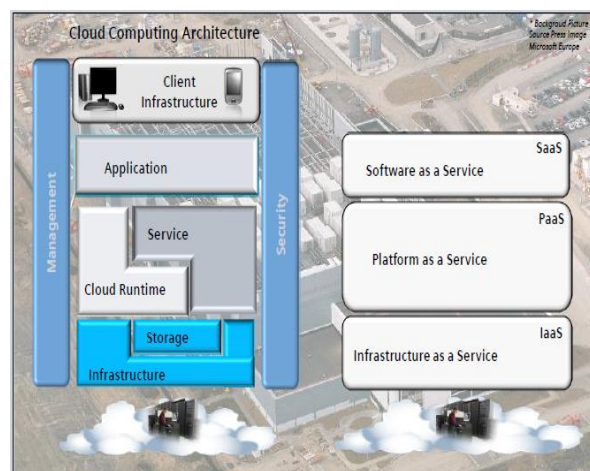

Fig.1.Cloud Computing Service Model.[3]

Four cloud deployment models have been defined in the Cloud community:

▪ *Private Cloud* - The cloud infrastructure is operated exclusively within a single organization, and managed by the organization or a third party anyway whether it is located premise or off premise. Academics often build private cloud for research and teaching purposes.

▪ *Community Cloud* - Several organizations jointly construct and share the same cloud infrastructure as well as policies, requirements, standards, and concerns. The cloud infrastructure could be hosted by a third-party vendor or within one of the organizations in the community.

▪ *Public cloud* - This cloud is used by the general public cloud consumers and the cloud service provider has the full ownership of the public cloud with its own policy, value, and profit, costing, and charging model.

▪ *Hybrid cloud* - The cloud infrastructure is a combination of more than one cloud (private, community, or public) that remain unique entities but are bound together by standardized or appropriate technology that enables data and application portability.

A. *1.2 Intelligent System and Multi Agent System*

Intelligent System: An Intelligent agent is a special software component that can act independent on behalf of its user. The amount of intelligence in an agent varies depending on the task assigned and the environment where it is used. An agent is special with its, Autonomy- having its own thread of control, Social- cooperating with other agents, Intelligence- perceives its environment and responding to it, Proactive- exhibiting its goal directed behavior, Learning- the ability to improve performance and decision making over time when interacting with the external environment.[4]
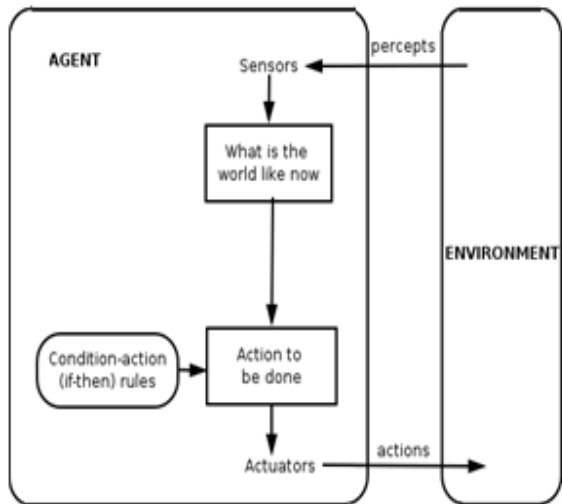

Fi
g 2. Intelligent Agent [4]

Multi Agent System: A **multi-agent system** (**MAS**) is composed of several interacting intelligent agents within an environment. Multi-agent systems are used for solving the problems that are difficult or not possible for a single agent or a monolithic system to solve. Intelligence may include some methodical, functional, procedural or algorithmic search, find and processing approach. The use of Multi Agent makes the cloud to service in better way. [5]

The agents in a multi-agent system have several important qualities:
▪ **Autonomy**
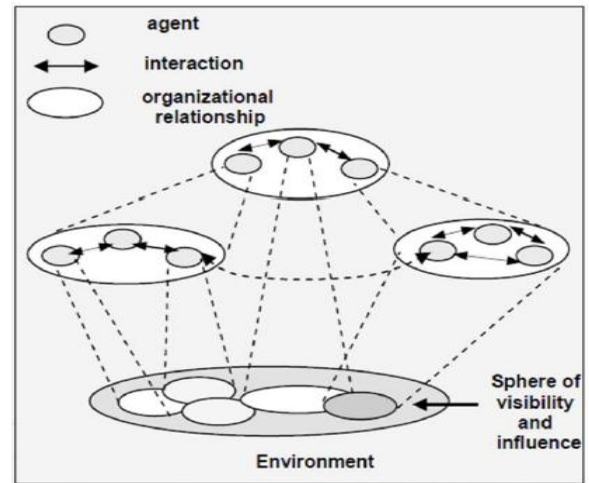▪ **Local views**
▪ **Decentralization**

Fig 3 .Multi Agent System [4]

To summarize this, multi-agent systems (MAS) present an additional distributed computing paradigm based on multiple interacting agents that are capable of intelligent behavior. Multi-agent systems are often used to solve problems by using a decentralized approach where several agents contribute to the solution by co-operating one each other. One quality of software agents is the intelligence that can be embodied into them in accordance with some collective artificial intelligence approach that needs cooperation among several agents that be able to run on a parallel or distributed computer to achieve the needed high performance for solving large complex problems keeping execution time low.

I. RELATED WORK

Dinesh Kumar R C, Ashwin R [7], they discuss about the MAS and the usage of the intelligent agents and how it is used for searching purpose in the cloud. Multi-agent systems (MASs) can integrate with Cloud Computing System.So that we can get high-performance and making clouds more flexible and autonomic.

