



## World Wide Web Distributed Authoring and Versioning: WebDAV

WebDAV is an extension of the HyperText Transfer Protocol (HTTP) providing a standard infrastructure for asynchronous collaborative authoring of a wide variety of content across the Internet. The goal of WebDAV is to define the HTTP extensions necessary to enable distributed web authoring tools to be broadly interoperable.

The Software research group at U.C. Irvine, building on its experience developing the HTTP and URL standards, has led the WebDAV working group of the Internet Engineering Task Force (IETF) from its inception. WebDAV achieved a major milestone in November, 1998, with IETF approval of the WebDAV Distributed Authoring Protocol standard.

### WebDAV Capabilities

**Overwrite prevention:** keeping more than one person from working on a document at the same time. This prevents the "lost update problem" in which modifications are lost as first one author, then another writes their changes without merging the other author's work.

WebDAV provides an exclusive write lock which guarantees that only the lock owner can overwrite a locked resource, and a shared write lock, which allows a group of collaborators to work together on a resource. Locks automatically time out, easing administration of a WebDAV server.

**Properties:** creation, removal, and querying of information about Web pages, such as its author, last modified date, etc. Also

included is the ability to link pages of any media type to related pages.

WebDAV properties are (name, value) pairs where the name is a URL, and the value is a well-formed Extensible Markup Language (XML) document. The URL name allows new properties to be added without having to centrally register them, while XML values provide typing via structured markup, extensibility from addition of new tags, and plug and play support for Resource Description Framework (RDF) values.

**Collections:** creation, removal, and listing of a set of resources.

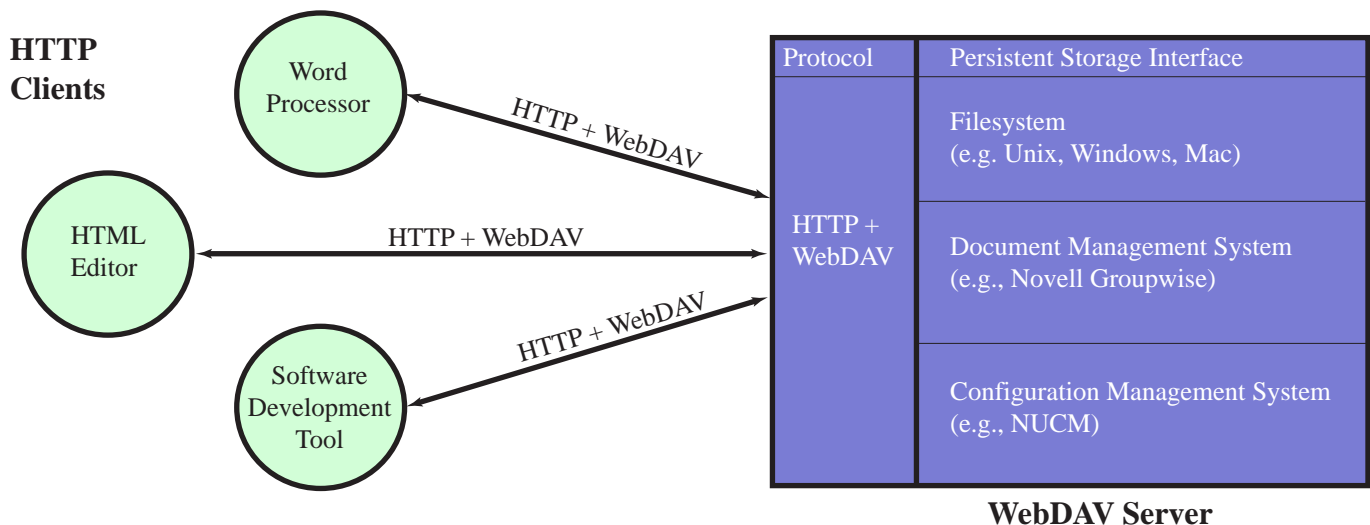
WebDAV collections provide direct containment for resources under the collection, and referential containment for resources located anywhere on the Web. The consistency of the direct containment relationship is maintained by the WebDAV server. For example, when a new resource is PUT into the namespace of a collection, it is automatically added to the collection.

**Name space management:** the ability to copy and move Web pages within a server's namespace.

WebDAV provides copy and move operations which can copy/move a single resource, or a tree of resources.

