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                 Calendaring Extensions to WebDAV (CalDAV)

Status of This Memo

   This document specifies an Internet standards track protocol for the
   Internet community, and requests discussion and suggestions for
   improvements. Please refer to the current edition of the "Internet
   Official Protocol Standards" (STD 1) for the standardization state
   and status of this protocol. Distribution of this memo is unlimited.

Abstract

   This document defines extensions to the Web Distributed Authoring and
   Versioning (WebDAV) protocol to specify a standard way of accessing,
   managing, and sharing calendaring and scheduling information based on
   the iCalendar format. This document defines the "calendar-access"
   feature of CalDAV.

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1. Introduction

   The concept of using HTTP [RFC2616] and WebDAV [RFC2518] as a basis
   for a calendar access protocol is by no means a new concept: it was
   discussed in the IETF CALSCH working group as early as 1997 or 1998.
   Several companies have implemented calendar access protocols using
   HTTP to upload and download iCalendar [RFC2445] objects, and using
   WebDAV to get listings of resources. However, those implementations
   do not interoperate because there are many small and big decisions to
   be made in how to model calendaring data as WebDAV resources, as well
   as how to implement required features that aren't already part of
   WebDAV. This document proposes a way to model calendar data in
   WebDAV, with additional features to make an interoperable calendar
   access protocol.

1.1. Notational Conventions

   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].

   The term "protected" is used in the Conformance field of property
   definitions as defined in Section 1.4.2 of [RFC3253].

   When XML element types in the namespaces "DAV:" and
   "urn:ietf:params:xml:ns:caldav" are referenced in this document
   outside of the context of an XML fragment, the string "DAV:" and
   "CALDAV:" will be prefixed to the element type names, respectively.

1.2. XML Namespaces and Processing

   Definitions of XML elements in this document use XML element type
   declarations (as found in XML Document Type Declarations), described
   in Section 3.2 of [W3C.REC-xml-20060816].

   The namespace "urn:ietf:params:xml:ns:caldav" is reserved for the XML
   elements defined in this specification, its revisions, and related
   CalDAV specifications. XML elements defined by individual
   implementations MUST NOT use the "urn:ietf:params:xml:ns:caldav"
   namespace, and instead should use a namespace that they control.

   The XML declarations used in this document do not include namespace
   information. Thus, implementers must not use these declarations as
   the only way to create valid CalDAV properties or to validate CalDAV
   XML element types. Some of the declarations refer to XML elements
   defined by WebDAV [RFC2518], which use the "DAV:" namespace.
   Wherever such XML elements appear, they are explicitly prefixed with
   "DAV:" to avoid confusion.

Also note that some CalDAV XML element names are identical to WebDAV
XML element names, though their namespace differs. Care must be
taken not to confuse the two sets of names.

Processing of XML by CalDAV clients and servers MUST follow the rules
described in [RFC2518]; in particular, Section 14, and Appendix 3 of
that specification.

1.3. Method Preconditions and Postconditions

A "precondition" of a method describes the state of the server that
must be true for that method to be performed. A "postcondition" of a
method describes the state of the server that must be true after that
method has been completed. If a method precondition or postcondition
for a request is not satisfied, the response status of the request
MUST either be 403 (Forbidden), if the request should not be repeated
because it will always fail, or 409 (Conflict), if it is expected
that the user might be able to resolve the conflict and resubmit the
request.

In order to allow better client handling of 403 and 409 responses, a
distinct XML element type is associated with each method precondition
and postcondition of a request. When a particular precondition is
not satisfied or a particular postcondition cannot be achieved, the
appropriate XML element MUST be returned as the child of a top-level
DAV:error element in the response body, unless otherwise negotiated
by the request.

