

Road Map for CMP915

Grid and Related Computing Technologies

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This course is designed around an essential core of topics and material, but delegates are encouraged and expected to also follow their own interests within the broad range of topics that span the Grid. The material sent to delegates is intended to support both the core and peripheral topics, but inevitably it is not possible to send out all the material that might be of interest. A list of material sent to delegates is given below. Each article is classified as core or peripheral.

The material for the course is divided into 3 sections:

1. Introductory material
2. Examples of grids and grid applications
3. Software technologies for the Grid

There will be four contact days for the module:

1. 16 February. By this time you should have read the first set of papers and articles listed below. This contact session will include lectures and discussions.
2. 9 March. By this time you should have read the second set of papers and articles listed below. This contact session will include lectures and discussions, and will discuss the Investigative Study that you will be asked to do
3. 20 April. By this time you should have read the third set of papers and articles listed below. You should also have started to read the “XML Schema” book.
4. 4 May. This contact session will focus on the coursework that you will be asked to do.

Your mark for this course will be based on:

- The Examination (50%)
- An Investigative Study (25%). This is an essay that you do in your own time.
- Coursework (25%). This is related to XML and XSLT.

First set of papers

Core:

1. "The Grid: Computing Without Bounds" by Ian Foster in *Scientific American*, Vol. 288, No. 4, pages 78-85, April 2003.
2. "The Anatomy of the Grid: Enabling Scalable Virtual Organizations," Ian Foster, Carl Kesselman, and Steven Tuecke, *The International Journal of High Performance Computing Applications*, volume 15, number 3, pages 200–222, Fall 2001. Also available from <http://www.globus.org/research/papers/anatomy.pdf>.
3. "Free-Market Computing and the Global Economic Infrastructure," D. W. Walker, *IEEE Parallel and Distributed Technology*, volume 4, number 3, pages 60–62, Fall 1996.
4. "Shifting Paradigms with the Application Service Provider Model," Lixin Tao, *IEEE Computer*, volume 34, number 10, pages 32–39, October 2001. This article can be accessed at <http://www.computer.org/computer/co2001/rx032abs.htm> by subscribers to the IEEE Computer Society Digital Library service.
5. "The Software Architecture of a Distributed Problem-Solving Environment," D. W. Walker, M. Li, O. F. Rana, M. S. Shields, and Y. Huang, *Concurrency: Practice and Experience*, volume 12, number 15, pages 1455–1480, December 2000.

Peripheral:

6. "Weaving Electrical and Computational Grids: How Analogous Are They?" by Madhu Chetty and Rajkumar Buyya. This article is available online at <http://www.csse.monash.edu.au/~rajkumar/papers/gridanalog.pdf>.
7. "Compute Power Market: Towards a Market-Oriented Grid," Rajkumar Buyya and Sudharshan Vazhkudai, presented at the First IEEE/ACM International Symposium on Cluster Computing and the Grid, Brisbane, Australia, May 16-18, 2001. See <http://www.buyya.com/papers/cpm.pdf> to view this paper online.
8. "Internet Computing and the Emerging Grid," Ian Foster, *Nature*, December 7, 2000.

Second set of papers

Core:

9. "Computational Grids," Geoffrey Fox and Dennis Gannon, *IEEE Computing in Science and Engineering*, Vol. 3, No. 4, pages 74-77, July/August 2001.
10. "The Grid: A New Infrastructure for 21st Century Science," Ian Foster, *Physics Today*, Vol. 55, No. 2, February 2002. This paper is also available online at the following URL: <http://www.aip.org/pt/vol-55/iss-2/p42.html>.
11. "From TeraGrid to Knowledge Grid," Fran Berman, *Communications of the ACM*, Vol. 44, No. 11, pages 27-28, November 2001.
12. "Grid Computing: The European Data Grid Project," Ben Segal, in proceedings of IEEE Nuclear Science Symposium and Medical Imaging Conference, Lyon, 15-20 October 2000.

13. "The Physiology of the Grid: An Open Grid Services Architecture for Distributed Systems Integration," I. Foster, C. Kesselman, J. Nick, S. Tuecke, January 2002. This is available online at <http://www.globus.org/research/papers/ogsa.pdf>
14. "Modeling Stateful Resources with Web Services," Ian Foster et al., January 2004.
15. "From Open Grid Services Infrastructure to WS-Resource Framework: Refactoring and Extension," Ian Foster et al., February 2004.
16. "A Grid Application Framework based on Web Services Specifications and Practices," S. Parastatidis, J. Webber, P. Watson, and T. Rischbeck, 2003. Available online at <http://www.neresc.ac.uk/projects/gaf/>
17. "CORBA: Integrating Diverse Applications within Distributed Heterogeneous Environments," S. Vinoski, IEEE Communications, Vol. 35, No. 2, pages 46-55, February 1997. This paper is also available online at the following URL: <http://www.cs.wustl.edu/~schmidt/PDF/vinoski.pdf>

Peripheral:

18. "The Information Power Grid Project," a project overview from the IPG web site at <http://www.ipg.nasa.gov/>.
19. "Using Computing and Data Grids for Large-Scale Science and Engineering," by William E. Johnston, International Journal of High Performance Computing Applications, Vol. 15, No. 3, Fall 2001. This article is essentially the same as the one provided to delegates and entitled "Issues for Using Computing and Data Grids for Large-Scale Science and Engineering".
20. "Data Mining on NASA's Information Power Grid," Thomas H. Hinke and Jason Novotny, Proceedings Ninth IEEE International Symposium on High Performance Distributed Computing, Pittsburgh, PA, Aug. 2000. This paper is also available at <http://www.ipg.nasa.gov/research/papers/21-Hinke.pdf>.
21. "DataGrid: Computing for Data Intensive Science" from the web site at <http://www.eu-datagrid.org/>.
22. "DataGrid: The Foundation of e-Science" from the web site at <http://www.eu-datagrid.org/>.
23. "From e-Science to e-Business: the Industry and Research Forum" from the web site at <http://www.eu-datagrid.org/>.
24. "GriPhyN Project Description" from the web site at <http://www.griphyn.org/>.
25. "Petascale Virtual Data Grids for Data Intensive Science" from the GriPhyN web site at <http://www.griphyn.org/>.
26. "From UNICORE to EuroGrid: A Software Infrastructure for Grid Computing," Dietmar Erwin.
27. "Web Access to Supercomputing," Giovanni Aloisio, Massimo Cafaro, Carl Kesselman, and Roy Williams, IEEE Computing in Science and Engineering, Vol. 3, No. 6, pages 66-72, November/December 2001.
28. "Collaborative Surgical Simulation over the Internet," Y. Kim, J-H Choi, J Lee, MK Kim, NK Kim, JS Yeom, and YO Kim, IEEE Internet Computing, Vol. 5, No. 3, pages 65-73, May/June 2001.

Third set of papers

Core:

29. "Jeff's CORBA/CCA Talk Notes," . This document is available online at <http://www.cs.ucsd.edu/classes/sp00/cse225/notes/jeff/talk.html>
30. "Distributed Computing with CORBA," Steve Vinoski.
31. "Managing Scientific Metadata, MB Jones, C Berkley, J Bojilova, and M Schildhauer, IEEE Internet Computing, Vol. 5, No. 5, pages 59-68, September/October 2001.
32. "XML's Impact on Databases and Data Sharing," L Seligman and A Rosenthal, IEEE Computer, Vol. 34, No. 6, pages 59-67, June 2001.
33. "The Semantic Web," T Berners-Lee, J Hendler, and O Lassila, Scientific American, May 2001. <http://www.sciam.com/2001/0501issue/0501berners-lee.html>.
34. "The Jini Architecture for Network-Centric Computing," Jim Waldo, Communications of the ACM, Vol. 42, No. 7, pages 76-82, July 1999.
35. "When the Network is Everything," Jim Waldo, Communications of the ACM, Vol. 44, No. 3, pages 68-69, March 2001.
36. "Three Years On, Can Sun's Jini Mesh with Web Services?" J Niccolai, InfoWorld, February 2002. This article looks at Sun's attempt to re-focus Jini from a technology for network devices to a technology for network services. <http://www.infoworld.com/articles/hn/xml/02/02/04/020204hnsunjini.xml>
37. "Project JXTA: An Open, Innovative Collaboration," this white paper is available at http://gecko.cs.purdue.edu/gnet/papers/jxta_whitepaper.pdf.
38. "Project JXTA," RV Dragan, PC Magazine, January 2002. This is available online at http://www.pcmag.com/print_article/0,3048,a=20102,00.asp.

Peripheral:

39. "A Brief Tutorial on CORBA," Kate Keahey. Also available online at <http://www.cs.indiana.edu/~kksiazek/tuto.html>
40. "Overview of CORBA," Douglas Schmidt. This document is available on line at <http://www.cs.wustl.edu/~schmidt/corba-overview.html>
41. "New Features for CORBA 3.0," Steve Vinoski.
42. "The Challenges that XML Faces," Maria-Angeles Grado-Caffaro and Martin Grado-Caffaro, IEEE Computer, Vol. 34, No. 10, pages 15-18, October 2001.
43. "Integrating XML and Databases," E Bertino and B Catania, IEEE Internet Computing, Vol. 5, No. 4, pages 84-88, July/August 2001.
44. "Ontological Computing," Felipe Castel, Communications of the ACM, Vol. 45, No. 2, pages 29-30, February 2002.
45. "Framework for the Semantic Web: An RDF Tutorial," S Decker, P Mitra, and S Melnik, IEEE Internet Computing, Vol. 4, No. 6, pages 68-73, November/December 2000.
46. "The Semantic Web: The Roles of XML and RDF," S Decker, S Melnik, F van Harmelen, D Fensel, M Klein, J Broekstra, M Erdmann, and I Horrocks, IEEE Internet Computing, Vol. 4, No. 5, pages 63-73, September/October 2000.

47. "Predicting How Ontologies for the Semantic Web Will Evolve," H Kim, Communications of the ACM, Vol. 45, No. 2, pages 48-54, February 2002.
48. "Jini Technology Architectural Overview." This is a Sun Microsystems white paper. Available online at <http://www.sun.com/jini/whitepapers/architecture.pdf>.
49. "Service Advertisement and Discovery: Enabling Universal Device Cooperation" GG Richard, IEEE Internet Computing, Vol. 4. No. 5, pages 18-26, September/October 2000.
50. "One Huge Computer," K Kelly and S Reiss, Wired magazine, August 1998. This article, available online at <http://www.wired.com/wired/archive/6.08/jini.html>, gives an early perspective on the vision behind Jini.
51. "Jini: The Universal Network?" A Williams, Web Techniques magazine, March 1999. Available at <http://www.webtechniques.com/archives/1999/03/williams/>
52. "Joy Poses JXTA Initiative," K Kayl. This article is available online at <http://java.sun.com/features/2001/02/peer.html>.
53. "Programming the Grid: Distributed Software Components, P2P and Grid Web Services for Scientific Applications," D Gannon et al. This article describes work by Gannon's group at Indiana University into Grid programming and its relation to web services and P2P computing. It is available online from location: <http://www.extreme.indiana.edu/~gannon/ProgGrid/ProgGridsword.PDF>.