05271 Abstracts Collection
Semantic Grid – The Convergence of Technologies
— Dagstuhl Seminar —

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Abstract. From 03.07.05 to 08.07.05, the Dagstuhl Seminar 05271 "Semantic Grid – The Convergence of Technologies" was held in the International Conference and Research Center (IBFI), Schloss Dagstuhl. During the seminar, several participants presented their current research, and ongoing work and open problems were discussed. Abstracts of the presentations given during the seminar as well as abstracts of seminar results and ideas are put together in this paper. The first section describes the seminar topics and goals in general. Links to extended abstracts or full papers are provided, if available.

Keywords. Semantic Grid, Semantic Web, Grid, Web Services, Agents, Peer-To-Peer

05271 – Report on the Dagstuhl Seminar on Semantic Grid

York Sure (Universität Karlsruhe, D)

The scientific paradigms of the Semantic Web, Web Services, Agents, Peer-to-Peer Networks and Grid Computing are currently receiving a lot of attention in the research community, and are producing solutions to important problems ranging from e-science to e-business. The United States DAML program, the European Commission and other organisations have also been investing heavily in these technologies. This Dagstuhl Seminar brought together world-leading experts from the diverse organizations and research areas. It strengthened the international collaboration with the aim to realize the vision of the Semantic Grid.

Keywords: Semantic Grid, Semantic Web, Grid, Web Services, Agents, Peer-To-Peer
Joint work of: Sure, York; Goble, Carole; Kesselman, Carl

Full Paper: http://drops.dagstuhl.de/opus/volltexte/2005/393

05271 – Prospectus for Dagstuhl Library Working Group

Reagan Moore (Univ. California - San Diego, USA)

Prospectus for the formation of a Digital Library Group The topics of data and information virtualization are proposed as the basis for a working group at the Dagtuhl conference on the Semantic Grid.

Keywords: Digital Library, Data Grid, Persistent Archive, Semantic Grid

Extended Abstract: http://drops.dagstuhl.de/opus/volltexte/2005/396

Semantic Grid Seminar – Welcome

York Sure (Universität Karlsruhe, D)

On behalf of the organizers I am happy to welcome you at the Semantic Grid Dagstuhl Seminar. Together we will first try to answer the questions "Where are we?", "Who brought you here?", "What do we miss (while being here)?" and "What do we do here?". In between I have a surprise for our friends from the US. I will conclude with an overview of organisational issues.

Keywords: Welcome

Semantic Technologies in the SIMDAT Grid Project

Jürgen Angele (ontoprise GmbH - Karlsruhe, D)

The SIMDAT project aims at developing generic grid technology for the solution of complex application problems and using this new technology in several industrial application sectors. Semantic technologies are expected to offer a significant added value to other technologies with respect to the management of resources on the process level and on the data level. The strategic objectives of SIMDAT are (i) to test and enhance data grid technology for product development and production process design, (ii) to develop federated versions of problem-solving environments (PSEs) by leveraging enhanced grid services, (iii) to exploit data grids as a basis for distributed knowledge discovery, (iv) to promote de facto standards for these enhanced grid technologies across a range of disciplines and sectors as well as (v) to raise awareness for the advantages of data grids in important industrial sectors.

Keywords: Simdat, Semantic Technologies

Joint work of: Angele, Juergen; Weiten, Moritz

Extended Abstract: http://drops.dagstuhl.de/opus/volltexte/2005/382

The Adaptable Viral Archive

Bruce R. Barkstrom (NASA Langley ASDC - Hampton, USA)

In this paper, the author considers how semantic technologies may impact the design of future archives, which require both very secure approaches to maintaining data, metadata, and their provenance, as well as the most cost effective operation possible. One potential application for semantic technologies may be improving the automation of system configuration, allowing an archive to be "self-replicating" or "viral" – meaning that the archive infrastructure as well as its data could automatically pack itself into a self-contained structure that could be transmitted to a new site and automatically unpack itself. A more challenging problem is likely to be dealing with the evolution of the semantics of the collection and of the archive's user communities over an extended period of time.

