Network Working Group	G. Clemm	
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Expires: April 6, 2009	J. Reschke, Ed.	
	greenbytes	
	J. Whitehead	
	U.C. Santa Cruz	
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Binding Extensions to Web Distributed Authoring and Versioning (WebDAV)
draft-ietf-webdav-bind-21

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Abstract

This specification defines bindings, and the BIND method for creating multiple bindings to the same resource. Creating a new binding to a resource causes at least one new URI to be mapped to that resource. Servers are required to insure the integrity of any bindings that they allow to be created.

Editorial Note (To be removed by RFC Editor before publication)

Please send comments to the Distributed Authoring and Versioning (WebDAV) working group at mailto:w3c-dist-auth@w3.org, which may be joined by sending a message with subject "subscribe" to mailto:w3c-dist-auth-request@w3.org. Discussions of the WEBDAV working group are archived at http://lists.w3.org/Archives/Public/w3c-dist-auth/. http://www.webdav.org/bind/draft-ietf-webdav-bind-issues.html lists all registered issues since draft 02.

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1. Introduction

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This specification extends the WebDAV Distributed Authoring Protocol ([RFC4918] (Dusseault, L., Ed., “HTTP Extensions for Web Distributed

Authoring and Versioning (WebDAV)," June 2007.)) to enable clients to create new access paths to existing resources. This capability is useful for several reasons:

URIs of WebDAV-compliant resources are hierarchical and correspond to a hierarchy of collections in resource space. The WebDAV Distributed Authoring Protocol makes it possible to organize these resources into hierarchies, placing them into groupings, known as collections, which are more easily browsed and manipulated than a single flat collection. However, hierarchies require categorization decisions that locate resources at a single location in the hierarchy, a drawback when a resource has multiple valid categories. For example, in a hierarchy of vehicle descriptions containing collections for cars and boats, a description of a combination car/boat vehicle could belong in either collection. Ideally, the description should be accessible from both. Allowing clients to create new URIs that access the existing resource lets them put that resource into multiple collections.

Hierarchies also make resource sharing more difficult, since resources that have utility across many collections are still forced into a single collection. For example, the mathematics department at one university might create a collection of information on fractals that contains bindings to some local resources, but also provides access to some resources at other universities. For many reasons, it may be undesirable to make physical copies of the shared resources on the local server: to conserve disk space, to respect copyright constraints, or to make any changes in the shared resources visible automatically. Being able to create new access paths to existing resources in other collections or even on other servers is useful for this sort of case.

The BIND method defined here provides a mechanism for allowing clients to create alternative access paths to existing WebDAV resources. HTTP [RFC2616] (Fielding, R., Gettys, J., Mogul, J., Frystyk, H., Masinter, L., Leach, P., and T. Berners-Lee, "Hypertext Transfer Protocol -- HTTP/1.1," June 1999.) and WebDAV [RFC4918] (Dusseault, L., Ed., "HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV)," June 2007.) methods are able to work because there are mappings between URIs and resources. A method is addressed to a URI, and the server follows the mapping from that URI to a resource, applying the method to that resource. Multiple URIs may be mapped to the same resource, but until now there has been no way for clients to create additional URIs mapped to existing resources.

BIND lets clients associate a new URI with an existing WebDAV resource, and this URI can then be used to submit requests to the resource. Since URIs of WebDAV resources are hierarchical, and correspond to a hierarchy of collections in resource space, the BIND method also has the effect of adding the resource to a collection. As new URIs are associated with the resource, it appears in additional collections.

A BIND request does not create a new resource, but simply makes available a new URI for submitting requests to an existing resource. The new URI is indistinguishable from any other URI when submitting a request to a resource. Only one round trip is needed to submit a

request to the intended target. Servers are required to enforce the integrity of the relationships between the new URIs and the resources associated with them. Consequently, it may be very costly for servers to support BIND requests that cross server boundaries.
This specification is organized as follows. Section 1.1 (Terminology) defines terminology used in the rest of the specification, while Section 2 (Overview of Bindings) overviews bindings. Section 3 (Properties) defines the new properties needed to support multiple bindings to the same resource. Section 4 (BIND Method) specifies the BIND method, used to create multiple bindings to the same resource. Section 5 (UNBIND Method) specifies the UNBIND method, used to remove a binding to a resource. Section 6 (REBIND Method) specifies the REBIND method, used to move a binding to another collection.

1.1. Terminology

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The terminology used here follows and extends that in the WebDAV Distributed Authoring Protocol specification [RFC4918] (Dusseault, L., Ed., "HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV)," June 2007.).
The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119] (Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels," March 1997.).
This document uses XML DTD fragments ([XML] (Bray, T., Paoli, J., Sperberg-McQueen, C., Maler, E., and F. Yergeau, "Extensible Markup Language (XML) 1.0 (Fourth Edition)," August 2006.)) as a notational convention, using the rules defined in [RFC4918] (Dusseault, L., Ed., "HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV)," June 2007.).

> A relation between an absolute URI and a resource. For an absolute URI U and the resource it identifies R, the URI mapping can be thought of as (U => R). Since a resource can represent items that are not network retrievable, as well as those that are, it is possible for a resource to have zero, one, or many URI mappings. Mapping a resource to an "http" scheme URI makes it possible to submit HTTP protocol requests to the resource using the URI.

> Informally, the characters found between slashes ("/") in a URI. Formally, as defined in [RFC3986] (Berners-Lee, T., Fielding, R., and L. Masinter, "Uniform Resource Identifier (URI): Generic Syntax," January 2005.).

> A relation between a single path segment (in a collection) and a resource. A binding is part of the state of a collection. If two different collections contain a binding between the same path segment and the same resource, these are two distinct bindings. So for a collection C, a path segment S, and a resource R, the binding can be thought of as C:(S -> R). Bindings create URI mappings, and hence allow requests to be sent to a single resource from multiple locations in a URI namespace. For example, given a collection C (accessible through the URI http://www.example.com/CollX), a path segment S (equal to "foo.html"), and a resource R, then creating the binding C: (S -> R) makes it possible to use the URI http://www.example.com/CollX/foo.html to access R.

> A resource that contains, as part of its state, a set of bindings that identify internal member resources.

> The URI that identifies an internal member of a collection, and that consists of the URI for the collection, followed by a slash character ('/'), followed by the path segment of the binding for that internal member.

1.2. Method Preconditions and Postconditions

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See [RFC4918] (Dusseault, L., Ed., “HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV),” June 2007.) for the definitions of "precondition" and "postcondition".

