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Smart Governance of Rock Arts through SOA based Processing and Preservation

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Abstract: This paper is aimed at proposing a service approach to preserve the rich heritage and culture of different countries and deploy these services in the cloud. The model (for e.g. bronze Idols and stone sculptures in India) maker's methodologies are represented as a service and are accessed by the intended client applications. Presently, these heritage services necessitate intellectual middleware to integrate with the cloud. Service-Oriented Architecture (SOA), which exploits the web services and XML technologies, will present an elucidation to meet the current requirements. Web services provide a method for an open and flexible interface between such heterogeneous heritage systems with loosely coupled service endpoints. The services may be in the form of 3D motion pictures; ultrasonically detected images; pictures captured using laser sensors and thermal input devices. The availability of such services in the cloud enhances the consumers who are fascinated in the culture and heritage of a particular country to access them efficiently. The proposal also promotes the transnational cultural exchange and bestows one a personal distinctiveness and close ties between the countries and hence preservation of culture and heritage of one country is endorsed. The proposed approach will provide a scalable infrastructure for integrating heterogeneous heritage model services from different countries using a small set of powerful abstractions.

IndexTerms **- culture, cloud, heritage, intellectual middleware, service, SOA, xml.**

I. INTRODUCTION

When a nation's development is considered, the notion of self-reliance, self-sufficiency and national identity comes as the core, the culture is referred as the origin of all the policies whether educational, social, political, medical or economical. The strategies of a nation's development would therefore depend on the perceptive of the culture, the adaptation of its elements for political, educational and economic progress as well as its strengths for societal integration and maturity.

In this paper, the heterogeneous cultural heritages of different countries are networked together to form a distributed heritage network. Heritage information will be an integration of various collections obtained from different countries such as many traditional arts and craft, ornaments, utensils, weapons, folk tales, temples, churches, mosques, monuments, idols, civilization, museums, libraries, festivals and histories. The above said heritage treasures need to be preserved with environmental protection and survival techniques as a valued aspect of human development, as a link to our past and as the pointer to our future. The conservation of knowledge is never a ravage. Processing and interpretation of huge amounts of diverse heritage data and interoperability are important issues in designing scalable heritage network architecture. The gathered data can be made accessible to the interested audience by a variety of means. For such applications, heritage networks could not operate as standalone networks; there must be an effective way for users to gain access to the data produced by the heritage networks. It is proposed to consider the cloud infrastructure as a solution. At present, the cloud system stresses an intellectual middleware that can be interoperable with different entities to fulfill the client application necessities. The Web services based SOA will present an affordable clarification to meet up the current demands.

This paper proposes an advanced middleware solution to the problem of integrating a heritage network of different countries designed as a heritage system into the cloud at a high abstraction level. The SOA is middleware which acts as an agent, translating application requirements into heritage configuration parameters and provides an abstraction layer between applications and the underlying heritage network infrastructure. In this paper, service-oriented programming model based on web services is presented for heritage applications. Here the communication between entities is carried out through Web Service Description Language (WSDL) which is in the form of xml messages and SOAP messages which again makes use of XML. Data provided by the heritage networks are represented as Services. The proposed heritage Profiles reduces the verbosity of XML messages embedded with SOAP, hence occupies less bandwidth during data transmission.

Service Oriented Technology is one of the promising technologies to build complex systems like a cloud system. While cloud systems tend to experience a number of potential advantages with the novel aspects of the Internet, the Internet has introduced significant security threats to cloud data. As the volume of users accessing the cloud data is also increasing heavily, the

vulnerability of the data, which is an invaluable asset for any organization, is also increasing proportionally. Here the service oriented heritage networks as designed above are integrated with cloud through a fastening proxy, which acts as the Gateway.

The paper is organized as follows: In Section 2, we describe the related works, in section 3, we describe the Heritage system architecture and integration architecture with cloud and its components. Afterwards, we discuss about the advantages of the proposed approach in Section 4. Lastly, we conclude in Section 5..

II. STATE OF THE ART

A project based on digitization of cultural heritages [1] in the form of geometric and photometric modeling is proposed leading to a cloud museum. The importance of preservation of heritage and culture is imbibed through game based learning [2] [3], hence the understanding of one country's richness goes unobtrusively in the young minds. Cultural heritage search engines [4] are available. Universeum [5] is a European network aims at the preservation, study, access and promotion of university collections, museums, archives, libraries, botanical gardens, astronomical observatories, etc. and it is open to heritage and museum professionals, researchers, students, university administrators and all those involved with university heritage. A heritage network [6] service is available in the UK.