Keywords: Self-replicating archives, Ontology Evolution

Extended Abstract: http://drops.dagstuhl.de/opus/volltexte/2005/389

From Knowledge-based Workflow Composition to Transparent Semantic Grid

Marian Bubak (AGH Univ.of Science & Technology - Krakow, PL)

The main objective of the K-WfGrid Project is the knowledge-based support for workflow construction and execution so we are developing methodology and build a system that semi-automatically composes a workflow of Grid services, executes the composed workflow application, monitors the performance of the Grid infrastructure and applications, analyses the resulting monitoring information, captures the knowledge contained in the information, reuses the joined knowledge gathered from all participating users in a collaborative way in order to efficiently construct workflows for new Grid applications.

Keywords: Workflow, Semantic Grid

Knowledge (discovery)-based Grid Middleware Services

Mario Cannataro (University of Catanzaro, I)

Scientific and commercial applications, as well as Grid middleware, will more and more produce an overwhelming quantity of application and usage data. The great availability of usage data and information at the different layers of Grids, the maturity of data exploration techniques able to extract and synthesize knowledge, such as data mining, text summarization, semantic modelling,

and knowledge management, and the demand for intelligent services in different phases of application life cycle, are the driving forces towards novel knowledge discovery-based Grid services. The goal of this position paper is to motivate the need of knowledge discovery-based Grid services that can be used to improve the behaviour, performance and quality of service of current Grid services as well as the workflow execution.

Keywords: Knowledge Discovery Grid Services, Knowledge Grids, Ontology

Reasoning Services for the Semantic Grid

Oscar Corcho (Manchester University, GB)

The aim of this work is to provide methods,techniques and technology to handle knowledge distribution and format heterogeneity, and to perform distributed reasoning by dividing complex reasoning processes in simpler ones and building up global solutions from the partial results obtained, ensuring the quality of service (QoS) of the reasoning process by solving problems regarding failures in resources and reasoning processes.

Keywords: Reasoning, Semantic Grid

What the Grid can do for the Semantic Web

David De Roure (Univ. of Southampton, GB)

One of the reasons that people turn to the Grid is for large scale computation and data processing, and there are Semantic Web applications which stand to benefit from this, including knowledge discovery and large reasoning tasks. However there are several additional ways in which the Semantic Web can benefit from the Grid and the Grid community. The Grid provides a robust, deployed distributed infrastructure for use and indeed for exploration - richer than Web Services at this time. Semantic Grid applications developed in recent years provide case studies which can inform Semantic Web research - for example the CombeChem e-Science project has over 80 million RDF triples across multiple stores and represents a substantial Semantic Web deployment, while other projects have emphasised issues of real time processing and interaction.

Significantly, the Grid community has processes in place to support community interaction and development of standards, providing a mechanism to achieve the degree of interoperability which is needed for uptake of Semantic Web; it also provides an enthusiastic developer community actively seeking solutions to problems in Grid middleware and applications and willing to try new solutions. Additionally the Grid provides a real context for deploying Semantic Web Services, particulary to support Virtual Organisations, and Semantic Grid

researchers are beginning to explore knowledge services supporting Grid services and vice versa.

Finally, a series of challenges for Semantic Web have emerged, including the engineering and architecture of large triplestores, working with incomplete or inconsistent descriptions, the relationship between Grid Services and agents, and autonomic aspects. In particular, Virtual Organisations are an important focus at this time, also drawing on aspects of agency.

Keywords: Semantic Web, Grid, Semantic Grid, Virtual Organisations

A Brief History of the Semantic Grid

David De Roure (Univ. of Southampton, GB)

This is the story of the Semantic Grid, from its origins in the UK eScience programme in 2001 through to the Dagstuhl event in 2005.

Keywords: Semantic Grid

Full Paper: http://drops.dagstuhl.de/opus/volltexte/2005/398

Web Services Modelling Ontology and the Grid

John Domingue (The Open University - Milton Keynes, GB)

WSMO is a framework and associated formal language and reference execution environment which aims to facilitate the automation of the tasks associated with the creation of web applications from web services. The talks first gives a generic overview of semantic web services and then outlines the main components of WSMO: ontologies, goals, web services and mediators.

Keywords: Semantic Web Services, WSMO, Grid

Virtual Organizations and Semantic Grid - The Enabling Effect of Explicit Knowledge Explicitly Used

Alvaro A. A. Fernandes (Manchester University, GB)

These notes are best read as raw material for an argument that expresses one position among many regarding what semantic approaches can bring of benefit to grid computing. The basic claim is that the grid vision is indeed of a semantic grid, insofar as the full range of virtual organizations will be difficult to realize with grids that are not founded on explicit knowledge explicitly used. A virtual organization is a computational system in which not only resource sharing but composition of capabilities too is essential. A (classical) grid enables virtual

organizations that are primarily concerned with resource sharing. Composition of capabilities requires an enrichment of the technical context which a grid provides.