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2. Overview of Bindings

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Bindings are part of the state of a collection. They define the internal members of the collection, and the names of those internal members.
Bindings are added and removed by a variety of existing HTTP methods. A method that creates a new resource, such as PUT, COPY, and MKCOL, adds a binding. A method that deletes a resource, such as DELETE, removes a binding. A method that moves a resource (e.g. MOVE) both adds a binding (in the destination collection) and removes a binding (in the source collection). The BIND method introduced here provides a mechanism for adding a second binding to an existing resource. There is no difference between an initial binding added by PUT, COPY, or MKCOL, and additional bindings added with BIND.

It would be very undesirable if one binding could be destroyed as a side effect of operating on the resource through a different binding. In particular, the removal of one binding to a resource (e.g. with a DELETE or a MOVE) disrupt another binding to that resource, e.g. by turning that binding into a dangling path segment. The server reclaim system resources after removing one binding, while other bindings to the resource remain. In other words, the server maintain the integrity of a binding. It is permissible, however, for future method definitions (e.g., a DESTROY method) to have semantics that explicitly remove all bindings and/or immediately reclaim system resources.

2.1. Bindings to Collections

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Creating a new binding to a collection makes each resource associated with a binding in that collection accessible via a new URI, and thus creates new URI mappings to those resources but no new bindings. For example, suppose a new binding CollY is created for collection C1 in the figure below. It immediately becomes possible to access resource R1 using the URI /CollY/x.gif and to access resource R2 using the URI /CollY/y.jpg, but no new bindings for these child resources were created. This is because bindings are part of the state of a collection, and associate a URI that is relative to that collection with its target resource. No change to the bindings in Collection C1 is needed to make its children accessible using /CollY/x.gif and /CollY/y.jpg.

2.1.1. Bind Loops

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Bindings to collections can result in loops ("cycles"), which servers detect when processing "Depth: infinity" requests. It is sometimes possible to complete an operation in spite of the presence of a loop. For instance, a PROPFIND can still succeed if the server uses the new status code 208 (Already Reported) defined in Section 7.1 (208 Already Reported).
However, the 506 (Loop Detected) status code is defined in Section 7.2 (506 Loop Detected) for use in contexts where an operation is terminated because a loop was encountered.
Support for loops is : servers reject requests that would lead to the creation of a bind loop (see DAV:cycle-allowed precondition defined in Section 4 (BIND Method)).

2.2. URI Mappings Created by a new Binding

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Suppose a binding from "Binding-Name" to resource R is to be added to a collection, C. Then if C-MAP is the set of URIs that were mapped to C before the BIND request, then for each URI "C-URI" in C-MAP, the URI "C-URI/Binding-Name" is mapped to resource R following the BIND request.
For example, if a binding from "foo.html" to R is added to a collection C, and if the following URIs are mapped to C:

```
http://www.example.com/A/1/
http://example.com/A/one/
```

then the following new mappings to R are introduced:

```
http://www.example.com/A/1/foo.html
http://example.com/A/one/foo.html
```

Note that if R is a collection, additional URI mappings are created to the descendents of R. Also, note that if a binding is made in collection C to C itself (or to a parent of C), an infinite number of mappings are introduced.
For example, if a binding from "myself" to C is then added to C, the following infinite number of additional mappings to C are introduced:

```
http://www.example.com/A/1/myself
http://www.example.com/A/1/myself/myself
   ...
```

and the following infinite number of additional mappings to R are introduced:

```
http://www.example.com/A/1/myself/foo.html
http://www.example.com/A/1/myself/myself/foo.html
   ...
```

2.3. COPY and Bindings

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As defined in [RFC4918] (Dusseault, L., Ed., “HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV),” June 2007.), COPY causes the resource identified by the Request-URI to be duplicated, and makes the new resource accessible using the URI specified in the Destination header. Upon successful completion of a COPY, a new binding is created between the last path segment of the Destination header, and the destination resource. The new binding is added to its parent collection, identified by the Destination header minus its final segment.
The following figure shows an example: Suppose that a COPY is issued to URI-3 for resource R (which is also mapped to URI-1 and URI-2), with the Destination header set to URI-X. After successful completion of the COPY operation, resource R is duplicated to create resource R', and a new binding has been created which creates at least the URI mapping between URI-X and the new resource (although other URI mappings may also have been created).

It might be thought that a COPY request with "Depth: 0" on a collection would duplicate its bindings, since bindings are part of the collection's state. This is not the case, however. The definition of Depth in [RFC4918] (Dusseault, L., Ed., “HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV),” June 2007.) makes it clear that a "Depth: 0" request does not apply to a collection's

members. Consequently, a COPY with "Depth: 0" does not duplicate the bindings contained by the collection.
If a COPY request causes an existing resource to be updated, the bindings to that resource be unaffected by the COPY request. Using the preceding example, suppose that a COPY request is issued to URI-X for resource R', with the Destination header set to URI-2. The content and dead properties of resource R would be updated to be a copy of those of resource R', but the mappings from URI-1, URI-2, and URI-3 to resource R remain unaffected. If because of multiple bindings to a resource, more than one source resource updates a single destination resource, the order of the updates is server defined.
If a COPY request would cause a new resource to be created as a copy of an existing resource, and that COPY request has already created a copy of that existing resource, the COPY request instead creates another binding to the previous copy, instead of creating a new resource.

2.3.1. Example: COPY with 'Depth: infinity' in Presence of Bind Loops

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As an example of how COPY with Depth infinity would work in the presence of bindings, consider the following collection:

If a COPY with Depth infinity is submitted to /CollX, with destination of /CollA, the outcome of the copy operation is:

2.3.2. Example: COPY with 'Depth: infinity' with Multiple Bindings to a Leaf Resource

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Given the following collection hierarchy:

A COPY of /CollX with Depth infinity to /CollY results in the following collection hierarchy:

2.4. DELETE and Bindings

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When there are multiple bindings to a resource, a DELETE applied to that resource remove any bindings to that resource other than the one identified by the Request-URI. For example, suppose the collection identified by the URI "/a" has a binding named "x" to a resource R, and another collection identified by "/b" has a binding named "y" to the same resource R. Then a DELETE applied to "/a/x" removes the binding named "x" from "/a" but remove the binding named "y" from "/b" (i.e. after the DELETE, "/y/b" continues to identify the resource R).
When DELETE is applied to a collection, it modify the membership of any other collection that is not itself a member of the collection being deleted. For example, if both "/a/.../x" and "/b/.../y" identify the same collection, C, then applying DELETE to "/a" must not delete an internal member from C or from any other collection that is a member of C, because that would modify the membership of "/b".

If a collection supports the UNBIND method (see Section 5 (UNBIND Method)), a DELETE of an internal member of a collection be implemented as an UNBIND request. In this case, applying DELETE to a Request-URI has the effect of removing the binding identified by the final segment of the Request-URI from the collection identified by the Request-URI minus its final segment. Although [RFC4918] (Dusseault, L., Ed., "HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV)," June 2007.) allows a DELETE to be a non-atomic operation, when the DELETE operation is implemented as an UNBIND, the operation is atomic. In particular, a DELETE on a hierarchy of resources is simply the removal of a binding to the collection identified by the Request-URI.

