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Want to Find Out More?

This appendix contains a list of links to the core organizations and umbrella projects for many of the distributed systems discussed in this book. This list is by no means exhaustive but it does provide some pointers to on-line information for further reading.

A.1 The Web

- **The W3C**, <http://www.w3.org/> is the World Wide Web consortium, which is the foremost forum for information, commerce, communication and collective understanding for the Web-related technologies. The W3C develops interoperable technologies and releases specifications, guidelines, software and tools. For example, the W3C has developed the specifications for XML, SOAP and WSDL. It is the first stop on discovering standardized Internet technologies.
- **The W3C**, <http://www.w3.org/2002/ws/> is a starting point on the W3C Web site that lists Web service-related technologies on which W3C is currently working.
- **Fielding's Dissertation**, <http://www.ics.uci.edu/~fielding/pubs/dissertation/top.htm> *Architectural Styles and the Design of Network-based Software Architectures*. Chapter 5 describes Representational State Transfer.
- **HTTP**, <http://www.w3.org/Protocols/> W3C gateway to documents relating to the HTTP protocol.
- **Berners-Lee page at the W3C**, <http://www.w3.org/People/Berners-Lee/> provides links, biographies and some nice questions and answers.
- **W3C Semantic Web Activity** <http://www.w3.org/2001/sw/> is a gateway to various Semantic Web technologies.

- **Web Design Issues** <http://www.w3.org/DesignIssues/> A series of essays and thought by Tim Berners-Lee on the Web, the Semantic Web and general architectural and philosophical points. Some of these writings are now ten years old, but they still make insightful reading.

A.2 Web 2.0

- <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>. The concept of “Web 2.0” began with a conference brainstorming session between O’Reilly and MediaLive International. Dale Dougherty, Web pioneer and O’Reilly VP, noted that “far from having crashed, the web was more important than ever, with exciting new applications and sites popping up with surprising regularity.” This Tim O’Reilly on-line article is a good start to the Web 2.0 discussions and how the term was coined.
- **Microformats homepage** <http://microformats.org/> links to news, mailing lists and wiki.
- **Mashups and APIs**, <http://www.programmableweb.com/> is a great collection of the latest developments in the world of mashups and service APIs.
- **Atom Syndication Format** <http://tools.ietf.org/html/rfc4287> Atom from the horse’s mouth. This is the Request for Comments.
- **Atom Publishing Protocol** <http://tools.ietf.org/html/rfc5023> This is the current state of the APP proposal.
- **Web Application Description Language** <https://wadl.dev.java.net/> This is the WADL project page.
- **The blogosphere** There are a host of discussions on the themes of Web and Web 2.0 across the blogosphere. A starting point into the mesh of opinions and developments are the blogs of those working in the field.

A.3 Web Services

- **OASIS**, <http://www.oasis-open.org/> is a non-profit consortium, which attempts to drive the development and adoption of e-business standards. For example, it has developed specifications for ebXML and UDDI.
- **XML.com**, <http://www.xml.com/> provides various resources for XML including a section on Web Services.
- **WebServices.org**, <http://www.webservices.org/> is a portal for finding out about Web Services. It contains newsletters, introductions to Web services, news and numerous articles.
- **Web Services Architect**, <http://www.webservicesarchitect.com/> hosts a collection of articles and links for Web Services from both a business and a technical perspective.

- **Microsoft's Web Services Developer Center**, <http://msdn.microsoft.com/webservices/> is a site dedicated to providing information to Web Service developers. It hosts many useful articles on the use of various Web Service technologies and lists the new Web service specifications.
- **IBM Developer Works for Web Services**, <http://www-136.ibm.com/developerworks/webservices/> contains a number of technical articles and specifications about Web Services and related technologies. It also has a download section and learning resources.
- **WS-I**, <http://www.ws-i.org/> is "an open, industry organization chartered to promote Web Services interoperability across platforms, operating systems, and programming languages." It works with industry and standards organizations to respond to customer needs.
- **XMethods**, <http://www.xmethods.com/> lists the publicly available Web Services. You can access the lists of Web Services by using their UDDI server, for example, to dynamically discover and connect to available resources.
- **Web Services Journal**, <http://www.sys-con.com/webservices/> is an on-line resource that lists real-use cases of how various companies and organizations are deploying and using Web Services. There is a news section that lists new incentives that are happening within the Web Services world.
- **Java Technology and Web Services**, <http://java.sun.com/webserices/index.jsp> covers the various Java tools and packages that can support the development and deployment of Web Services.