Vishal Jain and Mahesh Kumar Madan [8], they define capabilities of MAS that permits the user to solve methodic, functional algorithmic and or technical query to discover and process the data. The aim of authors is to retrieve the information using Multi Agent System with Data Mining technique in Cloud Computing environment. In this research paper,cloud computing allows the users to retrieve meaningful information from virtually integrated data warehouse that reduces the costs of infrastructure and storage.

Gagandeep Singh Narula,Vishal Jain, and Dr.Mayank Singh[10],In this paper they illustrates working of JADE and defines schemas (classes and subclasses) and instances (objects) with user defined methods that helps in execution of program by writing code in Java Script. It is known that responsibility of developing agents in complex and business environments is controlled by software framework called

JADE (Java Agent Development Framework).Even they try to implement a framework for MAS using JADE on Online Shopping System.

Yu Mon Zaw, Nay Min Tun[10],They propose a framework for Web Services Based Information Retrieval Agent System for Cloud Computing Environment. The proposed system framework is intended to apply in Medical field.Efficiently composed cloud Web Services with the use of Multi-Agents features can give new form for cloud wide information retrieval systems.The proposed system will become an intelligent way for searching or retrieving information from Cloud environment.

Shah Yesha B., Prof G.B.Jethava[11],In this paper they define about A Web Crawler and Multi Agent based Web mining for the process of search. And found that the problem with web crawlers is that the large volume of web documents on the World Wide Web implies that the crawler in a given amount of time can download only a few high prioritized web pages only it is difficult to crawl all web pages in given amount of time because of large volume of web documents .So to overcome this authors classify the web documents on their attribute information and cluster them into Multiple Agents. This work proposes an multi-agent based web mining technique to optimize the process of web search. The agent based search of the web contents would improve performance and provide better results to the user.

S.Balasubramaniam, Dr.V.Kavitha [12],In this study rigorous analysis is made on Data retrieval techniques which are used to retrieving the original data from the encrypted data on the cloud environment. Many searchable techniques have been analyzed based on single keyword, multiple keyword search, Ranking, Similarity search, Fuzzy tolerance. The goal is to enable rich search semantics in a privacy preserving manner and efficiently support for large scale and distributed nature of cloud data. Beyond the text data search, many ways of representing the data are available for example graph structured data search, image data search, multimedia data search and multi dimensional search. This study only explained various data retrieval techniques for text data.

II. PROBLEM DEFINITION

All papers that only give the information for web search and information retrieval using multi agent system and other search technique. None of paper deals with searching data in distributed file system (hadoop) in parallel manner. It is difficult for an individual agent system to search large volume of data in a given amount of time and also do not get optimize output. Parallel searching using either multiple process or threads is also possible. But process or thread has no in-built so called intelligence-and it's very costly to work with parallel running process or thread. It is difficult and inefficient to search of big data with the help of single agent. Agents are incorporated in many innovative applications in order to improve the performance of the system. Agent uses its possessed knowledge to react with the system and helps to improve the performance. Agents are introduced in the

cloud computing is to minimize the response time when similar request is raised from an end user in the globe.

III. PROPOSED WORK AND FLOW

We are going to use MAS for context search using cloud service to improve searching performance in DFS(Hadoop).The main goal is to improve the searching performance that gives optimum output that is not possible using single agent or thread. Parallel searching means the worker agents search the context parallel from DFS according to their intelligence and behavior.

Agents are incorporated in many innovative applications in order to improve the performance of the system. Agent uses its possessed knowledge to react with the system and helps to improve the performance. Agents are introduced in the cloud computing is to minimize the response time when similar request is raised from an end user in the globe. There should be no. of agents having their own dictionary. Each agent starts searching if the phrase is present in its own dictionary. Each agent is specialized in own area.
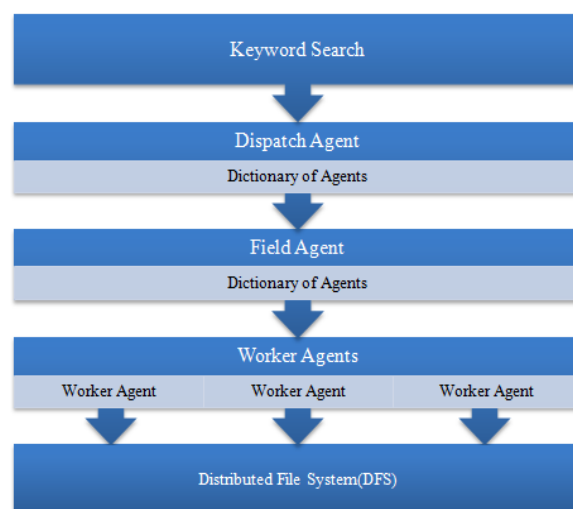

Fig 4. Flow of Multi Agent System

Terminology:
▪ Dispatch agent: This is the main front agent. This agent has a dictionary of field agents with their area of specification
▪ Field Agent: This agent has specialization on some specific area like food. It has a dictionary related to specialization area.
▪ Worker agent: These agents perform search operation in DFS. Worker agents search for word start with some alphabet only.
Steps:
Step1: User supply some keyword
Step2: The supervisor agent select field agent for which the keyword suit well.
Step3: The field agent analyzes the keyword and picks the worker agent and this is based on the starting alphabet of the keyword.
Step4: The worker agents start searching on DFS and return results.

IV. CONCLUSION

The JADE platform is used to support agents. Agents are simply an entity which has in-built behaviors. They run in an environment where they communicate with each other using message passing technique. Each agent has its own set of behavior and they run independent of each other. When a message arrives each agent shows their own behavior and hence an agent shows their coordination. We are going to parallel search technique using MAS to solve big data search problem with the help of one suitable search algorithm in DFS that improve the performance of searching and will give optimum output.

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