2.5. MOVE and Bindings

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When MOVE is applied to a resource, the other bindings to that resource be unaffected, and if the resource being moved is a collection, the bindings to any members of that collection be unaffected. Also, if MOVE is used with Overwrite:T to delete an existing resource, the constraints specified for DELETE apply.
If the destination collection of a MOVE request supports the REBIND method (see Section 6 (REBIND Method)), a MOVE of a resource into that collection be implemented as a REBIND request. Although [RFC4918] (Dusseault, L., Ed., "HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV)," June 2007.) allows a MOVE to be a non-atomic operation, when the MOVE operation is implemented as a REBIND, the operation is atomic. In particular, applying a MOVE to a Request-URI and a Destination URI has the effect of removing a binding to a resource (at the Request-URI), and creating a new binding to that resource (at the Destination URI). Even when the Request-URI identifies a collection, the MOVE operation involves only removing one binding to that collection and adding another.

2.5.1. Example: Simple MOVE

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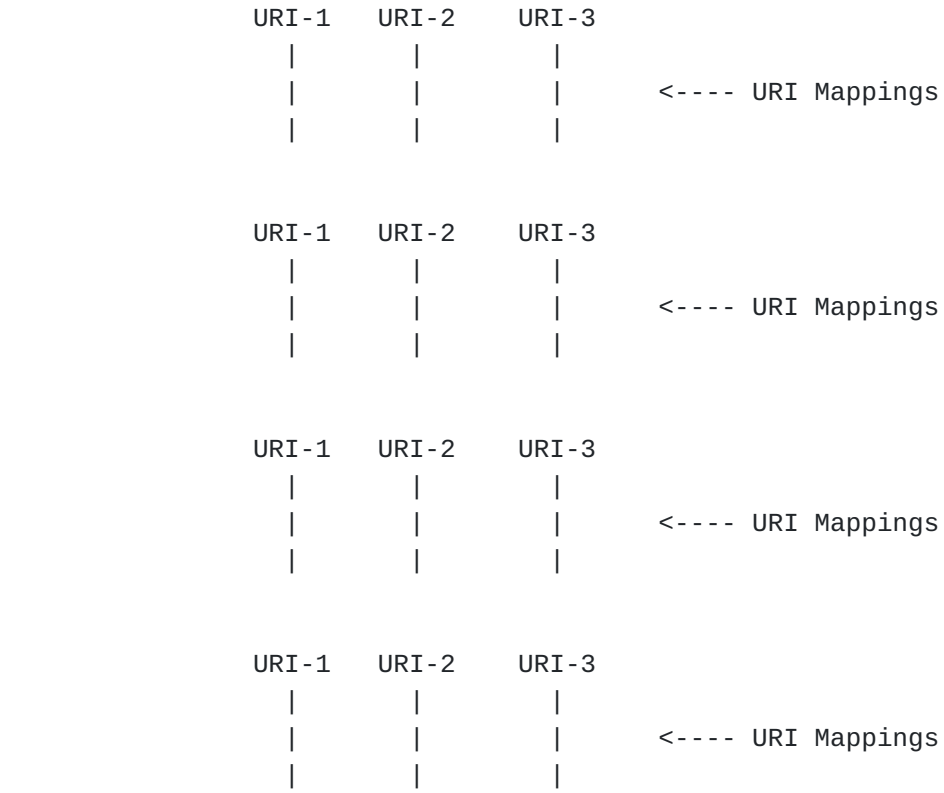
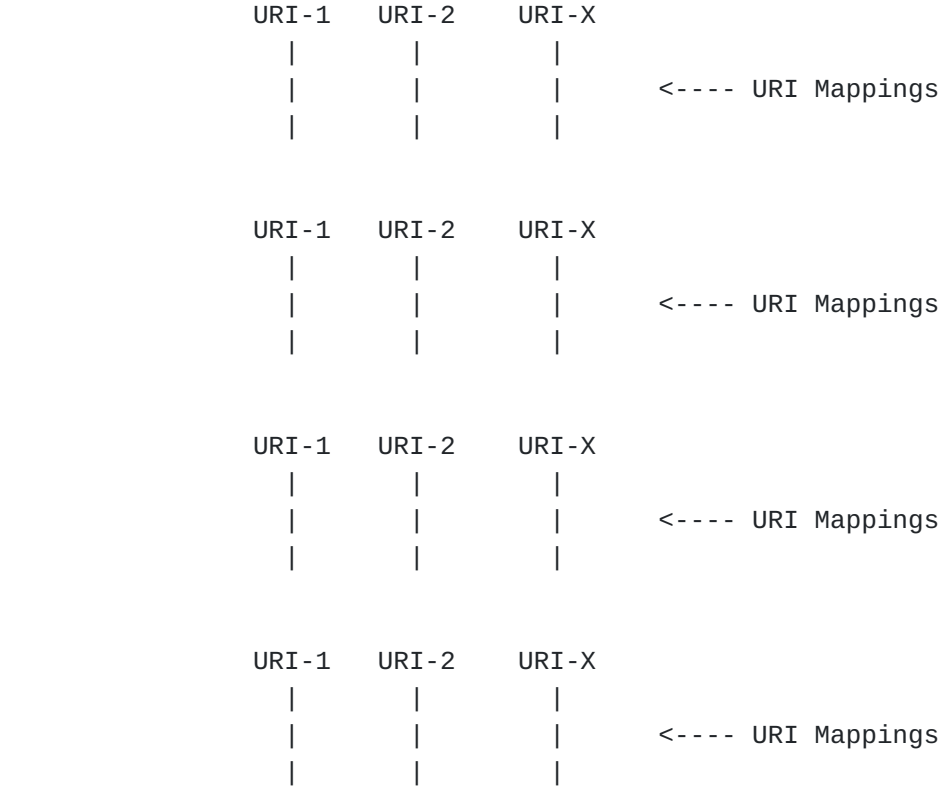
As an example, suppose that a MOVE is issued to URI-3 for resource R below (which is also mapped to URI-1 and URI-2), with the Destination header set to URI-X. After successful completion of the MOVE operation, a new binding has been created which creates the URI mapping between URI-X and resource R. The binding corresponding to the final segment of URI-3 has been removed, which also causes the URI mapping between URI-3 and R to be removed. If resource R were a collection, old URI-3 based mappings to members of R would have been removed, and new URI-X based mappings to members of R would have been created.
>> Before Request:



>> After Request:



2.5.2. Example: MOVE Request causing a Bind Loop

TOC

Note that in the presence of collection bindings, a MOVE request can cause the creating of a bind loop.
Consider a the top level collections C1 and C2 with URIs "/CollW/" and "/CollX/". C1 also contains an additional binding named "CollY" to C2:

In this case, the MOVE request below would cause a bind loop:
>> Request:

```
MOVE /CollW HTTP/1.1
Host: example.com
Destination: /CollX/CollZ
```

If the request succeeded, the resulting state would be:

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2.6. PROPFIND and Bindings

Consistent with [RFC4918] (Dusseault, L., Ed., “HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV),” June 2007.), the value of a dead property be independent of the number of bindings to its host resource or of the path submitted to PROPFIND. On the other hand, the behaviour for each live property depends on its individual definition (for example, see [RFC3744] (Clemm, G., Reschke, J., Sedlar, E., and J. Whitehead, “Web Distributed Authoring and Versioning (WebDAV) Access Control Protocol,” May 2004.), paragraph 2).

