Review: Web Semantics in Cloud Computing

Rupali A. Meshram, Assistant professor, CSE Department, PRMIT&R, Badnera
Komal R. Hole, Assistant professor, CSE Department, PRMIT&R, Badnera
Pranita P. Deshmukh, Assistant professor, CSE Department, PRMIT&R, Badnera
Roshan A. karwa, Assistant professor, CSE Department, PRMIT&R, Badnera

Abstract –
This paper shows how cloud computing on the background of Semantic Web is going to important. Cloud computing has become interesting area both in academia and industry. Semantic Web has been an important research area in academic and industrial researchers. Many applications will need to work with large amounts of data, one particular application would certainly not exist without the capability of accessing and processing arbitrary amounts of metadata: search engines that locate the data and services that other applications need. To solve this problem, semantic web services used with cloud computing. In this paper we present the use of well established semantic technologies in Cloud computing. The purpose of this report is to give an overview of semantic web services and semantic web technologies in cloud computing.

Keyword: Semantic Web Services, Semantic Web Technologies, Cloud Computing, Semantic Web

I. Introduction

Now a day, Internet provides many more services such as instant message, sharing videos, web search, e-commerce platforms, online video conference, and image processing, and various other types of third-party services on the Web. This require huge amount of memory space on web database to improve online performance and the demand for real-time applications and high-speed data processing. Because of this, many organizations causes a problem to construct large datacenter to satisfy their demand. As a solution to these problems, cloud computing technology used by various companies. The companies which provide web services no longer need large capital outlays in hardware and software to deploy their services. Those companies can just buy these “hardware” and “software” as cloud computing services on the Web. To build large datacenter required more money to build their services on cloud. Cloud computing provides on-demand self-service, , measured service, resource pooling, broad network access and rapid elasticity[1]. Developers can easily implement their creative ideas on web service and the web services are more efficient so as to attract more users.

Many cloud computing services are implementing on distributed web environment and provides virtualized resources, which focuses on some aspects like the semantic ambiguity, distributed semantic reasoning, distributed semantic models construction, distributed metadata storage, parallel semantic computing, etc. It also introduces many real world applications like semantic analysis in science computing, cloud resource discovery, accurate advertise recommendation, and web context understanding in commercial services.

The Semantic Web is gaining immense popularity. Tim Berners Lee’s vision of the Semantic Web or Web 3.0 is to transform the World Wide Web into an intelligent web system of structured, linked data which can be queried and inferred as a whole by the computers themselves. Interoperable applications hosted on the web as service for customers and these web services are designed to be automatically discovered by software agents and exchange data amongst themselves. In internet, the cloud computing platform is another business model, where hardware, software, applications and tools all will be use as public. The main purpose of this paper is to provide a research survey on semantic web technologies and semantic web services.

The paper is organized as follows section 2 contains brief introduction for cloud computing to provide the base of this concept. Section 3 describes Semantic Web with their technologies and services. Section 4 concludes this study.

II Cloud computing

The term "cloud" is group of network in computer. The word "cloud" often refers to the Internet and more precisely to some datacenter full of servers that is connected to the Internet. In internet, Cloud computing is a kind of Internet-based computing, where shared resources, information and data are provided to computers on-demand. At the time Google started in 1998, its business increased so rapidly that the internet

technologies are not enough to process the huge amount of data in acceptable manner. To solve this problem, they develop its own file system Google File System (GFS) [3], and built its parallel computing environment MapReduce [4] based on GFS. These technologies which are later called "cloud computing" turned out to be high efficient, stable and reliable. According to "The NIST Definition of Cloud Computing" [2], cloud computing is "the delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility (like the electricity grid) over a network (typically the Internet)". In cloud computing everything can be provided as service, including infrastructure, hardware platform, software, etc. The cloud computing model can be mainly classified into three layers [2]: Cloud Software as a Service (SaaS), Cloud Platform as a Service (PaaS), and Cloud Infrastructure as a Service (IaaS). In SaaS, the capability provided to the consumer is to use the provider's applications running on a Cloud Infrastructure. This is an alternative to locally run applications. The Google Docs is an example of SaaS. In PaaS, users can have flexibility and more choices. The consumer can deploy onto the cloud Infrastructure consumer-created or application created using different programming languages and tools supported by the provider. The Google Apps Engine and Microsoft Azure are some examples of PaaS. IaaS also provides flexibility and choices. The consumer can choose networks, processing, storage and other fundamental computing resources where the consumer is able to deploy and run software, which can include operating systems and applications. Amazon's Elastic Compute Cloud (based on Amazon machine Image) is an example of IaaS. If the cloud computing is based on Internet and available to the general public, it is referred as public cloud. The cloud service providers can decide adopting which deployment models based on the application goals of the cloud service consumers. Many companies create own cloud: eBay provides their own opensource PaaS platform turmeric, IBM released "Blue Cloud" service while Microsoft calls its cloud service platform "Azure" and Yahoo also develop non-structure data storage base "Mobstor" and data storage & processing platform "Sherpa".