A semantic grid is such an enriched grid. It is a grid in which knowledge in, of and for the grid is explicitly held and explicitly used. A semantic grid seems likely to be sufficient to enable the full range of virtual organizations.

Keywords: Virtual Organizations, Explicit Knowledge

Middleware Use Cases

Ian Foster (Argonne National Laboratory, USA)

This presentation gives an overview about Middleware Use Cases for Semantic Grids.

Keywords: Middleware, Web Services, WSRF, Virtual Organization

What Agends can do for Grids: Cognitive Grids

Yolanda Gil (USC/ISI - Marina del Rey, USA)

This presentation gives an overview on whatAgends can do for Grids, in particular the notion of Cognitive Grids is explained in detail and its relevance for a Semantic Grid is emphasized.

Keywords: Agents, Cognitive Grids

Why Grids for Distributed Intelligent Systems: Because Robustness Matters

Yolanda Gil (USC/ISI - Marina del Rey, USA)

This presentation focusses on the relationship of Grids and Distributed Intelligent Systems.

Keywords: Grid, Distributed System, Robustness

Semantic Grid: A love match? or A marriage of convenience?

Carole Goble (Manchester University, GB)

The Semantic Grid. Is it truly "A love match?" Or, is it rather "A marriage of convenience?".

Keywords: Semantic Grid, Marriage

Towards a Semantic Grid Architecture

Carole Goble (Manchester University, GB)

The Semantic Grid is an extension of the currentGrid in which information and services are given well defined and explicitly represented meaning, better enabling computers and people to work in cooperation. In the last few years, several projects have embraced this vision and there are already successful pioneering applications that combine the strengths of the Grid and of semantic technologies. However, the Semantic Grid currently lacks a reference architecture, or a systematic approach for designing Semantic Grid components or applications. We need a Reference Semantic Grid Architecture that extends the Open Grid Services Architecture by explicitly defining the mechanisms that will allow for the explicit use of semantics and the associated knowledge to support a spectrum of service capabilities. An architecture would have (at least) three major components which are depicted in the extended abstract.

Keywords: Semantic Grid Architecture

Extended Abstract: http://drops.dagstuhl.de/opus/volltexte/2005/384

ODESGS – an Environment for the Annotation and Design of Grid Environments

Asuncion Gomez-Perez (Univ. Politec. de Madrid, E)

ODESGS is an ongoing work carried out in the Ontogrid Project (FP6-511513). It is the extension of the ODESWS Environment developed in the context of the Esperonto Project (IST-2001-34372) and is an implementation of the ODESGS Framework [2]. This framework is being developed for the markup of Grid Services (GS) and creation of new complex Semantic Grid Services (SGS) from these annotated GS, to enable their discovery and (semi)automatic composition. It also formalizes Virtual Organizations (VO) with it, defined, since the appearance of OGSA, as a set of the services that are operated and shared. Therefore, VO description is closely attached to the descriptions made to each GS individually, plus additional information about the relationships and policies between these services. Note that what we mean as markup of VO and SGS is the association of these elements with an instance of the ODESGS Ontology.

Keywords: Semantic Grid Services

Extended Abstract: http://drops.dagstuhl.de/opus/volltexte/2005/388

Ontology Access Provisioning in Grid Environments

Asuncion Gomez-Perez (Univ. Politec. de Madrid, E)

The increase of use of semantic technologies has reached almost every computer science related field, including the grid computing field. The next generation Grid should virtualise the notion of distribution in computation, storage, and communication over unlimited resources with well defined computational semantics. A Grid node may provide new services, functions or even new concepts that are unknown to clients. The semantics of such services are defined by means of Ontologies. Thus providing the appropriate means for accessing and using Ontologies in the Grid is fundamental if semantic technologies are to be used. So, the transition from monolithic, centralized ontology services to a virtual organization of Grid compliant and Grid aware ontology services that can coordinate and cooperate with each other is crucial to progress towards the Semantic Grid.