2.7. Determining Whether Two Bindings Are to the Same Resource

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It is useful to have some way of determining whether two bindings are to the same resource. Two resources might have identical contents and properties, but not be the same resource (e.g. an update to one resource does not affect the other resource).
The DAV:resource-id property defined in Section 3.1 (DAV:resource-id Property) is a resource identifier, which be unique across all resources for all time. If the values of DAV:resource-id returned by PROPFIND requests through two bindings are identical character by character, the client can be assured that the two bindings are to the same resource.
The DAV:resource-id property is created, and its value assigned, when the resource is created. The value of DAV:resource-id be changed. Even after the resource is no longer accessible through any URI, that value be reassigned to another resource's DAV:resource-id property.
Any method that creates a new resource assign a new, unique value to its DAV:resource-id property. For example, a PUT applied to a null resource, COPY (when not overwriting an existing target) and CHECKIN (see [RFC3253] (Clemm, G., Amsden, J., Ellison, T., Kaler, C., and J. Whitehead, “Versioning Extensions to WebDAV (Web Distributed Authoring and Versioning),” March 2002.)) must assign a new, unique value to the DAV:resource-id property of the new resource they create.
On the other hand, any method that affects an existing resource must not change the value of its DAV:resource-id property. Specifically, a PUT or a COPY that updates an existing resource must not change the value of its DAV:resource-id property. A REBIND, since it does not create a new resource, but only changes the location of an existing resource, must not change the value of the DAV:resource-id property.

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2.8. Discovering the Bindings to a Resource

An DAV:parent-set property on a resource provides a list of the bindings that associate a collection and a URI segment with that resource. If the DAV:parent-set property exists on a given resource, it contain a complete list of all bindings to that resource that the client is authorized to see. When deciding whether to support the DAV:parent-set property, server implementers / administrators should balance the benefits it provides against the cost of maintaining the property and the security risks enumerated in Sections 10.4 (Private Locations May Be Revealed) and 10.5 (DAV:parent-set and Denial of Service).

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3. Properties

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The bind feature introduces the properties defined below.
A DAV:allprop PROPFIND request return any of the properties defined by this document. This allows a binding server to perform efficiently when a naive client, which does not understand the cost of asking a server to compute all possible live properties, issues a DAV:allprop PROPFIND request.

3.1. DAV:resource-id Property

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The DAV:resource-id property is a property that enables clients to determine whether two bindings are to the same resource. The value of DAV:resource-id is a URI, and may use any registered URI scheme that guarantees the uniqueness of the value across all resources for all time (e.g. the urn:uuid: URN namespace defined in [RFC4122] (Leach, P., Mealling, M., and R. Salz, "A Universally Unique IDentifier (UUID) URN Namespace," July 2005.) or the opaquelocktoken: URI scheme defined in [RFC4918] (Dusseault, L., Ed., "HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV)," June 2007.)).

```
<!ELEMENT resource-id (href)>
```

by definition, the URI specified in the DAV:resource-id property always is an alternate URI for that resource.

3.2. DAV:parent-set Property

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The DAV:parent-set property is an property that enables clients to discover what collections contain a binding to this resource (i.e. what collections have that resource as an internal member). It contains an href/segment pair for each collection that has a binding to the resource. The href identifies the collection, and the segment identifies the binding name of that resource in that collection.
A given collection appear only once in the DAV:parent-set for any given binding, even if there are multiple URI mappings to that collection.

```
<!ELEMENT parent-set (parent)*>
<!ELEMENT parent (href, segment)>
<!ELEMENT segment (#PCDATA)>
<!-- PCDATA value: segment, as defined in
```

[RFC3986] (Berners-Lee, T., Fielding, R., and L. Masinter, “Uniform Resource Identifier (URI): Generic Syntax,” January 2005.)


```
<!ELEMENT parent-set (parent)*>
<!ELEMENT parent (href, segment)>
<!ELEMENT segment (#PCDATA)>
<!-- PCDATA value: segment, as defined in
```

[RFC3986] (Berners-Lee, T., Fielding, R., and L. Masinter, “Uniform Resource Identifier (URI): Generic Syntax,” January 2005.)

```
<!ELEMENT parent-set (parent)*>
<!ELEMENT parent (href, segment)>
<!ELEMENT segment (#PCDATA)>
<!-- PCDATA value: segment, as defined in
```

3.2.1. Example for DAV:parent-set Property

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For example, if collection C1 is mapped to both /CollX and /CollY, and C1 contains a binding named "x.gif" to a resource R1, then either [/CollX, x.gif] or [/CollY, x.gif] can appear in the DAV:parent-set of R1, but not both. But if C1 also had a binding named "y.gif" to R1, then there would be two entries for C1 in the DAV:binding-set of R1 (i.e. both [/CollX, x.gif] and [/CollX, y.gif] or, alternatively, both [/CollY, x.gif] and [/CollY, y.gif]).

In this case, one possible value for DAV:parent-set property on "/CollX/x.gif" would be:

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4. BIND Method

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The BIND method modifies the collection identified by the Request-URI, by adding a new binding from the segment specified in the BIND body to the resource identified in the BIND body.
If a server cannot guarantee the integrity of the binding, the BIND request fail. Note that it is especially difficult to maintain the integrity of cross-server bindings. Unless the server where the resource resides knows about all bindings on all servers to that resource, it may unwittingly destroy the resource or make it inaccessible without notifying another server that manages a binding to the resource. For example, if server A permits creation of a binding to a resource on server B, server A must notify server B about its binding and must have an agreement with B that B will not destroy the resource while A's binding exists. Otherwise server B may receive a DELETE request that it thinks removes the last binding to the resource and destroy the resource while A's binding still exists. The precondition DAV:cross-server-binding is defined below for cases where servers fail cross-server BIND requests because they cannot guarantee the integrity of cross-server bindings.
By default, if there already is a binding for the specified segment in the collection, the new binding replaces the existing binding. This default binding replacement behavior can be overridden using the Overwrite header defined in [RFC4918] (Dusseault, L., Ed., “HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV),” June 2007.).
If a BIND request fails, the server state preceding the request be restored. This method is unsafe and idempotent (see [RFC2616] (Fielding, R., Gettys, J., Mogul, J., Frystyk, H., Masinter, L., Leach, P., and T. Berners-Lee, “Hypertext Transfer Protocol -- HTTP/1.1,” June 1999.)).