Art has distinguished the humankind from other species. The human intelligence is identified by the ability that they could express their thoughts and feelings through arts. The perception of art among human could be understood through the cave paintings, dating back to 40,000 years ago, [3] . From that time onwards, art has taken a material form. This form is susceptible to destruction and loss of arts.

There is no unique way to preserve and manage rock arts that are explored. It is essential and most urgent to preserve them as they extinguishing quickly. The Recent trend in academics and industries is to use enabled technologies such as IoT to create smart surroundings which is able to analyze the user's preferences. These technologies are not implemented widely in rock art sites. For this reason, the only advanced tools that could be used in cultural locations, such as rock art sites are the image capturing devices such as cameras, and transmitting these to user's mobile device after appropriate analyzing and processing.

Researchers [3] have proposed a process for evaluating and inferring from the pigments of rock art paintings through computer vision. The proposed method is designed to document and interpret poorly preserved pigments by making use of advanced techniques of photogrammetric and computational imaging.

CloudMuseum [4] is a project based on digitization of cultural heritages. A game based learning [5][6] enables the significance of preservation of heritage and culture in young minds. Universeum [7] is a European network, which aims at the preservation, study, access and promotion of university collections, museums, archives, libraries, botanical gardens, astronomical observatories, etc. and it is open to heritage and museum professionals, researchers, students, university administrators and all those involved with university heritage. In UK a heritage network [8] service is accessible.

A paper [9] on the preservation and reproducing the cultural heritage in cloud through service approach is presented. Cloud based machine learning analysis of rock art images is proposed in a paper [10]. An indoor location-aware architecture for smart museums based on IoT concept was designed and validated in [11].

Artie Vierkant [3], a digital artist has notified about the Image Objects which highlights the easy reconstruction. The essay "The Image Object Post-Internet", discussed the impact of technology on art which enables scanning, displaying, and printing.

III. PROPOSED HERITAGE SYSTEM

3.1 Service-Oriented Heritage Networks Architecture

An advanced middleware solution to the problem of integrating a Heritage Network into the information system of an enterprise, such as cloud at a high abstraction level is proposed through the Service Oriented Heritage Networks (SOHN) gateway. A client application querying the data to the heritage network plays the role of service requestor. The model makers of idols and historical building structures across the world act as a heritage service provider. Then the transformation and mapping algorithm have to be used to transform the heritage data into a user friendly format for the internet accessing. The heritage data is obtained from various country's model makers, which is in the form of heritage profiles-xml such as 3D motion pictures; ultrasonically detected images; pictures captured using laser sensors, thermal input devices and capturing the idol interiors using infra red thermo graphical methods.

Service Oriented Architectural model for representation of heritage services is shown in Figure 1. The heritage data is obtained from various country's model makers which is in the form of heritage profiles-xml such as 3D motion pictures; ultrasonically detected images; pictures captured using laser sensors, thermal input devices and capturing the idol interiors using infra red thermo graphical methods.

Service Oriented Architectural model for representation of heritage services is shown in Figure 1. A service is usable function that can be invoked by another component through a well-defined interface. Services are loosely coupled, that is, they hide their implementation details and only expose their interfaces. In this manner, heritage system client need not be aware of any underlying technology or programming language which the service is used. The loose coupling between services allows for a quick response to changes. This results in a much faster adoption to the need of applications which makes use of heritage applications. The heritage system clients discover the service available in the heritage registry by service names and acquire the interface information by HSDL of the heritage services. Based on this information, the clients have a binding with the heritage service provider and can invoke services using Simple Object Access Protocol (SOAP).To facilitate orchestration and aggregation of services into sensor processes and applications, an eb-XML-registry-repository is used. The registry-repository provides a single view of all services. The sensor services are published into the eb-XML registry using HSDL. The lists of services are discovered and invoked by the heritage applications (client), using SOAP with heritage profiles-XML messages.