Keywords: Ontology Access, WS-DAIO

Joint work of: Gutierrez, Miguel Esteban, Gomez-Perez, Asuncion

Extended Abstract: http://drops.dagstuhl.de/opus/volltexte/2005/383

Semantics, OGSATM, and Agents (Oh my)

Andrew Grimshaw (University of Virginia, USA)

In this presentation background information on OGSA are provided. Further, the following questions are raised and (partially) answered: When and how can semantics help OGSA? How can grids help semantic grid efforts?

Keywords: OGSA, Agents

Grid Brief

Andrew Grimshaw (University of Virginia, USA)

This presentation gives a brief overview on "Grids", including definitions such as: "A Grid system is a collection of distributed resources connected by a network.", "A grid is all about gathering together resources (CPU, data, policy, devices, ...) and making them accessible to users and applications." and "A grid enables users to collaborate securely by sharing processing, applications, work flows and processes, and data across heterogeneous systems and administrative domains for collaboration, faster application execution, and easier access to data."

Keywords: Grid

What the Semantic Web can do for the Grid

James A. Hendler (University of Maryland - College Park, USA)

The Semantic Web is a set of emerging technologies that can be used for modeling organizations, enterprises and resources on the Web in a machine readable way. Based on a set of emerging standards from the World Wide Web Consortium (W3C), RDF, RDFS and OWL, the Semantic Web is reaching a maturity and use level that is of importance to the Grid. This talk overviews work in the Semantic Web, including demos, and assesses the state of maturity of each of the relevant technologies.

Keywords: Semantic Web, Grid, RDF, RDFS, OWL

Full Paper: http://www.sciam.com/article.cfm?articleID=00048144-10D2-1C70-84A9809EC588EF21

Enhanced Semantic Discovery and Composition of Complex Workflows

Kashif Iqbal (National University of Ireland - Galway, IRL)

The limited descriptions of Web Services currently held by the standard UDDI-based registries restrict their dynamic discovery and composition. In addition, a service or resource description can appear semantically compatible but may actually be structurally incompatible, which may create inconsistencies during dynamic service composition. It is evident that well-defined service descriptions in terms of their capability, interfaces, and non-functional properties will enhance their dynamic discovery, composition, and invocation. This project will address the research area related to semantically enhancing service descriptions so that complex workflows based on these services can be dynamically composed and invoked. The work within this project will address the research and development of the informational model that needs to be implemented to semantically enhance service descriptions for dynamic composition. In addition, the project will investigate the potential of a variety of registries to be extended to enable the extended service descriptions as well as the ability to support a variety of complex queries that fulfil the needs of complex workflow composition.

Keywords: Web Services, Dynamic Discovery and Composition, Workflow, Compatibility

The Grid

Carl Kesselman (USC/ISI -Marina del Rey, USA)

Grids enable resource sharing and coordinated problem solving in dynamic, multi-institutional virtual organizations. I will present major characteristics of Grids, examples of Grid applications, a glimpse on where semantics fits into Grids and illustrate the need for Grids in Virtual Organisations. I conclude by listing 10 most urgent research questions for Grids.

Keywords: Grid

Scientific Workflow and Semantic Grid - Notes from

Bertram Ludaescher (Univ. of California, Davis, USA)

Scientific workflows allow scientists to automate repetitive data management, analysis, and visualization tasks, and to document the provenance of analysis results. Scientific workflows are composed of interlinked computational components (sometimes called "actors"), and the datasets that are consumed and produced by those components. Scientific workflow systems are problem-solving environments to design, reuse, share, execute, monitor, and archive scientific workflows. As such, they are the primary tool that end user scientists use when interacting with the emerging e-Science cyberinfrastucture. Scientific workflow systems can often benefit from both, Grid and Semantic Web capabilities. Thus, scientific workflows can bring together these otherwise loosely connected technologies and "catalyze the reaction" between them. Taken together, resource management provided by Grid services and knowledge capture and management through Semantic Web technologies, provide essential capabilities of any general purpose, large-scale scientific workflow systems. In various ongoing projects we employ these technologies to enhance the Kepler scientific workflow system and make it more versatile for the scientist and more interoperable with other e-Science/cyberinfrastructure tools and services.

Keywords: Scientific Workflows, Semantic Web, Ontologies, Grid, Distributed Computing, Problem-Solving Environments

Joint work of: Ludaescher, Bertram; Guo, Yike; Barkstrom, Bruce; Rana, Omer F.

