

# WebDAV and DeltaV: Collaborative Authoring, Versioning, and Configuration Management for the Web

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## ABSTRACT

WebDAV and DeltaV are application-layer network protocols that provide capabilities for remote collaborative authoring, metadata management, version control, and configuration management. Both protocols extend the core protocol of the Web, the Hypertext Transfer Protocol (HTTP 1.1). WebDAV adds operations for overwrite prevention, properties, and namespace management, while DeltaV builds upon WebDAV to offer versioning (checkout and checkin), autoversioning, workspaces, activities, and configuration management.

**KEYWORDS:** remote collaborative authoring, version control, configuration management

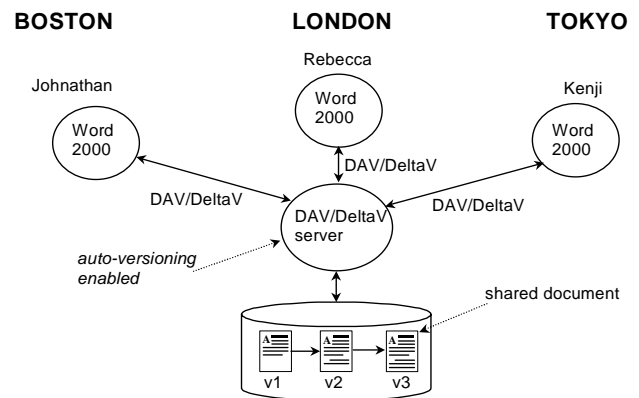
## COLLABORATION SCENARIOS

Consider the following Web site authoring, document collaboration, and software development scenarios:

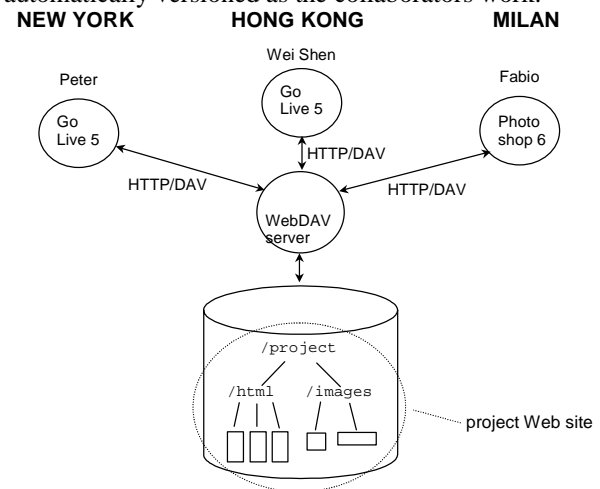
- A task force of people from geographically dispersed business units need to develop a report together. Throughout the report-writing process, this group needs to solicit feedback, and would like to keep a permanent copy of the exact report version they are having other people review (see Figure 1).
- A home computer user wants to develop a Web site, but has no Unix shell or programming experience. Their Internet service provider (ISP) must host their Web site, since they do not have a server computer in their home, and the ISP limits up channel traffic. Furthermore, the ISP would prefer not to give out shell accounts, for security reasons.
- A geographically diverse project team maintains their project's Web site, allowing all project members to make Web site updates (see Figure 2).
- A large corporate Web site needs to accept content contributions from any of the company's geographically separate business units.
- An open source project, comprised of team members from around the globe, is collaboratively developing a software application. They need to record all source code changes, as well as create stable baselines of their source code corresponding to public releases of the software. Furthermore, developers need to edit and compile source code on their local machine.

All of these scenarios have in common the need to *remotely author and version Web pages, documents, and*

*source code*. Together, WebDAV and DeltaV provide an open, standards-based infrastructure that supports these scenarios.



**Figure 1** - Three collaborators, located at three different sites, are jointly authoring a document using the WebDAV capabilities of Microsoft Word 2000. The shared document is stored on a DeltaV server, with auto-versioning enabled, and hence the document is automatically versioned as the collaborators work.



**Figure 2** - WebDAV Web Site Collaboration. A team with members in New York, Hong Kong, and Milan collaboratively maintain their project's Web site using a combination of WebDAV-enabled Web site authoring, and image authoring tools, in this case Go Live 5, and Photoshon 6.

## WEBDAV FEATURES

The WebDAV protocol supports the following 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.

