

Glossary

ACID A set of properties (Atomicity, Consistency, Isolation and Durability) that guarantee that transactions over a shared space are processed reliably. The atomicity rule said that a modification over the shared space is fully completed; otherwise the shared space state is unchanged. The consistency rule said that a modification of the shared state will take the shared space from one consistent state to another. The isolation rule refers to the requirement that other process cannot access data that has been modified during a modification that has not yet completed. Finally, durability rule ensures that a datum inserted in the shared space remains until a process explicitly deletes it. 85

active socket An active socket is connected to a remote socket via an open data connection. 93

architectural pattern An architectural pattern expresses a fundamental structural organization schema for software systems. It provides a set of predefined subsystems, specifies their responsibilities, and includes rules and guidelines for organizing the relationships between them. 42

binary semaphore A semaphore which has two operations (P and V) for controlling access by multiple processes to a common resource. The P operation sleeps the process until the resource controlled by the semaphore becomes available, at which time the resource is immediately claimed. The V operation is the inverse, it makes a resource available again after the process has finished using it. 93

bmp Image format used to store bitmap digital images. 209

byu Classic Brigham Young University file format for surfaces in 3D. 209

CLOS Common Lisp Object System (CLOS) [Gra96] is the facility for object-oriented programming which is part of ANSI Common Lisp. 21, 22, 48

component A part of a software system. A component has an interface that provides access to its services. On a programming language level components may be represented as modules, classes, objects or a set of related functions. 42, 53, 72

concurrency Property of systems in which several computations are executing simultaneously. 97

CORBA The Common Object Request Broker Architecture, a distributed object computing middleware standard defined by the Object Management Group (OMG), see [Gro]. 40

Curry A logic *functional programming* language, see [Han06], based on the *Haskell* language. It merges elements of functional and logic programming. 111

event An action initiated either by the user or the computer. An example of a user event is any mouse movement or a keystroke. 324

event handler A software routine that provides the processing for various *events* such as mouse movement, a mouse click, a keystroke or a spoken word. 112

expert system An expert system is an interactive computer-based decision tool that uses both facts and heuristics to solve decision problems based on knowledge acquired from an expert. 60

framework A software system intended to be instantiated. A framework defines the architecture for a system. 42

functional programming A programming paradigm that treats computation as the evaluation of mathematical functions and avoids state and mutable data. 20, 324

hash table Data structures which use a hash function to map certain identifiers (keys) to associated values. 57

Haskell A *functional programming* language, see [Hut07]. 324

IDE Integrated Development Environment (IDE). An editor that lets the programmer edit, compile and debug all from within the same program. 106, 112

initial space In this text, a space whose definition does not involve any other space. 250

interface A publicly accessible portion of a component, subsystem, or application. 53, 55

jpeg Image format used by digital cameras and other photographic image capture devices. 209

jvx Geometry file format for curves, surfaces and volumes in n-dimensional space. 209

Maple A general-purpose commercial Computer Algebra system. 39

Mathematica A computational software program used in scientific, engineering, and mathematical fields and other areas of technical computing. 39