Trust Management in the Semantic Grid

Brian Matthews (Rutherford Appleton Lab. - Didcot, GB)

The analysis of trust and it management in virtual organisations has been active research area over the last few years. The European project TrustCoM is looking to build a framework for using trust and contract management in the context of virtual organisations across businesses. It has developed a model of trust and an analysis of how trust management influences the establishment of contracts and SLAs, and the enforcement of the contracts during the execution of the VO. This framework offers the Semantic Grid a definition of trust, its relationship to reputation, risk and contracts, and a set of challenges and models for the use of trust in a VO management system. By adding ontologies from the semantic web for trust evaluation, contracts and policies, we can make these concepts more explicit and expressive, capturing in an extensible and tranferable fashion their attributes. Rules can be then used to enforce policies and provide feedback of execution onto the policies and trust evaluations.

Keywords: Trust Management, Semantic Web, Grid, Virtual Organisations, Security, Policies

Digital Libraries and the Semantic Grid

Reagan Moore (Univ. California - San Diego, USA)

The topics of data and information virtualization are proposed as the basis for a working group at the Dagtuhl conference on the Semantic Grid.

Keywords: Digital Library, Data Grid, Persistent Archive, Semantic Grid

See also: Moore, R., A. Rajasekar, M. Wan, "Data Grids, Digital Libraries and Persistent Archives: An Integrated Approach to Publishing, Sharing and Archiving Data", Special Issue of the Proceedings of the IEEE on Grid Computing, Vol. 93, No.3, March 2005.

Data Grid Security Implementation in the Storage Resource Broker

Reagan Moore (Univ. California - San Diego, USA)

The security mechanisms that are used within digital libraries and persistent archives rely upon the ability to authenticate every person with permissions for altering material. These permissions must be maintained as the stored files are moved between storage systems. This implies that the concept of security must be managed by the digital library independently of the underlying storage

systems. Fortunately this capability is provided by data grids. Data grids assert ownership of the registered data and store the data under an account ID that is set up for the data grid. Data grids also manage the name spaces for identifying resources, users, files, metadata, and access constraints independently of the storage repositories. An access control is a relationship established between any two of the name spaces. The implication is that as data is moved within the data grid, the access controls remain invariant since neither the logical file name or the distinguished user name changes.

Keywords: Data Grid, Access Controls, Access Roles

See also: 39. Rajasekar, A.,M. Wan, R. Moore, "mySRB and SRB, Components of a Data Grid", 11th High Performance Distributed Computing conference, Edinburgh, Scotland, July 2002.

Digital Library and Data Grid Technology Group

Reagan Moore (Univ. California - San Diego, USA)

Digital libraries and data grids manage state information about data collections. This is in contrast to the management of semantic information used for discovery that is provided by semantic web technology. The discussion group investigated the types of inferences and relationship management that would improve digital library and grid services. Notable examples include management of relationships discovered by data mining services, management of properties associated with grid name spaces, and management of properties associated with encoding format structure descriptions.

Keywords: Digital Library, Data Grid, Persistent Archive, Encoding Format, Semantic Web

Extended Abstract: http://drops.dagstuhl.de/opus/volltexte/2005/390

Digital Libraries and Data Grids Group

Reagan Moore (Univ. California - San Diego, USA)

The management of data entails an understanding of the name spaces needed to characterize grid state information, the name spaces that describe results of data mining and knowledge generation, and the name spaces associated with structures in data files. The working group explored how ontologies can associate properties with these name spaces that support the creation of new grid services. The slides include a presentation, notes on the working group discussion, and the summary.

Keywords: Data Grid, State Information, Ontology

What can the Semantic Grid do for Science and Engineering?

James D. Myers (Univ. of Illinois - Champaign, USA)

Scientists and Engineers have been happily performing research and Analyses for hundreds of years without the Semantic Grid. What's changing in their world now that would motivate them to look to the Semantic Grid? Which of their problems can it solve? And how can we recognize the low-hanging fruit Ű the combinations of communities and issues where introducing the Semantic grid now will create the most scientific value? Traditional science is being done ŚfasterŠ and community-level discovery-based science and systems approaches are emerging. Semantic Grid technologies can provide a critical capability to reuse data, software, and services while evolving the underlying grid and science models involved. While not often mentioned by name, SG technologies Ű exposing and reasoning over model-level descriptions of resources within and on the Grid Ű are directly relevant to problems of managing large amounts of heterogeneous data in a fluid scientific and technological environment. This presentation will attempt to map between language of science and that of grids and the semantic web to identify use cases where deploying a Semantic Grid could have significant scientific value.