2. Requirements Overview

This section lists what functionality is required of a CalDAV server.
To advertise support for CalDAV, a server:

o MUST support iCalendar [RFC2445] as a media type for the calendar
   object resource format;

o MUST support WebDAV Class 1 [RFC2518] (note that [rfc2518bis]
   describes clarifications to [RFC2518] that aid interoperability);

o MUST support WebDAV ACL [RFC3744] with the additional privilege
   defined in Section 6.1 of this document;

o MUST support transport over TLS [RFC2246] as defined in [RFC2818]
   (note that [RFC2246] has been obsoleted by [RFC4346]);

o MUST support ETags [RFC2616] with additional requirements
   specified in Section 5.3.4 of this document;

   o MUST support all calendaring reports defined in Section 7 of this
      document; and

   o MUST advertise support on all calendar collections and calendar
      object resources for the calendaring reports in the DAV:supported-
      report-set property, as defined in Versioning Extensions to WebDAV
      [RFC3253].

   In addition, a server:

   o SHOULD support the MKCALENDAR method defined in Section 5.3.1 of
      this document.

3. Calendaring Data Model

   One of the features that has made WebDAV a successful protocol is its
   firm data model. This makes it a useful framework for other
   applications such as calendaring. This specification follows the
   same pattern by developing all features based on a well-described
   data model.

   As a brief overview, a CalDAV calendar is modeled as a WebDAV
   collection with a defined structure; each calendar collection
   contains a number of resources representing calendar objects as its
   direct child resource. Each resource representing a calendar object
   (event, to-do, journal entry, or other calendar components) is called
   a "calendar object resource". Each calendar object resource and each
   calendar collection can be individually locked and have individual
   WebDAV properties. Requirements derived from this model are provided
   in Section 4.1 and Section 4.2.

3.1. Calendar Server

   A CalDAV server is a calendaring-aware engine combined with a WebDAV
   repository. A WebDAV repository is a set of WebDAV collections,
   containing other WebDAV resources, within a unified URL namespace.
   For example, the repository "http://www.example.com/webdav/" may
   contain WebDAV collections and resources, all of which have URLs
   beginning with "http://www.example.com/webdav/". Note that the root
   URL, "http://www.example.com/", may not itself be a WebDAV repository
   (for example, if the WebDAV support is implemented through a servlet
   or other Web server extension).

   A WebDAV repository MAY include calendar data in some parts of its
   URL namespace, and non-calendaring data in other parts.

   A WebDAV repository can advertise itself as a CalDAV server if it
   supports the functionality defined in this specification at any point

within the root of the repository. That might mean that calendaring
data is spread throughout the repository and mixed with non-calendar
data in nearby collections (e.g., calendar data may be found in
/home/lisa/calendars/ as well as in /home/bernard/calendars/, and
non-calendar data in /home/lisa/contacts/). Or, it might mean that
calendar data can be found only in certain sections of the repository
(e.g., /calendar/). Calendaring features are only required in the
repository sections that are or contain calendar object resources.
Therefore, a repository confining calendar data to the /calendar/
collection would only need to support the CalDAV required features
within that collection.

The CalDAV server or repository is the canonical location for
calendar data and state information. Clients may submit requests to
change data or download data. Clients may store calendar objects
offline and attempt to synchronize at a later time. However, clients
MUST be prepared for calendar data on the server to change between
the time of last synchronization and when attempting an update, as
calendar collections may be shared and accessible via multiple
clients. Entity tags and other features make this possible.

3.2. Recurrence and the Data Model

Recurrence is an important part of the data model because it governs
how many resources are expected to exist. This specification models
a recurring calendar component and its recurrence exceptions as a
single resource. In this model, recurrence rules, recurrence dates,
exception rules, and exception dates are all part of the data in a
single calendar object resource. This model avoids problems of
limiting how many recurrence instances to store in the repository,
how to keep recurrence instances in sync with the recurring calendar
component, and how to link recurrence exceptions with the recurring
calendar component. It also results in less data to synchronize
between client and server, and makes it easier to make changes to all
recurrence instances or to a recurrence rule. It makes it easier to
create a recurring calendar component and to delete all recurrence
instances.