> The request include an Overwrite header.
>
> The request body be a DAV:bind XML element.
>
> ```
> <!ELEMENT bind (segment, href)>
> ```

If the request succeeds, the server return 201 (Created) when a new binding was created and 200 (OK) when an existing binding was replaced.

If a response body for a successful request is included, it be a DAV:bind-response XML element. Note that this document does not define any elements for the BIND response body, but the DAV:bind-response element is defined to ensure interoperability between future extensions that do define elements for the BIND response body.

```
        <!ELEMENT bind-response ANY>
```

(DAV:bind-into-collection): The Request-URI identify a collection.

(DAV:bind-source-exists): The DAV:href element identify a resource.

(DAV:binding-allowed): The resource identified by the DAV:href supports multiple bindings to it.

(DAV:cross-server-binding): If the resource identified by the DAV:href element in the request body is on another server from the collection identified by the Request-URI, the server support cross-server bindings (servers that do not support cross-server bindings can use this condition code to signal the client exactly why the request failed).

(DAV:name-allowed): The name specified by the DAV:segment is available for use as a new binding name.

(DAV:can-overwrite): If the collection already contains a binding with the specified path segment, and if an Overwrite header is included, the value of the Overwrite header be "T".

(DAV:cycle-allowed): If the DAV:href element identifies a collection, and if the Request-URI identifies a collection that is a member of that collection, the server support cycles in the URI namespace (servers that do not support cycles can use this condition code to signal the client exactly why the request failed).

(DAV:locked-update-allowed): If the collection identified by the Request-URI is write-locked, then the appropriate token be specified in an If request header.

(DAV:locked-overwrite-allowed): If the collection already contains a binding with the specified path segment, and if that binding is protected by a write-lock, then the appropriate token be specified in an If request header.

> (DAV:new-binding): The collection have a binding that maps the segment specified in the DAV:segment element in the request body, to the resource identified by the DAV:href element in the request body.

4.1. Example: BIND

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```
>> Request:

     BIND /CollY HTTP/1.1
     Host: www.example.com
     Content-Type: application/xml; charset="utf-8"
     Content-Length: xxx

     <?xml version="1.0" encoding="utf-8" ?>


     BIND /CollY HTTP/1.1
     Host: www.example.com
     Content-Type: application/xml; charset="utf-8"
     Content-Length: xxx

     <?xml version="1.0" encoding="utf-8" ?>

>> Response:

     HTTP/1.1 201 Created
```

The server added a new binding to the collection, "http://www.example.com/CollY", associating "bar.html" with the resource identified by the URI "http://www.example.com/CollX/foo.html". Clients can now use the URI "http://www.example.com/CollY/bar.html" to submit requests to that resource.

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5. UNBIND Method

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The UNBIND method modifies the collection identified by the Request-URI, by removing the binding identified by the segment specified in the UNBIND body.
Once a resource is unreachable by any URI mapping, the server reclaim system resources associated with that resource. If UNBIND removes a binding to a resource, but there remain URI mappings to that resource, the server reclaim system resources associated with the resource.

If an UNBIND request fails, the server state preceding the request be restored. This method is unsafe and idempotent (see [RFC2616] (Fielding, R., Gettys, J., Mogul, J., Frystyk, H., Masinter, L., Leach, P., and T. Berners-Lee, “Hypertext Transfer Protocol -- HTTP/1.1,” June 1999.)).

> The request body be a DAV:unbind XML element.
>
> ```
> <!ELEMENT unbind (segment)>
> ```
>
> If the request succeeds, the server return 200 (OK) when the binding was successfully deleted.
>
> If a response body for a successful request is included, it be a DAV:unbind-response XML element. Note that this document does not define any elements for the UNBIND response body, but the DAV:unbind-response element is defined to ensure interoperability between future extensions that do define elements for the UNBIND response body.
>
> ```
> <!ELEMENT unbind-response ANY>
> ```

> (DAV:unbind-from-collection): The Request-URI identify a collection.
>
> (DAV:unbind-source-exists): The DAV:segment element identify a binding in the collection identified by the Request-URI.
>
> (DAV:locked-update-allowed): If the collection identified by the Request-URI is write-locked, then the appropriate token be specified in the request.
>
> (DAV:protected-url-deletion-allowed): If the binding identified by the segment is protected by a write-lock, then the appropriate token be specified in the request.

> (DAV:binding-deleted): The collection have a binding for the segment specified in the DAV:segment element in the request body.
>
> (DAV:lock-deleted): If the internal member URI of the binding specified by the Request-URI and the DAV:segment element in the request body was protected by a write-lock at the time of the request, that write-lock must have been deleted by the request.

5.1. Example: UNBIND

TOC

```
>> Request:

     UNBIND /CollX HTTP/1.1
     Host: www.example.com
     Content-Type: application/xml; charset="utf-8"
     Content-Length: xxx

     <?xml version="1.0" encoding="utf-8" ?>


     UNBIND /CollX HTTP/1.1
     Host: www.example.com
     Content-Type: application/xml; charset="utf-8"
     Content-Length: xxx

     <?xml version="1.0" encoding="utf-8" ?>

>> Response:

     HTTP/1.1 200 OK
```

The server removed the binding named "foo.html" from the collection, "http://www.example.com/CollX". A request to the resource named "http://www.example.com/CollX/foo.html" will return a 404 (Not Found) response.

---

6. REBIND Method

TOC

The REBIND method removes a binding to a resource from a collection, and adds a binding to that resource into the collection identified by the Request-URI. The request body specifies the binding to be added (segment) and the old binding to be removed (href). It is effectively an atomic form of a MOVE request, and be treated the same way as MOVE for the purpose of determining access permissions.
If a REBIND request fails, the server state preceding the request be restored. This method is unsafe and idempotent (see [RFC2616] (Fielding, R., Gettys, J., Mogul, J., Frystyk, H., Masinter, L., Leach, P., and T. Berners-Lee, “Hypertext Transfer Protocol -- HTTP/1.1,” June 1999.)).

> The request include an Overwrite header.
>
> The request body be a DAV:rebind XML element.

```
        <!ELEMENT rebind (segment, href)>
```

If the request succeeds, the server return 201 (Created) when a new binding was created and 200 (OK) when an existing binding was replaced.

If a response body for a successful request is included, it be a DAV:rebind-response XML element. Note that this document does not define any elements for the REBIND response body, but the DAV:rebind-response element is defined to ensure interoperability between future extensions that do define elements for the REBIND response body.