A.4 Grid Computing

- **Open Grid Forum (OGF)**, <http://www.ogf.org/> contains information about Grid-related events. The OGF is a forum of some 5000+ individual researchers and practitioners working on distributed computing or Grid technologies, and has a wide range of technical groups working on aspects of Grid technology and deployment.
- **GridForge**, <http://forge.gridforum.org/> is the working repository for OGF Working and Research Groups, housing the related documents through an open public comment process.
- **Globus**: <http://www.globus.org/> hosts the Globus middleware for Grid computing and all associated documentation.
- **GRIDSTART**, <http://www.gridstart.org/> contains information about the EU Framework 5 IST-funded Grid research projects. You can find links to CrossGrid, DAMIEN, DataGrid (EDG and EGEE), DataTAG, EGSO, EuroGrid, GRIA, GridLab and GRIP, along with a number of other projects that form the GRIDSTART cluster. The project's intention is to stimulate the widespread deployment of Grid technology by raising the awareness of potential users of the solutions already developed

or being developed. They also organize IST Concertation Meetings on Grid Research, twice yearly, which host a number of plenary talks and European technical working groups.

- **UK e-Science**, <http://www.rcuk.ac.uk/escience/> Here you can find more information about the UK e-Science program.
- **National e-Science Center**: <http://www.nesc.ac.uk/> is a site containing links to a number of projects within the UK e-Science program.
- **GridCafe**, <http://gridcafe.web.cern.ch/gridcafe/> is a place to learn various aspects of Grid computing, from the name and the dream to a list of concrete projects around the world.
- **Grid Technology Repository (GTR)**, <http://gtr.globus.org/> was set up as a place for people to publish and discover work related to Grid technology.
- **The Grid Computing**, <http://www.gridcomputing.com/> information center is designed to promote the development of technologies which provide seamless and scalable access to wide-area distributed resources.
- **Grid Today**, <http://www.gridtoday.com/> provides daily news and information for the Grid community.
- **The Grid Report**, <http://www.thegridreport.com/> is a collection of news items about distributed and Grid computing. It contains the latest news and information about Grid computing; it's run by software engineers and its focus is for software engineers.
- **Grid Computing Planet**, <http://www.gridcomputingplanet.com/> is one of many sites run by JupiterWeb, the on-line division of Jupitermedia, which is a leading global provider of information, images, research and events for information technology, business and creative professionals. The Grid Computing Planet is in the EarthWeb information section and provides numerous articles, news events and so on, for Grid computing.
- **CCGrid**, <http://www.ccgrid.org/> is a yearly IEEE International Symposium on Cluster Computing and the Grid. It also hosts a number of workshops.

A.5 P2P Tools and Software

- **P2P and XML in Business**, <http://www.xml.com/pub/a/2001/07/11/xmlp2p.html> provides an article discussing the integration of P2P and XML for businesses.
- **Peer-to-Peer Computing**, <http://p2p.ingce.unibo.it/> is a popular yearly conference on Agents and P2P Computing (AP2PC).
- **P2P4B2B**, <http://www.stratvantage.com/directories/p2pworkgroups.htm> is a site listing non-commercial peer-to-peer efforts. The sites listed are non-profit, open source or informational and have relevance to the business use of P2P technology. The sites also represent standards efforts.

- **O'Reilly OpenP2P.com**, <http://www.openp2p.com/> is a site dedicated to various articles on P2P-related technology. Always interesting!
- **Global and Peer-to-Peer Computing**, <http://gp2pc.lri.fr/> is an international yearly workshop held in conjunction with CCGrid.
- **Intel P2P Developer Center**, <http://www.intel.com/cd/ids/developer/asmo-na/eng/technologies/peertopeer/index.htm> is a site dedicated to technologies that can leverage the power of the existing end-user's resources on the Internet.
- **Distributed Hash Tables**, http://en.wikipedia.org/wiki/Distributed_hash_table is the wikipedia page for DHT technology.
- **BitTorrent:**
 - **BitTorrent, Inc.**, <http://www.bittorrent.com/> is the home page of BitTorrent, Inc. and provides a number of BitTorrent related resources.
 - **Wired**, http://www.wired.com/techbiz/startups/news/2007/12/YE_10_startups, *Wired* magazine 2003 interview with Bram Cohen, author of BitTorrent.
 - **BitTorrent Protocol**, http://www.bittorrent.org/beps/bep_0003.html is the location of the Official BitTorrent Protocol Specification.
 - **Doug Walker Interview**, <http://gigaom.com/2008/03/09/bittorrent-ceo-doug-walker-interview/> - video interview with new CEO for BitTorrent.
- **Gnutelliums**, <http://www.gnutelliums.com/> provides a comprehensive directory of Gnutella clients for Windows, Linux/Unix and Macintosh, some of which are provided below:
 - **BearShare**, <http://www.bearshare.com> is a Windows file sharing program from Free Peers, Inc.
 - **Gnutella**, <http://www.gnutella.com> is a clone of Gnutella for Windows.
 - **Gnucleus**, <http://gnucleus.sourceforge.net/> is an open Gnutella client for Windows.
 - **LimeWire**, <http://www.limewire.com> is a very popular Java-based Gnutella client.
 - **Phex**, <http://www.konrad-haenel.de/phex/> is also a Java client, based on William W. Wong's Furi.
 - **Toadnode**, <http://www.toadnode.com> is an extensible platform for P2P networks. Its core functionality revolves around the ability to find, retrieve and distribute data between users across multiple networks.
 - **Gnut**, http://www.gnutelliums.com/linux_unix/gnut/ is a command-line client which implements the Gnutella protocol. It will run on a wide range of POSIX-compliant systems including: SunOS, Linux, FreeBSD, HP-UX and Win32.