Since WebDAV locks exist independent of a TCP connection, it is possible to take out a lock, work disconnected from the network, and then reconnect to submit editing updates. This type of work pattern is very useful for wireless networking, where network connections can frequently get dropped.

*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 value is a well-formed Extensible Markup Language (XML) document, thus permitting storage of a wide range of XML-tagged data. XML values provide typing via structured markup, extensibility from addition of new tags, and plug and play support for XML Linking (XLink) and Resource Description Framework (RDF) values.

*Namespace management:* The ability to copy and move Web pages within a server's namespace, and the ability to create and list the contents of collections. Namespace management permits the creation of "Save As..." style dialog boxes found in most application software.

## DELTA V FEATURES

The DeltaV protocol builds upon WebDAV's features and data model to provide the following capabilities:

*Versioning:* The ability to record important states in the evolution of a resource. DeltaV supports the basic checkout-edit-checkin style of version control. Additionally, autoversioning allows a server to automatically record revisions made by versioning unaware tools, such as those that only understand the WebDAV protocol. Comments may be recorded about a revision, and a listing of the predecessor and successor relationships can be retrieved.

*Workspaces:* A workspace is a location where a person can work in isolation from the ongoing changes made by all other collaborators working on the same set of resources. There are two broad classes of workspace, server-side and client-side. Server-side workspaces provide a portion of the server's URL namespace for each collaborator. For example, an author named Uffe might have a workspace named /ws/ht01paper/uffe/. Client-side workspaces expect all collaborators to work in the same portion of the URL space. In both cases, clients are expected to replicate significant portions of the version history to a local store/filesystem for increased efficiency of file intensive operations, like compiles.

*Activities:* An activity represents a single logical change, tracking all the resources that were modified in the course of making the change. One use of activities is track several different logical changes made in a single workspace, and then selectively merge a subset of those logical changes to other workspaces. Activities are restricted to tracking only changes made on a single line of descent, and hence can be used to enforce versioning policies where each change must be on only one line of descent. Such a policy makes it easier to merge logical changes.

*Configuration Management:* The ability to record a snapshot of the current revisions of multiple resources. DeltaV provides operations to record the specific resource versions that comprise a workspace or a collection hierarchy, and automatically creates a by-reference copy of the snapshot in a portion of the server's URL namespace. This makes each snapshot always available, even to versioning unaware clients.

## SUPPORTING APPLICATIONS

Several insights guided the WebDAV and DeltaV work. It was assumed that people would not switch tools to gain the advantages of remote authoring. Furthermore, the best way to enable widespread support for remote collaborative authoring and versioning in everyday tools was to create a network protocol, rather than an application program interface (API). This approach has paid off: today there are many industrial strength clients and server supporting WebDAV. Supporting clients include Office 2000, Acrobat, Photoshop, Go Live 5, and Dreamweaver 4. WebDAV servers include Apache mod\_dav, Microsoft IIS 5, Exchange 2000, and Sharepoint, Oracle Internet File System, Adobe In Scope, Xythos WebFile Server, and the W3C Jigsaw server.

## ADDITIONAL INFORMATION

**WebDAV Resources** – <http://www.webdav.org/>

*A web site containing a central collection of pages and links to all things WebDAV.*

**WebDAV Working Group**

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

*Contains links to active documents, and a complete list of WebDAV-supporting applications.*

**HTTP Extensions for Distributed Authoring**

Y. Y. Goland, E. J. Whitehead, Jr., A. Faizi, S. R. Carter, D. C. Jensen, RFC 2518, February, 1999.

<http://www.ics.uci.edu/pub/ietf/webdav/protocol/rfc2518.pdf>

*This is the WebDAV Distributed Authoring Protocol specification.*

**DeltaV Working Group**

<http://www.webdav.org/deltav/>

*The home page for the IETF Delta-V Working Group, with links off to the most recent specifications.*

**Versioning Extensions to WebDAV**

G. Clemm, J. Amsden, C. Kaler, J. Whitehead, Internet-Draft, work-in-progress, draft-ietf-deltav-versioning-15, April 14, 2001.

<http://www.webdav.org/deltav/protocol/draft-ietf-deltav-versioning-15.htm>

*The most recent revision of the versioning and configuration management protocol specification.*