```
        <!ELEMENT rebind-response ANY>
```

(DAV:rebind-into-collection): The Request-URI identify a collection.

(DAV:rebind-source-exists): The DAV:href element identify a resource.

(DAV:cross-server-binding): If the resource identified by the DAV:href element in the request body is on another server from the collection identified by the Request-URI, the server support cross-server bindings (servers that do not support cross-server bindings can use this condition code to signal the client exactly why the request failed).

(DAV:name-allowed): The name specified by the DAV:segment is available for use as a new binding name.

(DAV:can-overwrite): If the collection already contains a binding with the specified path segment, and if an Overwrite header is included, the value of the Overwrite header be "T".

(DAV:cycle-allowed): If the DAV:href element identifies a collection, and if the Request-URI identifies a collection that is a member of that collection, the server support cycles in the URI namespace (servers that do not support cycles can use this condition code to signal the client exactly why the request failed).

(DAV:locked-update-allowed): If the collection identified by the Request-URI is write-locked, then the appropriate token be specified in the request.

(DAV:protected-url-modification-allowed): If the collection identified by the Request-URI already contains a binding with the

specified path segment, and if that binding is protected by a write-lock, then the appropriate token be specified in the request.

(DAV:locked-source-collection-update-allowed): If the collection identified by the parent collection prefix of the DAV:href URI is write-locked, then the appropriate token be specified in the request.

(DAV:protected-source-url-deletion-allowed): If the DAV:href URI is protected by a write lock, then the appropriate token be specified in the request.

(DAV:new-binding): The collection have a binding that maps the segment specified in the DAV:segment element in the request body, to the resource that was identified by the DAV:href element in the request body.

(DAV:binding-deleted): The URL specified in the DAV:href element in the request body be mapped to a resource.

(DAV:lock-deleted): If the URL specified in the DAV:href element in the request body was protected by a write-lock at the time of the request, that write-lock must have been deleted by the request.

6.1. Example: REBIND

TOC

```
>> Request:

     REBIND /CollX HTTP/1.1
     Host: www.example.com
     Content-Type: application/xml; charset="utf-8"
     Content-Length: xxx

     <?xml version="1.0" encoding="utf-8" ?>


     REBIND /CollX HTTP/1.1
     Host: www.example.com
     Content-Type: application/xml; charset="utf-8"
     Content-Length: xxx

     <?xml version="1.0" encoding="utf-8" ?>

>> Response:
```

```
HTTP/1.1 200 OK
```

The server added a new binding to the collection, "http://www.example.com/CollX", associating "foo.html" with the resource identified by the URI "http://www.example.com/CollY/bar.html", and removes the binding named "bar.html" from the collection identified by the URI "http://www.example.com/CollY". Clients can now use the URI "http://www.example.com/CollX/foo.html" to submit requests to that resource, and requests on the URI "http://www.example.com/CollY/bar.html" will fail with a 404 (Not Found) response.

6.2. Example: REBIND in Presence of Locks and Bind Loops

TOC

To illustrate the effects of locks and bind loops on a REBIND operation, consider the following collection:

(where L1 is "urn:uuid:f92d4fae-7012-11ab-a765-00c0ca1f6bf9").

Note that the binding between CollZ and C1 creates a loop in the containment hierarchy. Servers are not required to support such loops, though the server in this example does.
The REBIND request below will remove the segment "CollZ" from C3 and add a new binding from "CollA" to the collection C2.

```
REBIND /CollW/CollX HTTP/1.1
Host: www.example.com
If: (<urn:uuid:f92d4fae-7012-11ab-a765-00c0ca1f6bf9>)
Content-Type: application/xml; charset="utf-8"
Content-Length: xxx

<?xml version="1.0" encoding="utf-8" ?>
```

```
REBIND /CollW/CollX HTTP/1.1
Host: www.example.com
If: (<urn:uuid:f92d4fae-7012-11ab-a765-00c0ca1f6bf9>)
Content-Type: application/xml; charset="utf-8"
Content-Length: xxx

<?xml version="1.0" encoding="utf-8" ?>
```

The outcome of the REBIND operation is:

7. Additional Status Codes

TOC

7.1. 208 Already Reported

TOC

The 208 (Already Reported) status code can be used inside a DAV:propstat response element to avoid enumerating the internal members of multiple bindings to the same collection repeatedly. For each binding to a collection inside the request's scope, only one will be reported with a 200 status, while subsequent DAV:response elements for all other bindings will use the 208 status, and no DAV:response elements for their descendants are included.

Note that the 208 status will only occur for "Depth: infinity" requests, and that it is of particular importance when the multiple collection bindings cause a bind loop as discussed in Section 2.2 (URI Mappings Created by a new Binding).

A client can request the DAV:resource-id property in a PROPFIND request to guarantee that they can accurately reconstruct the binding structure of a collection with multiple bindings to a single resource.

For backward compatibility with clients not aware of the 208 status code appearing in multistatus response bodies, it be used unless the client has signalled support for this specification using the "DAV" request header (see Section 8.2 ('DAV' Request Header)). Instead, a 506 status should be returned when a binding loop is discovered. This allows the server to return the 506 as the top level return status, if it discovers it before it started the response, or in the middle of a multistatus, if it discovers it in the middle of streaming out a multistatus response.

7.1.1. Example: PROPFIND by Bind-Aware Client

TOC

For example, consider a PROPFIND request on /Coll (bound to collection C), where the members of /Coll are /Coll/Foo (bound to resource R) and /Coll/Bar (bound to collection C).

>> Request:

```
     PROPFIND /Coll/ HTTP/1.1
     Host: www.example.com
     Depth: infinity
     DAV: bind
     Content-Type: application/xml; charset="utf-8"
     Content-Length: xxx

     <?xml version="1.0" encoding="utf-8" ?>


     PROPFIND /Coll/ HTTP/1.1
     Host: www.example.com
     Depth: infinity
     DAV: bind
     Content-Type: application/xml; charset="utf-8"
     Content-Length: xxx

     <?xml version="1.0" encoding="utf-8" ?>

>> Response:

     HTTP/1.1 207 Multi-Status
     Content-Type: application/xml; charset="utf-8"
     Content-Length: xxx

     <?xml version="1.0" encoding="utf-8" ?>


     HTTP/1.1 207 Multi-Status
     Content-Type: application/xml; charset="utf-8"
     Content-Length: xxx

     <?xml version="1.0" encoding="utf-8" ?>
```

7.1.2. Example: PROPFIND by Non-Bind-Aware Client

TOC

In this example, the client isn't aware of the 208 status code introduced by this specification. As the "Depth: infinity" PROPFIND request would cause a loop condition, the whole request is rejected with a 506 status.