Keywords: Science, Semantic Grid, Decoupling

Extended Abstract: http://drops.dagstuhl.de/opus/volltexte/2005/395

The Semantic Grid in the context of EU IST Research

Eoghan O'Neill (European Commission Brussels, B)

In this presentation an overview is given about available funding options at the European Union Commission in the IST research division.

Keywords: EU IST Research

Policy Based Negotiation for Authorization

Daniel Olmedilla (L3S Research Center and Hannover University, D)

Policy-based dynamic negotiations allow more flexible authorization in complex Grid environments, and relieve both users and administrators from up front negotiations and registrations. This paper describes how such negotiations overcome current Grid authorization limitations, and how policy-based negotiation mechanisms can be easily integrated into a Grid infrastructure. Such an extension provides advanced access control and automatic credential fetching, and can be integrated and implemented in the new version 4.0 of the Globus Toolkit.

Keywords: Trust, Security, Policies, Safety, Reputation, VO Lifecycle

Negotiating Trust on the Grid

Daniel Olmedilla (L3S Research Center and Hanover University, D)

Grids support dynamically evolving collections of resources and users, usually spanning multiple administrative domains. The dynamic and crossorganizational aspects of Grids introduce challenging management and policy issues for controlling access to Grid resources. In this paper we show how to extend the Grid Security Infrastructure to provide better support for the dynamic and cross-organizational aspects of Grid activities, by adding facilities for dynamic establishment of trust between parties. We present the PeerTrust language for access control policies, which is based on guarded distributed logic programs, and show how to use PeerTrust to model common Grid trust needs.

Keywords: Trust, Policy, Negotiation

Joint work of: Basney, Jim, Nejdl, Wolfgang, Olmedilla, Daniel, Welch, Von, Winslett,Marianne

Full Paper: http://drops.dagstuhl.de/opus/volltexte/2005/387

Full Paper: http://www.l3s.de/ olmedilla/pub/negotiationOnTheGrid.pdf

See also: 2nd Workshop on Semantics in P2P and Grid Computing at the Thirteenth International World Wide Web Conference, May 2004, New York, USA

Trust and Security (break-out session)

Daniel Olmedilla (L3S Research Center and Hanover University, D)

Current trend in GSI is to enable trusts relationships to be established in the Grid community – generally through the use of X509-based digital certificates, and more recently, through the use of security assertions (SAML) and role-based access management (PERMIS and Shibboleth). However, those security mechanisms still do not scale. Among the existing problems we can identify mechanisms that are too rigid for authentication and authorization, in terms of access control, and the lack of an ability to determine how “trustworthy” the result obtained from a specific provider is likely to be. Trust management provides us with the basis to overcome these two points of view. However, the general notion of "trust" is excessively complex, and appears to have many different meanings depending on how it is used. Trust is seen as a multifaceted issue and may be related to other themes such as risk, competence, security, beliefs and perceptions, utility and benefit, and expertise. In addition, policy-based trust management is understood as statements guiding a process where two strangers are able to commit a specific transaction. Therefore, the aim of this special session will be to encourage the discussion about and identify the advantages/uses/requirements/threads of applying trust on Grid computing from complementary points of view.

Keywords: Trust, Security, Policies, Safety, Reputation, VO Lifecycle

Joint work of: Olmedilla, Daniel;Rana, Omer F.;

Security and Trust Issues in Semantic Grids

Daniel Olmedilla (L3S Research Center and Hannover University, D)

Grid computing allows sharing of services and resources accross institutions. However, current Grid security mechanisms for authentication and authorization are too rigid and they lack the ability to determine how "trustworthy" the result obtained from a specific provider is likely to be. This paper describes the different facets associated to Trust and identifies the need for Trust Management approaches in the context of Virtual Organizations lifecycle and resource access control in the Grid.