Clients are not forced to retrieve information about all recurrence
instances of a recurring component. The CALDAV:calendar-query and
CALDAV:calendar-multiget reports defined in this document allow
clients to retrieve only recurrence instances that overlap a given
time range.

4. Calendar Resources

4.1. Calendar Object Resources

   Calendar object resources contained in calendar collections MUST NOT
   contain more than one type of calendar component (e.g., VEVENT,
   VTODO, VJOURNAL, VFREEBUSY, etc.) with the exception of VTIMEZONE
   components, which MUST be specified for each unique TZID parameter
   value specified in the iCalendar object. For instance, a calendar
   object resource can contain one VEVENT component and one VTIMEZONE
   component, but it cannot contain one VEVENT component and one VTODO
   component. Instead, the VEVENT and VTODO components would have to be
   stored in separate calendar object resources in the same collection.

   Calendar object resources contained in calendar collections MUST NOT
   specify the iCalendar METHOD property.

   The UID property value of the calendar components contained in a
   calendar object resource MUST be unique in the scope of the calendar
   collection in which they are stored.

   Calendar components in a calendar collection that have different UID
   property values MUST be stored in separate calendar object resources.

   Calendar components with the same UID property value, in a given
   calendar collection, MUST be contained in the same calendar object
   resource. This ensures that all components in a recurrence "set" are
   contained in the same calendar object resource. It is possible for a
   calendar object resource to just contain components that represent
   "overridden" instances (ones that modify the behavior of a regular
   instance, and thus include a RECURRENCE-ID property) without also
   including the "master" recurring component (the one that defines the
   recurrence "set" and does not contain any RECURRENCE-ID property).

For example, given the following iCalendar object:

```
BEGIN:VCALENDAR
PRODID:-//Example Corp.//CalDAV Client//EN
VERSION:2.0
BEGIN:VEVENT
UID:1@example.com
SUMMARY:One-off Meeting
DTSTAMP:20041210T183904Z
DTSTART:20041207T120000Z
DTEND:20041207T130000Z
END:VEVENT
BEGIN:VEVENT
UID:2@example.com
SUMMARY:Weekly Meeting
DTSTAMP:20041210T183838Z
DTSTART:20041206T120000Z
DTEND:20041206T130000Z
RRULE:FREQ=WEEKLY
END:VEVENT
BEGIN:VEVENT
UID:2@example.com
SUMMARY:Weekly Meeting
RECURRENCE-ID:20041213T120000Z
DTSTAMP:20041210T183838Z
DTSTART:20041213T130000Z
DTEND:20041213T140000Z
END:VEVENT
END:VCALENDAR
```

The VEVENT component with the UID value "1@example.com" would be stored in its own calendar object resource. The two VEVENT components with the UID value "2@example.com", which represent a recurring event where one recurrence instance has been overridden, would be stored in the same calendar object resource.

4.2. Calendar Collection

A calendar collection contains calendar object resources that represent calendar components within a calendar. A calendar collection is manifested to clients as a WebDAV resource collection identified by a URL. A calendar collection MUST report the DAV: collection and CALDAV:calendar XML elements in the value of the DAV: resourcetype property. The element type declaration for CALDAV: calendar is:

```
<!ELEMENT calendar EMPTY>
```

A calendar collection can be created through provisioning (i.e.,
automatically created when a user's account is provisioned), or it
can be created with the MKCALENDAR method (see Section 5.3.1). This
method can be useful for a user to create additional calendars (e.g.,
soccer schedule) or for users to share a calendar (e.g., team events
or conference rooms). However, note that this document doesn't
define the purpose of extra calendar collections. Users must rely on
non-standard cues to find out what a calendar collection is for, or
use the CALDAV:calendar-description property defined in Section 5.2.1
to provide such a cue.