```
>> Request:
```

```
     PROPFIND /Coll/ HTTP/1.1
     Host: www.example.com
     Depth: infinity
     Content-Type: application/xml; charset="utf-8"
     Content-Length: xxx

     <?xml version="1.0" encoding="utf-8" ?>


     PROPFIND /Coll/ HTTP/1.1
     Host: www.example.com
     Depth: infinity
     Content-Type: application/xml; charset="utf-8"
     Content-Length: xxx

     <?xml version="1.0" encoding="utf-8" ?>

>> Response:

     HTTP/1.1 506 Loop Detected
```

7.2. 506 Loop Detected

TOC

The 506 (Loop Detected) status code indicates that the server terminated an operation because it encountered an infinite loop while processing a request with "Depth: infinity". This status indicates that the entire operation failed.

---

8. Capability Discovery

TOC

8.1. OPTIONS Method

TOC

If the server supports bindings, it return the compliance class name "bind" as a field in the "DAV" response header (see [RFC4918] (Dusseault, L., Ed., “HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV),” June 2007.)) from an OPTIONS request on any resource implemented by that server. A value of "bind" in the "DAV" header indicate that the server supports all level requirements and features specified in this document.

8.2. 'DAV' Request Header

TOC

Clients signal support for all level requirements and features by submitting a "DAV" request header containing the compliance class name "bind". In particular, the client understand the 208 status code defined in Section 7.1 (208 Already Reported).

9. Relationship to WebDAV Access Control Protocol

TOC

BIND and REBIND behave the same as MOVE with respect to the DAV:acl property (see [RFC3744] (Clemm, G., Reschke, J., Sedlar, E., and J. Whitehead, “Web Distributed Authoring and Versioning (WebDAV) Access Control Protocol,” May 2004.)).

10. Security Considerations

TOC

This section is provided to make WebDAV implementors aware of the security implications of this protocol.
All of the security considerations of HTTP/1.1 and the WebDAV Distributed Authoring Protocol specification also apply to this protocol specification. In addition, bindings introduce several new security concerns and increase the risk of some existing threats. These issues are detailed below.

10.1. Privacy Concerns

TOC

In a context where cross-server bindings are supported, creating bindings on a trusted server may make it possible for a hostile agent to induce users to send private information to a target on a different server.

10.2. Bind Loops

TOC

Although bind loops were already possible in HTTP 1.1, the introduction of the BIND method creates a new avenue for clients to create loops

accidentally or maliciously. If the binding and its target are on the same server, the server may be able to detect BIND requests that would create loops. Servers are required to detect loops that are caused by bindings to collections during the processing of any requests with "Depth: infinity".

10.3. Bindings, and Denial of Service

TOC

Denial of service attacks were already possible by posting URIs that were intended for limited use at heavily used Web sites. The introduction of BIND creates a new avenue for similar denial of service attacks. If cross-server bindings are supported, clients can now create bindings at heavily used sites to target locations that were not designed for heavy usage.

10.4. Private Locations May Be Revealed

TOC

If the DAV:parent-set property is maintained on a resource, the owners of the bindings risk revealing private locations. The directory structures where bindings are located are available to anyone who has access to the DAV:parent-set property on the resource. Moving a binding may reveal its new location to anyone with access to DAV:parent-set on its resource.

10.5. DAV:parent-set and Denial of Service

TOC

If the server maintains the DAV:parent-set property in response to bindings created in other administrative domains, it is exposed to hostile attempts to make it devote resources to adding bindings to the list.

---

11. Internationalization Considerations

TOC

All internationalization considerations mentioned in [RFC4918] (Dusseault, L., Ed., “HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV),” June 2007.) also apply to this document.

---

12. IANA Considerations

TOC

Section 7 (Additional Status Codes) defines the HTTP status codes 208 (Already Reported) and 506 (Loop Detected), to be added to the registry at http://www.iana.org/assignments/http-status-codes.

---

13. Acknowledgements

TOC

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14. References

TOC

14.1. Normative References

TOC

[RFC2119]	Bradner, S., “Key words for use in RFCs to Indicate Requirement Levels,” BCP 14, RFC 2119, March 1997.
[RFC2616]	Fielding, R., Gettys, J., Mogul, J., Frystyk, H., Masinter, L., Leach, P., and T. Berners-Lee, “Hypertext Transfer Protocol -- HTTP/1.1,” RFC 2616, June 1999.
[RFC3986]	Berners-Lee, T., Fielding, R., and L. Masinter, “Uniform Resource Identifier (URI): Generic Syntax,” STD 66, RFC 3986, January 2005.
[RFC4918]	Dusseault, L., Ed., “HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV),” RFC 4918, June 2007.
[XML]	Bray, T., Paoli, J., Sperberg-McQueen, C., Maler, E., and F. Yergeau, “Extensible Markup Language (XML) 1.0 (Fourth Edition),” W3C REC-xml-20060816, August 2006.

14.2. Informative References

TOC

[RFC3253]	Clemm, G., Amsden, J., Ellison, T., Kaler, C., and J. Whitehead, "Versioning Extensions to WebDAV (Web Distributed Authoring and Versioning)," RFC 3253, March 2002.
[RFC3744]	Clemm, G., Reschke, J., Sedlar, E., and J. Whitehead, "Web Distributed Authoring and Versioning (WebDAV) Access Control Protocol," RFC 3744, May 2004.
[RFC4122]	Leach, P., Mealling, M., and R. Salz, "A Universally Unique IDentifier (UUID) URN Namespace," RFC 4122, July 2005.

Appendix A. Clarification to RFC2518bis' Usage of the term 'lock root'

TOC

[RFC4918] (Dusseault, L., Ed., "HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV)," June 2007.) claims:
A LOCK request to an existing resource will create a lock on the resource identified by the Request-URI, provided the resource is not already locked with a conflicting lock. The resource identified in the Request-URI becomes the root of the lock.
This is incorrect in that it implies that the "lock root" is a resource, not a URL (http://www.rfc-editor.org/errata_search.php?eid=1207). However, should a directly locked resource have multiple bindings, only the one used in the Request-URI of the LOCK request will be the protected from changes of clients not supplying the lock token.
A correct description would be:

> A LOCK request to an existing resource will create a lock on the resource identified by the Request-URI, provided the resource is not already locked with a conflicting lock. The Request-URI becomes the root of the lock.

Note that this change makes the description consistent with the definition of the DAV:lockroot XML element in [RFC4918] (Dusseault, L., Ed., "HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV)," June 2007.).
The authors of this specification recommend that future revisions of [RFC4918] (Dusseault, L., Ed., "HTTP Extensions for Web Distributed Authoring and Versioning (WebDAV)," June 2007.) will update the description as suggested above.

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Appendix B. Change Log (to be removed by RFC Editor before publication)

B.1. Since draft-ietf-webdav-bind-02

TOC

Add and resolve issues "2.3_COPY_SHARED_BINDINGS" and "2.3_MULTIPLE_COPY". Add issue "5.1_LOOP_STATUS" and proposed resolution, but keep it open. Add issues "ED_references" and "4_507_status". Started work on index. Rename document to "Binding Extensions to Web Distributed Authoring and Versioning (WebDAV)". Rename "References" to "Normative References". Close issue "ED_references". Close issue "4_507_status".

B.2. Since draft-ietf-webdav-bind-03

TOC

Add and close issues "9.2_redirect_loops", "ED_authors" and "ED_updates". Add section about capability discovery (DAV header). Close issues "5.1_LOOP_STATUS". Add and resolve new issue "5.1_506_STATUS_STREAMING". Update XML spec reference. Add issue "locking" and resolve as invalid.

B.3. Since draft-ietf-webdav-bind-04

TOC

Add and close issues "6_precondition_binding_allowed" and "6_lock_behaviour". Add mailing list and issues list pointers to front.

B.4. Since draft-ietf-webdav-bind-05

TOC

Editorial fixes. Add and resolve issues "1.3_error_negotiation", "2.5_language" and "7.1.1_add_resource_id". Add historical issue "4_LOCK_BEHAVIOR" and it's resolution for better tracking.

TOC

B.5. Since draft-ietf-webdav-bind-06

Rewrite Editorial Note. Open and resolve issues "2.6_identical", "specify_safeness_and_idempotence" and "ED_rfc2026_ref".

B.6. Since draft-ietf-webdav-bind-07 TOC

Add more index items (no change tracking). Add and resolve issues "2.3_copy_to_same", "bind_properties", "bind_vs_ACL", "6_rebind_intro" and "rfc2396bis" (actually an action item). Fix XML DTD fragment in section 3.3. Make spelling of "Request-URI" consistent.

B.7. Since draft-ietf-webdav-bind-08 TOC

Resolved editorial issues raised by Jim Whitehead in http://lists.w3.org/Archives/Public/w3c-dist-auth/2004OctDec/0129.html. Add and resolve issues "atomicity", "2_allow_destroy", "2.1_separate_loop_discussion", "2.1.1_bind_loops_vs_locks", "2.3_copy_depth_infinity", "2.3_copy_example", "2.3_copy_vs_loops", "2.6_resource-id_vs_versions", "3.2_example" and "6_rebind_premissions". Add issue "2.6_when_do_ids_change". Re-open and resolve "6_rebind_intro".

B.8. Since draft-ietf-webdav-bind-09 TOC

Add and resolve issue "6.1_rebind_vs_locks", adding proposed example text. Add action item "3.1_uuids". Close issue "2.6_when_do_ids_change". Add and resolve issues "2.6_bindings_vs_properties" and "uri_draft_ref".

B.9. Since draft-ietf-webdav-bind-10 TOC

Resolve action item "3.1_uuids". Add and resolve issue "2.7_unlock_vs_bindings". Revisit issue "2.6_bindings_vs_properties", and remove the part of the sentence that speaks about live properties. Update "rfc2396bis" references to "RFC3986". Add issue "9_ns_op_and_acl" and add potential resolution. Align artwork where applicable (new xml2rfc1.29rc2 feature).

B.10. Since draft-ietf-webdav-bind-11

TOC

Updated [draft-mealling-uuid-urn] to [RFC4122]. Add statement about live properties in Section 2.6.

B.11. Since draft-ietf-webdav-bind-12

TOC

Updated Author's address. Uppercase "Section" when referring to other documents.
Updating from RFC2518 to RFC2518bis:

- Remove own explanation of DTD syntax.
- Remove own definition of precondition/postcondition.
- Remove reference to broken RFC2518 language about DELETE and UNLOCK.
- Remove own definition of DAV: request header.
- Updated "Rationale for Distinguishing Bindings from URI Mappings" to reflect the changes in [draft-ietf-webdav-rfc2518bis], making proposals for more changes so that the issue can be closed (see also http://ietf.cse.ucsc.edu:8080/bugzilla/show_bug.cgi?id=227 and http://greenbytes.de/tech/webdav/draft-ietf-webdav-rfc2518bis-12.html#rfc.section.5.2).

B.12. Since draft-ietf-webdav-bind-13

TOC

Update [draft-ietf-webdav-rfc2518-bis] to draft 14. Update one incorrect section reference. Remove Section "Rationale for Distinguishing Bindings from URI Mappings" as [draft-ietf-webdav-rfc2518-bis] now uses the proper definition of collection state.
Examples use application/xml instead of text/xml MIME type.
Fix IANA section (there are no IANA considerations).

TOC

B.13. Since draft-ietf-webdav-bind-14

Update [draft-ietf-webdav-rfc2518-bis] to draft 15. Update [XML] to 4th edition.
Markup ASCII art for box recognition (doesn't affect ASCII version).
Identify Julian Reschke as Editor.

B.14. Since draft-ietf-webdav-bind-15

TOC

Fix typo in RFC2119 keywords section (sorry!).
Update [draft-ietf-webdav-rfc2518-bis] to draft 17.
Add and resolve issue "rfc2518bis-lock-root".

B.15. Since draft-ietf-webdav-bind-16

TOC

Add and resolve issue "iana-vs-http-status".

B.16. Since draft-ietf-webdav-bind-17

TOC

Update rfc2518bis reference to draft 18 (note that the bug reported in http://ietf.osafoundation.org:8080/bugzilla/show_bug.cgi?id=251 is still present).

B.17. Since draft-ietf-webdav-bind-18

TOC

Update: draft-ietf-webdav-rfc2518bis replaced by RFC4918.

B.18. Since draft-ietf-webdav-bind-19

TOC

Add and resolve issues "2.1.1-bind-loops", "2.1.1-cycles", "2.5-move-creating-cycles", "3.1-clarify-resource-id" and "4-precondition-language".

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B.19. Since draft-ietf-webdav-bind-20

Use "urn:uuid:" instead of "opaquelocktoken:" scheme in examples.
Replace RFC518bis issue link by pointer to RFC Errata Page.
Add issues "" and "".

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Authors' Addresses

TOC

	Geoffrey Clemm
	IBM
	20 Maguire Road
	Lexington, MA 02421
Email:	geoffrey.clemm@us.ibm.com
	Jason Crawford
	IBM Research
	P.O. Box 704
	Yorktown Heights, NY 10598
Email:	ccjason@us.ibm.com
	Julian F. Reschke (editor)
	greenbytes GmbH
	Hafenweg 16
	Muenster, NW 48155
	Germany
Email:	julian.reschke@greenbytes.de
	Jim Whitehead
	UC Santa Cruz, Dept. of Computer Science
	1156 High Street
	Santa Cruz, CA 95064
Email:	ejw@cse.ucsc.edu

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