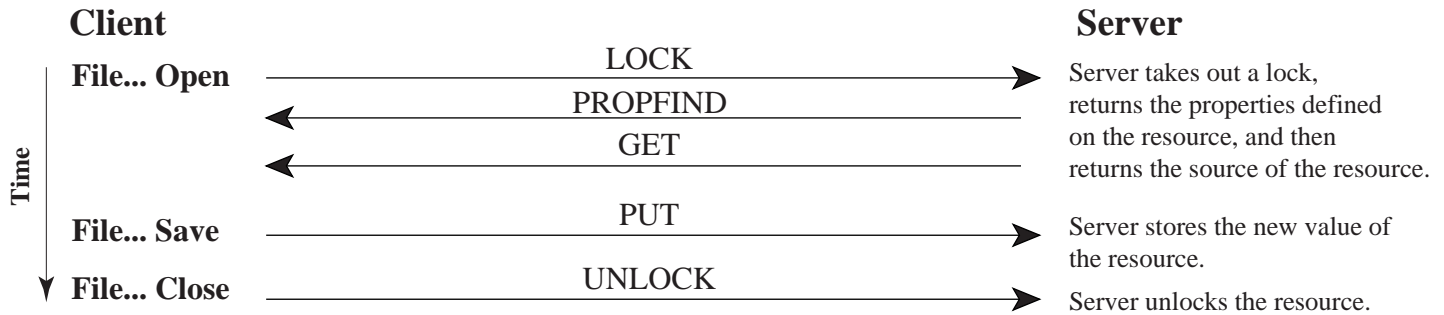
**Version management:** the ability to store important revisions of a document for later retrieval, retrieve a listing of the history graph for a resource, and to assign a version as the default published version of the resource.

**Access Control:** the ability to limit the access rights of a given authenticated principal on a given resource. WebDAV mandates the support of HTTP Digest authentication technology.



**Figure 1.** This diagram shows three distributed authoring tools communicating via the HTTP protocol using WebDAV extensions to a WebDAV server. The server shows three different persistent storage interfaces, highlighting the ability to map WebDAV operations across a broad spectrum of repositories. Typically no one server will implement so many storage interfaces simultaneously.

## How An Authoring Client Uses WebDAV



**Figure 2.** This figure shows the protocol requests that a generic WebDAV client would make to carry out specific client actions. Arrows indicate the predominant information flow associated with a request. All requests use the WebDAV + HTTP/1.1 protocol.

### Infrastructure for a Global Software Engineering Environment (gSEE)

As part of U.C. Irvine's WebSoft project, WebDAV is developing the necessary infrastructure for a global software engineering environment. Using WebDAV enabled tools ranging from remote authoring text editors to distributed workflow systems, teams within a globally dispersed organization or a virtual organization can collaboratively develop and maintain software.

Extending the HTTP protocol to perform distributed authoring and versioning required several innovations:

**Media Type Independence:** gaining the advantages of HTTP, a binary-clean protocol, WebDAV makes no assumptions on the media type being edited, supporting collaborative authoring of text, XML, word processing files, spreadsheets, images, and all others.

**Connectionless Locking:** separating long-duration lock semantics from TCP/IP connections improves server scalability and lock reliability. Exclusive and shared locks, support varying levels of out-of-band coordination; lock timeouts reduce administrative overhead.

**Multiple Repository Support:** selection of a simple set of useful primitives allows a WebDAV interface to multiple types of document repositories, including filesystems, databases, document management systems.

**Argument Marshalling:** encoding method arguments and results in XML provides extensibility, internationalization, and human readability.

**Global Property Namespace:** using URLs for property names provides a global, unique property namespace, without requiring central registration of property names.

### WebDAV Clients and Servers

Several organizations are developing WebDAV technology:  
**Microsoft:** Internet Information Services 5 (IIS) web server, Internet Explorer 5, Office 2000 all support WebDAV

**Apache:** mod\_dav module provides WebDAV support

**sitecopy:** Utility to synchronize a WebDAV site with a local filesystem directory.

**Xerox PARC, IBM:** prototype Python and Java-based servers

**U.C. Irvine:** Java-based WebDAV Explorer client, providing Windows Explorer-like interface for a WebDAV repository.

### WebDAV Documents

WebDAV documents can be retrieved from the WebDAV home page: <http://www.ics.uci.edu/pub/ietf/webdav/>

**Requirements:** Functional requirements for distributed authoring and versioning on the Web

**Protocol:** Extensions to HTTP for distributed authoring capability

**Advanced Collections:** Referential members, ordered collections

**Access Control:** Requirements and protocol for providing access control to a WebDAV server

**Versioning:** Extensions to HTTP for remote versioning capability

### Key WebDAV Participants

The WebDAV specifications have been developed by a core group of participants, and often involvement indicates interest by their organization. Authors on WebDAV specifications are:

Jim Amsden, IBM; Steve Carter & Del Jensen, Novell; Geoff Clemm, Rational; Jim Davis, Xerox; David Durand, Boston University; Asad Faizi, Netscape; Yaron Goland & Chris Kaler & Lisa Lippert, Microsoft; Bradley Sergeant, Intersolv; Judith Slein, Xerox; Fabio Vitali, Univ. of Bologna; Jim Whitehead, UC Irvine.

#### Contact Information

E. James Whitehead, Jr.  
 Professor Richard N. Taylor  
 Professor David F. Redmiles  
 Information and Computer Science  
 University of California  
 Irvine, California 92697-3425  
 {ejw, taylor, redmiles}@ics.uci.edu  
 949-824-{4121, 6429, 3823}  
 949-824-1715 (fax)

#### WebDAV Information

Information about the IETF WebDAV working group, including mailing list archives, and instructions on joining the working group is available at:

<http://www.ics.uci.edu/pub/ietf/webdav/>

#### WebSoft Information

<http://www.ics.uci.edu/pub/websoft/>

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