A.6 Distributed Object Systems

- **Jan Newmarch's Guide to JINI Technologies**, <http://pandonia.canberra.edu.au/java/jini/tutorial/Jini.xml> provides an on-line extensive guide to Jini Technologies.
- **The Distributed Component Object Model (DCOM)**, <http://www.microsoft.com/com/tech/DCOM.asp> is a Web site for finding out about distributed DCM technology, which enables software distributed components to communicate in a reliable, secure and efficient manner. It was previously called "Network OLE" and was based on the Open Software Foundation's DCE-RPC specification.
- **CORBA**, <http://www.corba.org/> is the home page for the Common Object Request Broker Architecture (CORBA) middleware. It contains a number of resources, CORBA success stories and pointers to the Object Management Group.
- **Object Management Group (OMG)**, www.omg.org which is establishing a model-driven architecture through its worldwide standard specifications including CORBA, CORBA/IIOP, the UML, XMI, MOF, Object Services, Internet Facilities and Domain Interface specifications.
- **Jini**, <http://www.jini.org/> is a central place for finding information about Jini. It contains new information, has discussion groups and allows users to exchange code and ideas.
- **Distributed Object Computing**, http://www.yy.ics.keio.ac.jp/~suzuki/object/dist_comp.html is a useful page containing a number of links and information about distributed object systems including CORBA, Jini, MOMs and distributed agents.

A.7 Underlying Transport and Discovery Protocols

- **IANA**, <http://www.iana.org/>, home page for the Internet Assigned Numbers Authority (IANA), responsible for the assigned IP address range.
- **Multicast Protocol**, <http://www.ietf.org/rfc/rfc1112.html> is the request for comments (RFC) Web site for the original Multicast protocol.
- **UDP Protocol**, <http://www.ietf.org/rfc/rfc768.html> is the RFC Web site for the UDP protocol.
- **TCP Protocol**, <http://www.ietf.org/rfc/rfc793.html> is the RFC Web site for the TCP protocol.
- **SLP Protocol**, <http://www.ietf.org/rfc/rfc2608.html> is the RFC Web site for the Service Location Protocol.

B

RSA Algorithm

Figure B.1 shows an outline of the RSA algorithm for encryption, taken from Tanenbaum and van Steen [16]. For more information, see the original text.

Find P and Q , two large (e.g., 1024-bit) prime numbers:

1. Choose E such that E is greater than 1, E is less than PQ , and E and $(P-1)(Q-1)$ are *relatively prime*, which means they have no prime factors in common. E does not have to be prime, but it must be odd. $(P-1)(Q-1)$ can't be prime because it's an even number.
2. Compute D such that $(DE - 1)$ is evenly divisible by $(P-1)(Q-1)$. Mathematicians write this as $DE = 1 \pmod{(P-1)(Q-1)}$, and they call D the *multiplicative inverse* of E . This is easy to do -- simply find an integer X which causes $D = (X(P-1)(Q-1) + 1)/E$ to be an integer, then use that value of D .
3. The encryption function is $C = (T^E) \pmod{PQ}$, where C is the ciphertext (a positive integer), T is the plaintext (a positive integer), and \wedge indicates exponentiation. The message being encrypted, T , must be less than the modulus, PQ .
4. The decryption function is $T = (C^D) \pmod{PQ}$, where C is the ciphertext (a positive integer), T is the plaintext (a positive integer), and \wedge indicates exponentiation.

...and now:

- The *public key* is the pair (PQ, E) .
- The *private key* is the number D .
- The product PQ is the *modulus* (often called N in the literature).
- E is the *public exponent*. D is the *secret exponent*.

Fig. B.1. An outline of the RSA public-key system, which is based on the difficulty of factoring large numbers that are the product of two prime numbers. This factoring problem has been studied for hundreds of years and still appears to be intractable.

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