In 2004, the most famous opersource cloud computing framework Hadoop began to build. Hadoop was derived from Google's MapReduce and Google File System (GFS) and is adopted by IBM, Yahoo and Facebook to construct cloud service infrastructures. It supports distributed applications to work with thousands of computational independent computers. In early 2008, Eucalyptus [5] became AWS API-compatible platform for deploying private clouds. At the same time, OpenNebula, an open-source cloud computing toolkit is enhanced in the RESERVOIR European Commission-funded project. Pregel [6] is a new proposed cloud computing model for large scale graph processing. It can avoid multiple iterations in MapReduce framework and give stable and scalable performance. Pig-latin [7], a SQL-like and data flow language can be implemented on Pig [8] to perform database-like functionality.

To access web service, firstly user has to login to the websites who provides cloud service then they can select any web service that they needed. Users can set up their real-time applications on cloud by using different virtual resources like hard disks, CPU processors and memories and they can run their web services application on the platforms of cloud service. If users want to develop any application then, they can just adopt the existing software services in the cloud.

III Semantic Web

"Semantic Web" was coined by Tim Berners-Lee (inventor of the "W3C"). The Semantic web is a polymorphism of similar data on web. The Semantic Web is an extension of the Web through standards by the W3C. Tim Berners-Lee defines the Semantic Web as "a web of data that can be processed directly and indirectly by machines". The Semantic Web provides a common framework that allows data to be shared and reused across application, enterprise, and community boundaries. Since the inception of the World Wide Web in 1990 by Tim Berners Lee, it has been a large databaes of documents and nowadays the percentage of documents is growing very rapidly. The information from these huge documents can be aggregated and inferred quickly, they don't have much use. Human readers cannot read huge amount of documents retrieved by the previously used search engines based on keyword searches. To solve this problem Tim Berners Lee's vision is to transform this World Wide Web into an intelligent web system or Semantic Web [10], [11], [12], [13], [14], [15], [16], [17] which will allow concept searches rather than old concept of keyword searches. Semantic Web or Web 3.0 technologies will transform disconnected text documents on the web into a global database of structured, linked data. These large volumes of linked data in global database will no longer be only for human consumption but for quick machine processing.

The semantic web includes web services, resources, semantic relations, etc, can be identified with Uniform Resource Identifier (URI). It is used to avoid semantic ambiguities and is convenient to make version control. In Semantic web, user can reach data and resources on the web directly through URL. Hence, in the cloud computing environment, the semantic web applications are likely to be kinds of PaaS or SaaS. The semantic web technologies can help to represent domain knowledge and organize metadata in the cloud computing. It can also solve the semantic ambiguity and heterogeneity problems which arise in distributed architecture and big data in cloud

computing services and hence encourage data sharing and knowledge discovery.

a) Semantic Web Technology

In artificial intelligence (AI) studies, semantic information processing is an essential problem. The AI is to make machine "understand" human beings. Semantic information processing can make "meaning" and the relations for knowledge discovery and information sharing. Semantic information are used to classified into two kinds: pure semantic information that deals with the properties of artificially constructed formal system; descriptive semantic information, a factual search for rules governing truth and meaning fullness of sentences in natural language [9]. On the web, the semantic information contains both of these two kinds.

- To understand and represent the semantic information, appropriate semantic model should be build and formal standards are adopted.
- Metadata and semantic role can be used to describe and tag the meaning containing in natural language.

Semantic web allow machine supported data interpretation and ontologies as data model. The term "Semantic Web" is often used more specifically to refer to the formats and technologies that enable it. The collection, structuring and recovery of linked that provide a formal description of concepts, terms, and relationships within a given knowledge domain. These technologies are specified as W3C standards and include:

- RDF (Resource Description Framework)
- SKOS (Simple Knowledge Organization System)
- Web Ontology Language (OWL)
- RDFS (RDF Schema)
- SPARQL, an RDF query language
- N-Triples
- Notation3 (N3)
- Turtle (Terse RDF Triple Language)

b) Semantic Web Service

Web Service is software system designed to support interoperable machine-to-machine interaction over a network and Semantic Web Service is layer on top of the web service infrastructure to supply semantic meaning for web services. Semantic web services are used for the interchange of semantic data, because of this it easy to programmer to combine data from different sources and services without losing their own meaning. This Web Services can be activated "behind the scenes". In Web Services when a web browser makes a request to a web server, then this web services construct a reply. Automatic programs used semantic web services to run without any connection to a web browser. OWL (Web Ontology Language) used in Semantic Web Services platform that allows data and service providers to semantically describe their resources using third-party ontology is SSWAP: Simple Semantic Web Architecture and Protocol. SSWAP implements a lightweight protocol and the concept of a "canonical graph" to enable providers to logically describe a service. A service is transformation of some, possibly null, input to some, possibly null, output. The semantic service developers interested in semantic information. To describe domain knowledge, they adopt semantic model. Most of the companies focus on semantic information processing in cloud computing (example: Yahoo and Google).

IV. Conclusion and Future Scope

The purpose of this survey has been to describe semantic web with various technologies and services on web. This also describe semantic web in cloud computing and to convey to the reader about the richness and deepness of the area. Semantic Web Services as integrated solution for realizing the vision of the next generation of the Web. In the current year, researchers interested in semantic cloud service, and have made many great achievements. The rich literature is growing around these topics.

Many researchers attracted towards how to adopted ontologies in the distributed cloud computing environment. In future, we can focus on use of neural network concept with cloud computing and development of semantic web techniques. In this paper, we have provided some helpful information to the readers who are encouraged to take up the many challenges that remain in the area.

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