Keywords: Trust, Security, Policies, Safety, Reputation, VO Lifecycle

Joint work of: Olmedilla, Daniel; Rana, Omer F.; Matthews, Brian; Nejdl, Wolfgang

Modeling Services for the Semantic Grid

Axel Polleres (Universität Innsbruck, A)

The Grid has emerged as a new distributed computing infrastructure for advanced science and engineering aiming at enabling sharing of resources and information towards coordinated problem solving in dynamic environments. Research in Grid Computing and Web Services has recently converged in what is known as the Web Service Resource Framework. While Web Service technologies and standards such as SOAP and WSDL provide the syntactical basis for communication in this framework, a service oriented grid architecture for communication has been defined in the Open Grid Service architecture. Wide agreement that a flexible service Grid is not possible without support by Semantic technologies has lead to the term "Semantic Grid" which is at the moment only vaguely defined. In our ongoing work on the Web Service Modeling Ontology (WSMO) we so far concentrated on the semantic description of Web services with respect to applications in Enterprise Application Integration and B2B integration scenarios. Although the typical application areas of Semantic Web services have slightly different requirements than the typical application scenarios in the Grid a big overlap justifies the assumption that most research results in the Semantic Web Services area can be similarly applied in the Semantic Grid. The present abstract summarizes the authors view on how to fruitfully integrate Semantic Web service technologies around WSMO/WSML and WSMX and Grid technologies in a Semantic Service Grid and gives an outlook on further possible directions and research.

Keywords: Semantic Web Services, WSMO

Joint work of: Polleres, Axel; Toma, Ioan; Fensel, Dieter

Extended Abstract: http://drops.dagstuhl.de/opus/volltexte/2005/394

Virtual Organization Ontology 2.0

Line Pouchard (Oak Ridge National Lab., USA)

An ontology of things found in Virtual Organizations and how they are related. This ontology provides a formal specification for what a Virtual Organization is. It was developed on a table cloth in the music room and encoded in OWL-DL using Protege 3.0. It was then uploaded into SWOOP and checked consistent all the way. Things found their way in this ontology following discussions of a use case for the lifecycle of virtual organizations. The discussion group never made it past the birth of a Virtual Organization, but seven ages are planned. Many people participated, including Jim Myers, Dave Snelling, Sean Bechhofer, Dave De Roure, Jon McLaren, and many others. Only the .owl file contains the ontology. The accompanying slides show the ESG ontology developed starting May 2003 that was instrumental in developing the VO ontology.

Keywords: Virtual Organization Ontology

WSRF Ontology

Line Pouchard (Oak Ridge National Lab., USA)

Several people wrote an ontology for WSRF which was subsequently modeled in OWL-DL following the process used in the development of the VO 2.0 ontology. (Jim Myers has the evidence – the famous yellow table cloth).

Keywords: WSRF Ontology

Semantic Infrastructure for Grid Applications

Line Pouchard (Oak Ridge National Lab., USA)

Pressing needs have emerged in several domain sciences and grid computing applications for an adequate description of the large volumes of data produced by data-intensive simulations and experiments on scientific instruments. The data produced by scientific applications including climate modeling, high throughput biology, proteomics, high energy physics, astronomy, and the knowledge derived from these applications may loose its value in the future if the mechanisms for inventory, cataloging, searching, viewing, retrieving, and presenting generated data

are not quickly improved. For example, at the end of 2004, the volume of climate modeling data cataloged by the Earth System Grid was about 100 Terabytes (1.2 million files) distributed across several storage facilities. Other sciences such as biomedical science and bioinformatics produce smaller but thousands of diverse and widely distributed files stored on individual desktops and databases. Faced with an impending data crisis, scientists and data managers are forming partnerships with computer scientists for developing adequate solutions: semantic-based data descriptions, models, and services may play a crucial role.

Keywords: Semantic Grid, Grid Applications

Trust Management for Semantic Services

Omer F. Rana (Cardiff University, GB)

The general notion of trust is defined – with definition provided from three different perspectives. Relationship of trust management to a Service Level Agreement is also provided, and may be used as the basis for managing trustful service provision over Grid infrastructure.

Keywords: Trust, Service Level Agreements

Semantics and NextGRID

David Snelling (Fujitsu Labs. - Hayes, GB)

This presentation gives an overview about the NextGrid project.