- MathML** Mathematical Markup Language (MathML) [A⁺08] is a standard XML language adopted by the World Wide Web Consortium (W3C) as the approved way of expressing math on the web. 46
- Maxima** A free Lisp system for the manipulation of symbolic and numerical expressions, see [Sch09]. 40
- memoization** An optimization technique used to speed up computer programs by storing the results of function calls for later reuse, rather than recomputing them at each invocation of the function. 30, 44
- module** A portion of a program that carries out a specific function and may be used alone or combined with other modules of the same program. 116
- native XML databases** A data persistence software system that allows data to be stored in XML format; the internal model of such databases depends on XML and uses XML documents as the fundamental unit of storage, which are, however, not necessarily stored in the form of text files. 85
- obj** Popular geometry format 3D geometry file format for surfaces in 3D originally used in Wavefront's Advanced Visualizer and now by Sun's Java3D. 209–211, 215, 216
- OMDoc** An open markup language for mathematical documents, and the knowledge encapsulate in them, see [Koh06]. This format extends OpenMath and hence provides some features not available in OpenMath, for example a theory level and a way of incorporating executable code. 101
- OpenMath** An XML standard for representing mathematical objects with their semantics, allowing them to be exchanged between computer programs, stored in databases, or published on the worldwide web, see [Con04]. 46, 73
- passive socket** A passive socket is not connected, but rather awaits an incoming connection, which will spawn a new active socket. 93
- pattern** A pattern describes a problem that happens over and over, and also the solution to that problem. Patterns cover various ranges of scale and abstraction. Some patterns help in structuring a software system into subsystems. Other patterns support the refinement of subsystems and components. 42
- pbm** Portable Bit Map (PBM). The PBM format is a monochrome file format for images. 209, 210, 214–216
- Phrasebook** A piece of software which transforms from the internal representation of a data structure of an application to its OpenMath representation and viceversa. 45, 75

platform The software that a system uses for its implementations. Software platforms include operating systems, libraries, and frameworks. A platform implements a virtual machine with applications running on top of it. 42

plug-in A set of software components that adds specific capabilities to a larger software application. Plug-in based applications can be executed with no plug-ins. 99–102, 116

png Image format, that does not requiring a patent license, used to store bitmap digital images. 209

prefix notation Mathematical notation where the function is noted before the arguments it operates on. 36

process The actual running of a program module. 97

prompt A message on the computer screen indicating that the computer is ready to accept user input. In a command-line interface, the prompt may be a simple “>” symbol or “READY >” message, after which the user may type a command for the computer to process. 105

raster A rectangular grid of picture elements representing graphical data for displaying. 209

request An event sent by a client to a service provider asking it to perform some processing on the client’s behalf. 45

semaphore A mechanism for controlling access by multiple processes to a common resource in a concurrent programming environment. 93

service A set of functionality offered by a service provider or server to its clients. 53, 72, 73

SOAP Simple Object Access Protocol is a standard protocol for exchanging structured information in the implementation of Web Services. 90

socket A mechanism for interprocess communication. A socket is an end-point of communication that identifies particular network address and port number. 93, 132–134

stack overflow An error which occurs when too much memory is used on the data structure that stores information about the active computer program. 258

stylesheet A program used to render an XML document into another format. 113, 121

thread One subprocess in a system which allows the concurrently execution of multiple streams of instructions within the same program. 98

UI User Interface. 111

web service A web service is traditionally defined by the World Wide Web Consortium as a software system designed to support interoperable machine-to-machine interaction over a network. 82, 90

well-formed XML XML that follows the XML tag rules listed in the W3C Recommendation for XML 1.0. A well-formed XML document contains one or more elements; it has a single document element, with any other elements properly nested under it; and each of the parsed entities referenced directly or indirectly within the document is well formed. 73, 75

XML enabled databases A data persistence software system that allows data to be stored in XML format; the internal model of such databases is a traditional database (relational or object oriented). These databases do the conversion between XML and its internal representation. 85

XML schema A formal specification of element names that indicates which elements are allowed in an XML document, and in what combinations. It also defines the structure of the document: which elements are child elements of others, the sequence in which the child elements can appear, and the number of child elements. It defines whether an element is empty or can include text. The schema can also define default values for attributes. 46

XPath XML Path Language, is a query language for selecting nodes from an XML document. 85

XQuery XQuery is a query and functional programming language that is designed to query collections of XML data. 85

XSLT eXtensible Stylesheet Language Transformations (XSLT) [K⁺07] are procedures, defined in XML, for converting one kind of XML into another. For viewing on the Web, an XSLT can be written for conversion to XHTML. 121

XUL XML User Interface [H⁺00], it is Mozilla's XML-based user interface language which lets us build feature rich cross-platform applications defining all the elements of a User Interface. 111