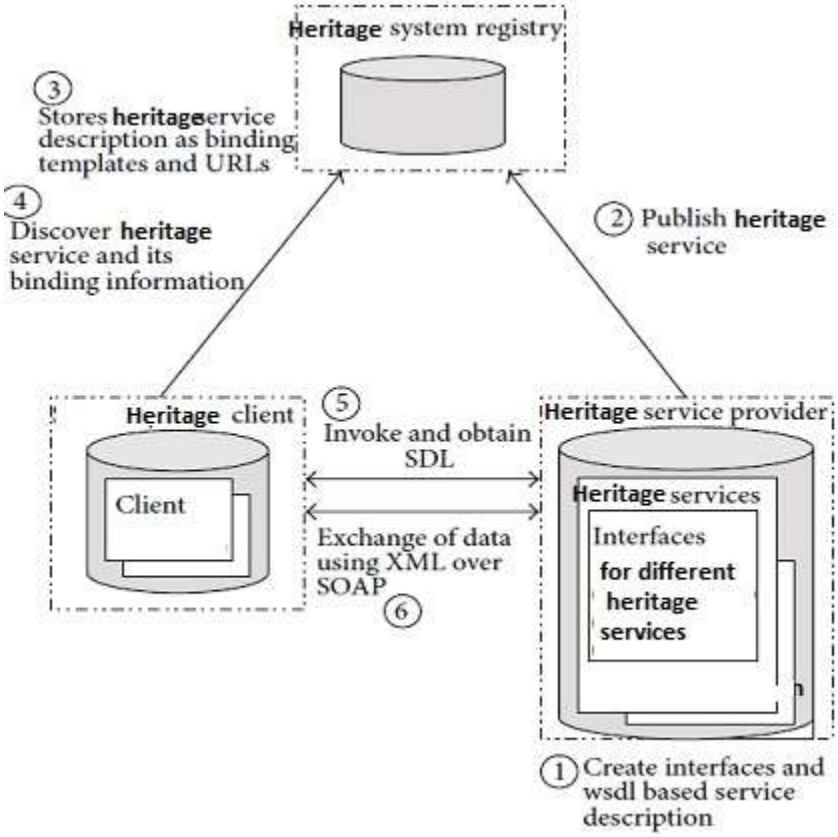

Fig.1. Service Oriented Heritage Network Architecture

3.2 Cultural Heritages as software

The heritage data, such as idol image in the form of 3D motion pictures, ultrasonically detected images, images obtained through laser sensors and thermal input devices are transformed in to digital data. The above said information is offered as a heritage service from different countries. The heritage parameters are converted into a web service and they could be deployed as a web service. Web services are application components that are designed to support interoperable machine-to-machine interaction over a network. This interoperability is gained through a set of XML-based open standards, such as the Web Services Description Language (WSDL), the Simple Object Access Protocol (SOAP), and Universal Description, Discovery, and Integration (UDDI). These standards provide a common and interoperable approach for defining, publishing, and using web services.

3.3 Heritage Profiles with xml

Using XML as a standardized data exchange format is a means to support more complex data management and heterogeneous heritage networks.XML representation of heritage data is essential for web service deployment. Moreover, XML is a key feature towards service-oriented sensor networks. Using XML in heritage networks encourages the interchangeability of different types of heritage models and systems. In this proposed work, heritage profiles are written in XML, to be transported with SOAP request and response message.

3.4 Heritage system Registry

To facilitate orchestration and aggregation of heritage services into processes and applications, registry (heritage repository) is used. To publish the heritage services, the eb-XML registry available with tomcat50-java web services developer package is used. The SDL files for heritage services are used and the appropriate service bindings are set to register the services on tomcat server.

3.5 Heritage Cloud Architecture with SOHNA

Heritage networks collect information about the iconic model makers, but typically lack the resources to store and process the collected data over long periods of time. Cloud computing elastically provides the missing storage and computing resources. Specifically, it allows to store and access the collected heritage data effectively via Cloud-based services. Heritage resources do not have direct connection with cloud. Hence, a framework is necessary to manage the data from the heritage network and take it over long environment. In this section, SOA architecture is extended to cloud by using fastening proxy which acts as a conduit between the two technologies. The Cloud architecture is shown in figure 2. In this architecture the fastening proxy will upload the heritage data to the IBM Blue mix Cloud . In the proposed architecture, the authentication of the message transmitted is taken care of in the fastening proxy module; the intended user is able to access the heritage data by performing a simple step of providing user name and password.

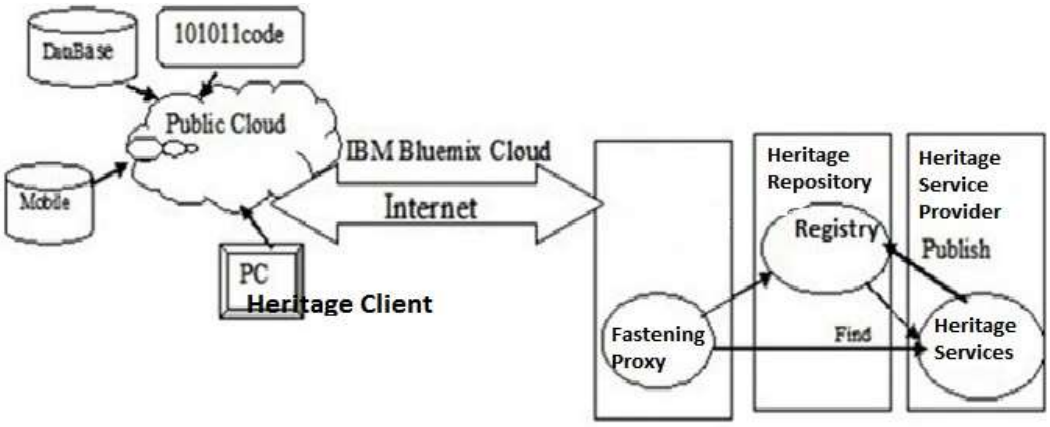

Fig. 2. Integrated Heritage Cloud Architecture with SOHN

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IV. ADVANTAGES OF THE PROPOSED APPROACH