The following restrictions are applied to the resources within a
calendar collection:

a.   Calendar collections MUST only contain calendar object resources
     and collections that are not calendar collections, i.e., the only
     "top-level" non-collection resources allowed in a calendar
     collection are calendar object resources. This ensures that
     calendar clients do not have to deal with non-calendar data in a
     calendar collection, though they do have to distinguish between
     calendar object resources and collections when using standard
     WebDAV techniques to examine the contents of a collection.

b.   Collections contained in calendar collections MUST NOT contain
     calendar collections at any depth, i.e., "nesting" of calendar
     collections within other calendar collections at any depth is not
     allowed. This specification does not define how collections
     contained in a calendar collection are used or how they relate to
     any calendar object resources contained in the calendar
     collection.

Multiple calendar collections MAY be children of the same collection.

5. Calendar Access Feature

5.1. Calendar Access Support

A server supporting the features described in this document MUST
include "calendar-access" as a field in the DAV response header from
an OPTIONS request on any resource that supports any calendar
properties, reports, method, or privilege. A value of "calendar-
access" in the DAV response header MUST indicate that the server
supports all MUST level requirements specified in this document.

5.1.1. Example: Using OPTIONS for the Discovery of Calendar Access
        Support

   >> Request <<

   OPTIONS /home/bernard/calendars/ HTTP/1.1
   Host: cal.example.com

   >> Response <<

   HTTP/1.1 200 OK
   Allow: OPTIONS, GET, HEAD, POST, PUT, DELETE, TRACE, COPY, MOVE
   Allow: PROPFIND, PROPPATCH, LOCK, UNLOCK, REPORT, ACL
   DAV: 1, 2, access-control, calendar-access
   Date: Sat, 11 Nov 2006 09:32:12 GMT
   Content-Length: 0

   In this example, the OPTIONS method returns the value "calendar-
   access" in the DAV response header to indicate that the collection
   "/home/bernard/calendars/" supports the properties, reports, method,
   or privilege defined in this specification.

5.2. Calendar Collection Properties

   This section defines properties for calendar collections.

5.2.1. CALDAV:calendar-description Property

   Name: calendar-description

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Provides a human-readable description of the calendar
      collection.

   Conformance: This property MAY be defined on any calendar
      collection. If defined, it MAY be protected and SHOULD NOT be
      returned by a PROPFIND DAV:allprop request (as defined in Section
      12.14.1 of [RFC2518]). An xml:lang attribute indicating the human
      language of the description SHOULD be set for this property by
      clients or through server provisioning. Servers MUST return any
      xml:lang attribute if set for the property.

   Description: If present, the property contains a description of the
      calendar collection that is suitable for presentation to a user.
      If not present, the client should assume no description for the
      calendar collection.

Definition:

       <!ELEMENT calendar-description (#PCDATA)>
       PCDATA value: string

   Example:

       <C:calendar-description xml:lang="fr-CA"
          xmlns:C="urn:ietf:params:xml:ns:caldav"
       >Calendrier de Mathilde Desruisseaux</C:calendar-description>

5.2.2. CALDAV:calendar-timezone Property

   Name: calendar-timezone

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Specifies a time zone on a calendar collection.

   Conformance: This property SHOULD be defined on all calendar
      collections. If defined, it SHOULD NOT be returned by a PROPFIND
      DAV:allprop request (as defined in Section 12.14.1 of [RFC2518]).

   Description: The CALDAV:calendar-timezone property is used to
      specify the time zone the server should rely on to resolve "date"
      values and "date with local time" values (i.e., floating time) to
      "date with UTC time" values. The server will require this
      information to determine if a calendar component scheduled with
      "date" values or "date with local time" values overlaps a CALDAV:
      time-range specified in a CALDAV:calendar-query REPORT. The
      server will also require this information to compute the proper
      FREEBUSY time period as "date with UTC time" in the VFREEBUSY
      component returned in a response to a CALDAV:free-busy-query
      REPORT request that takes into account calendar components
      scheduled with "date" values or "date with local time" values. In
      the absence of this property, the server MAY rely on the time zone
      of their choice.