Keywords: NextGrid

Towards Mapping-Based Document Retrieval in Heterogeneous Digital Libraries

Heiner Stuckenschmidt (Vrije Universiteit Amsterdam, NL)

In many scientific domains, researchers depend on a timely and efficient access to available publications in their particular area. The increasing availability of publications in electronic form via digital libraries is a reaction to this need. A remaining problem is the fact that the pool of all available publications is distributed between different libraries. In order to increase the availability of information, these different libraries should be linked in such a way, that all the information is available via any one of them. Peer-to-peer technologies provide sophisticated solutions for this kind of loose integration of information sources. In our work, we consider digital libraries that organize documents according to a dedicated classification hierarchy or provide access to information on the basis

of a thesaurus. These kinds of access mechanisms have proven to increase the retrieval result and are therefore widely used. On the other hand, this causes new problems as different sources will use different classifications and thesauri to organize information. This means, that we have to be able to mediate between these different structures. Integrating this mediation into the information retrieval process is a problem that to the best of our knowledge has not been addressed before.

Keywords: Classifications, Concept Matching, Information Retrieval

Joint work of: Stuckenschmidt, Heiner; Siberski, Wolf; van Mulligen, Erik

Extended Abstract: http://drops.dagstuhl.de/opus/volltexte/2005/385

Designing Services for Knowledge Discovery in Data Grids

Domenico Talia (University of Calabria, I)

Knowledge Discovery services are key components for designing complex applications on Grids. This talk discussed the WSRF-based services of the KNOWLEDGE GRID and their relationships to ontologies and semantic services.

Keywords: Data Mining, Grid Services, Knowledge Grid, Semantic Grid

OntoGrid: Paving the way for Knowledgeable Grid Services and Systems

Valentina Tamma (University of Liverpool, GB)

Coordination is one of the fundamental problems in systems composed of multiple interacting processes. Such processes will need to coordinate their activities if ever there is a possibility that these activities may interact with one-another. As an example, imagine two processes making use of a non-shareable resource. If both processes attempt to use the resource simultaneously, we will naturally have problems - a lost update at best, perhaps damage to the resource at worst. The processes thus need to coordinate their activities, to make use of the non-shareable resource. Although such a scenario represents the best-known type of possible coordination interaction, there are many other less obvious ways in which coordination may be mutually beneficial. For example, imagine two e-science processes carrying out some computational task, where both processes require the results of some intermediate computation; then, it makes sense for them to adopt a policy of pro-actively exchanging information that may be of use to other processes. Here, coordination is not required for the agents to be successful in their tasks, but there is a global benefit to be gained by adopting this rule.

Coordination in the limited sense of synchronisation (preventing scenarios such as simultaneous access to a non-shareable resource) has long been a central topic of research in the concurrency community. However, the pre-dominant approach to handling coordination has been to hard-wire the coordination mechanism into the system structure (for example by means of semaphores, monitors, or locks). In more open systems, where the processes and resources of which the system is comprised are not known at design time, such an approach is often impossible. In such systems, it may be desirable to allow the relevant processes to communicate their intentions with respect to future activities and resource utilisation, and get them to reason about coordination at run time, with the goal of preventing negative interactions, and facilitating positive interactions. This is a dynamic approach to coordination, since the coordination requirement is handled at run-time, rather than design time. Note that the communication implied by this approach requires an agreed common vocabulary for coordination, with a precise semantics, and hence we have an ontological approach to dynamic coordination, in short.

Our goal in Ontogrid is to describe such an ontological approach to coordination, and present our results with respect to a proof-of-concept implementation of the approach.

Keywords: OntoGrid, Grid Coordination

Semantic Grid Roadmap

Ziga Turk (University of Ljubljana, SLO)

While the first level of information systems was built to assist humans in real world processes, the increasing complexity of the ITC infrastructures calls for a second level of information systems that will assist in making a better use of ITC. All business process roadmaps are foreseeing a strong role of ICT in the future. Semantic grid has a potential to be a highway in these roadmaps or a dead end into which substantial effort will be placed, but that will not address the needs of the users. We will not know, unless we try it out, looking carefully at the technology pull in some areas and applying the technology push if a breakthrough seems possible.

Keywords: Technology Roadmapping, Requirements Analysis, Workflow, Interoperability

Extended Abstract: http://drops.dagstuhl.de/opus/volltexte/2005/391

Semantic Grid Seminar – Farewell

York Sure (Universität Karlsruhe, D)

Thank you very much for attending the seminar – and making it so lively, such a big success and so much fun! We – Carole, Carl and myself – hope that you have enjoyed the seminar at least as much as we did. We'd love to see you all again in the near future to continue our lively discussions, to further strengthen our collaboration and to make the (or 'a'? ;-)) Semantic Grid reality.

Keywords: Farewell