Any country's cultural bequest is diverse. The proposed approach of preserving the culture and heritage of a country is articulated around the following major schema with an apparent and critical task for cultural heritage: artistic multiplicity and intercultural discourses are upheld.; promoting culture as a mechanism for inventiveness in the framework of any country's Strategy for development and employment; promoting culture as a critical ingredient in the external relations of any country. But the above said agenda engrosses the recognition of policy makers and collaborative work of heritage managers, conservators and researchers of a country.This approach provides the international cultural and heritage exchanges.

The proposed approach may lead to the linkage of public and private research organizations across the Globe and research partners from universities, research centres, archeologists, museums to a Private Corporation to develop and apply the best technology and scientific know-how to the cultural heritage. Research has focused on solutions to preserve movable and immovable cultural heritage assets, such as artifacts and monuments respectively. This tangible part of the cultural heritage, together with the digital and intangible aspects, embodies a precious store of knowledge and treasure of significant historical and socioeconomic significance of a country.

Architectural beauty is good for the human brain. A relatively new area of neuroscience known as Neuro-aesthetics posits the theory that beauty in art and design makes people happy. Hence, when people study about art and culture, it improves their life span.

We have distributed information about the culture and heritage which are available through Wikipedia and several web sites. The proposed approach will bring a unified integrated solution for interested model makers of idols and historical structures. The antique bronze idols and the idols made of herbal plants are getting looted and many such incidents are evidenced in news papers [7] [8]. A five-and-half-foot tall Vishnu stone idol belonging to Pallava period and datable to the 9th century CE was stolen from a Vishnu temple in India. With this information the idol can be restructured and hence preserved using the proposed approach.

If the precious monuments are destroyed in natural calamities such as earthquakes, strong tremors, tsunami and flood, they could be reconstructed within a short period of time, using the proposed method. Dilapidated idols and monuments could be restructured in any shape such as miniature models or a very big massive structure of the replica could be reconstructed. Historic buildings are physical links to the past. It's not just about saving bricks, but about saving the layers and layers of information about the lives and those of the ancestors. Historically significant buildings contribute to countries, cultural and economic well-being, the vibrancy of street life need not be mentioned.

For example, if each and every stone of the Thanjavur big temple in India is visualized as 3D along with the study of material property and sturdiness, it is possible to replicate the Thanjavur big temple. By this preservation is achieved and it will be a valuable asset for our future generation.

Cultural heritage could provide an automatic sense of unity and belonging within a group and allows the people to better understand previous generations and the history of where they come from. There is a scientific meaning for each and every structure of Indian temple. For example the tallest structures with vessels on the top in Hindu temples absorbs the thunder and withstand the lightening, hence the surrounding areas could be safeguarded. The property of such structures should be preserved for reconstruction. With proposed approach, fewer building materials are required to refurbish old buildings, which reduce waste headed to landfill and the demand for aggregates grooving holes in the geography to supply the materials for new bricks and mortar. With readymade concrete technology, nothing is impossible to reproduce.

Finally, since the heritage information is stored in a heritage registry/ repository, recording this information in huge volumes of books, CDs are avoided. The models need not be kept in very large museums; they can be accessed virtually for reference from the heritage cloud which leads to Green environment.

V. CONCLUSION

The proposed paper aimed at working on the service oriented paradigm as a medium for preserving the heritage network. This solution is extended to heritage clouds offering heritage as a Service. The necessary abstraction could be implemented using the service oriented parameters. The proposed architecture enables the interested client applications of the particular domain to easily access and process large amounts of heritage data from various countries. Hence the architecture is scalable as heterogeneous heritage systems can be integrated with cloud through the service oriented heritage parameters. A way to preserve the culture of one country is to record it for future generation. The proposed approach achieves this. The availability of such rock art images as services in cloud enhances the consumers who are fascinated in culture and heritage of a particular country to access them efficiently and reprocess. The proposed scheme promotes the global cultural exchange and bestows one a personal distinctiveness and a close tie between the countries and hence the preservation of culture and heritage of one country is endorsed. The proposed system provides an effective, integrated rock-art management information service to the end user over the Web.

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