SAVOIR: Coordination of Collaboration as a Service

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ABSTRACT
Today’s open Internet protocols and extensible standards give rise to enhanced collaboration. But the scope of collaboration is too complex for any single vendor to be able to provide all the pieces. Rather than basing a collaboration platform on a single application, heterogeneous resources arising from multiple sources should be plugged into a shared framework. Thus there is a demand for a collaboration framework that is open, extensible and modular. We introduce such a framework: Service-oriented Architecture for a Virtual Organization’s Infrastructure and Resources (SAVOIR). Built on the concept of Software as a Service (SaaS), SAVOIR provides Coordination of Collaboration as a Service (CCaaS) that supports interaction of resources from different suppliers as well as scheduling and provisioning them; thus it provides a single entry point to coordinate participants and resources into collaborative sessions.

Author Keywords
Virtual Organization, resource management, coordination, open collaborative system, SOA

ACM Classification Keywords
C.2.4 Distributed Systems: Distributed Applications; D.2.13 Reusable Software: Reuse models

General Terms
Design, Experimentation, Management

INTRODUCTION
Many people are now working with remote collaborators under the notion of Virtual Organization (VO) - the flexible, secure and coordinated sharing of resources among dynamic collections of individuals, institutions, and resources [1]. A VO addresses critical resource, personnel, and logistical issues, and accomplishes some common goals that are unlikely to be achievable by any collaborator individually. Typically each VO shares a pool of resources that may include software applications, hardware, data collections, computational power, storage, network connectivity, and in some cases specialized applications for dynamically reconfiguring network or computational infrastructure for ad

hoc needs. This includes cloud computing and reconfiguring optical networks [4].

It is a huge challenge to create effective collaborative sessions where geographically distributed experts access widely varying resources, both synchronously and asynchronously. Beyond human-to-human conferencing tools with all of the human interface factors, the required coordinations also include human to device, device to data, application to application, device to network, and organization to organization. Can service computing provide the solution to coordinating these collaboration requirements, and be sufficient to support different VOs in different domains, each sharing different resources?

Our demo system, SAVOIR, creates an open platform to provide Coordination of Collaboration as a Service (CCaaS). The requirements, collaboration domains, members of the VOs, and resources are ever-changing. Thus a closed system will be unable to capture every aspect of collaboration. New VOs must be defined on demand; resources gathered from multiple sources must be plugged into an open framework. SAVOIR is built on a service-oriented architecture and utilizes open Internet protocols and standards such as HTTP, REST, SOAP, and WSDL to provide resource, user, and session coordination with the emphasis on openness, extensibility, and customizability.

We demonstrate how SAVOIR supports two very different VOs, one for distributed architectural design, and another for health training.

TWO SAMPLE SCENARIOS
To help understand the diversity of collaboration sessions SAVOIR is designed to deal with, we provide two scenarios. In the first, a large scale urban redevelopment project involved a number of collaborative stakeholders including architects, urban designers and planners, landscape architects, artists, lighting designers, engineers, heritage conservationists, stone masons, developers, financiers, city officials, and the general public. These diverse parties are unlikely to be located in the same place, but they have to work together as a team. SAVOIR provides the means to acquire and create digital contents on and off the urban site, to visualize and manipulate those contents in immersive environments, and to deploy those environments across networks. The precursor of SAVOIR, Eucalyptus [2],[3], brought together the visualization clusters, rendering farms, media repositories, and high definition videoconferencing applications into the
participatory design sessions, hiding most of the logistics of provisioning these resources from the collaborators.

In the second scenario, suppose two doctors are in training. They are discussing a case under the observation of the instructor and the rest of the class. They are using a number of tools that allow them to investigate the patient’s symptoms, find the root causes, look up recommended procedures, test procedures on both a mannequin and a virtual patient simulator, and observe the procedure’s effect on the patient. For example, the patient may experience high blood pressure, meaning that something was not done correctly. The instructor would then review the case and review the trainees progress with the other students in class. Now imagine the participants are in different locations. The instructor is in one city, the two doctors are in another city, and the rest of the class are perhaps in different locations. Furthermore, some of the tools that are being used are also distributed Internet applications, such as the Remote Stereo Viewer for 3D anatomy and the online searchable medical guidelines. Figure 1 shows the connections required to support this scenario.

SAVOIR evolved from Eucalyptus by making all the components more generic, with the intent to support CCaaS for any given domain, including health services training described in the second scenario. SAVOIR also supports more collaboration between the tools at runtime, as described in the next section.

DESIGN HIGHLIGHTS

In order to deliver CCaaS, SAVOIR is designed to use open standards with the maximum flexibility for one to customize the services to be used in a VO. SAVOIR manages the interactions through several core management services: the user manager, the session manager, the resource manager and the threshold manager. We use the term edge service to refer to any of the interactive devices, services and resources that are not part of the core of SAVOIR. These devices are wrapped as web services and thus made available to SAVOIR. SAVOIR employs an enterprise service bus to host the management services, and all the edge services are also connected to the bus as different endpoints. The bus routes messages based on rules that are governed by the threshold manager, which consists of a forward chaining rule engine loaded with rules specific to a given collaboration session. When the state of one of the resources or users changes in a way that signals an important event, like the worsening of the vital signs of a patient, then other events are triggered to provide an appropriate response. Figure 2 illustrates the conceptual architectural design in SAVOIR.

A collaborator using the SAVOIR CCaaS service can interact with another collaborator(s) and edge services via the web based client called MySAVOIR, where each edge service is represented as a widget. In the case where some edge service requires some local applications to be executed, we use a 2-way bridge to communicate with the user’s system tray for any events of interest.

REFERENCES