   Note: The iCalendar data embedded within the CALDAV:calendar-
      timezone XML element MUST follow the standard XML character data
      encoding rules, including use of <, >, & etc. entity
      encoding or the use of a <![CDATA[...]]> construct. In the
      later case, the iCalendar data cannot contain the character
      sequence "]]>", which is the end delimiter for the CDATA section.

   Definition:

        <!ELEMENT calendar-timezone (#PCDATA)>
        PCDATA value: an iCalendar object with exactly one VTIMEZONE
             component.

   Example:

   <C:calendar-timezone
       xmlns:C="urn:ietf:params:xml:ns:caldav">BEGIN:VCALENDAR
   PRODID:-//Example Corp.//CalDAV Client//EN
   VERSION:2.0
   BEGIN:VTIMEZONE
   TZID:US-Eastern
   LAST-MODIFIED:19870101T000000Z
   BEGIN:STANDARD
   DTSTART:19671029T020000
   RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
   TZOFFSETFROM:-0400
   TZOFFSETTO:-0500
   TZNAME:Eastern Standard Time (US & Canada)
   END:STANDARD
   BEGIN:DAYLIGHT
   DTSTART:19870405T020000
   RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
   TZOFFSETFROM:-0500
   TZOFFSETTO:-0400
   TZNAME:Eastern Daylight Time (US & Canada)
   END:DAYLIGHT
   END:VTIMEZONE
   END:VCALENDAR
   </C:calendar-timezone>

5.2.3. CALDAV:supported-calendar-component-set Property

   Name: supported-calendar-component-set

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Specifies the calendar component types (e.g., VEVENT,
      VTODO, etc.) that calendar object resources can contain in the
      calendar collection.

   Conformance: This property MAY be defined on any calendar
      collection. If defined, it MUST be protected and SHOULD NOT be
      returned by a PROPFIND DAV:allprop request (as defined in Section
      12.14.1 of [RFC2518]).

   Description: The CALDAV:supported-calendar-component-set property is
      used to specify restrictions on the calendar component types that
      calendar object resources may contain in a calendar collection.
      Any attempt by the client to store calendar object resources with
      component types not listed in this property, if it exists, MUST
      result in an error, with the CALDAV:supported-calendar-component
      precondition (Section 5.3.2.1) being violated. Since this
      property is protected, it cannot be changed by clients using a
      PROPPATCH request. However, clients can initialize the value of
      this property when creating a new calendar collection with
      MKCALENDAR. The empty-element tag <C:comp name="VTIMEZONE"/> MUST
      only be specified if support for calendar object resources that
      only contain VTIMEZONE components is provided or desired. Support
      for VTIMEZONE components in calendar object resources that contain
      VEVENT or VTODO components is always assumed. In the absence of
      this property, the server MUST accept all component types, and the
      client can assume that all component types are accepted.

   Definition:

        <!ELEMENT supported-calendar-component-set (comp+)>

   Example:

        <C:supported-calendar-component-set
           xmlns:C="urn:ietf:params:xml:ns:caldav">
          <C:comp name="VEVENT"/>
          <C:comp name="VTODO"/>
        </C:supported-calendar-component-set>

5.2.4. CALDAV:supported-calendar-data Property

   Name: supported-calendar-data

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Specifies what media types are allowed for calendar object
      resources in a calendar collection.

   Conformance: This property MAY be defined on any calendar
      collection. If defined, it MUST be protected and SHOULD NOT be
      returned by a PROPFIND DAV:allprop request (as defined in Section
      12.14.1 of [RFC2518]).

   Description: The CALDAV:supported-calendar-data property is used to
      specify the media type supported for the calendar object resources
      contained in a given calendar collection (e.g., iCalendar version
      2.0). Any attempt by the client to store calendar object

resources with a media type not listed in this property MUST
result in an error, with the CALDAV:supported-calendar-data
precondition (Section 5.3.2.1) being violated. In the absence of
this property, the server MUST only accept data with the media
type "text/calendar" and iCalendar version 2.0, and clients can
assume that the server will only accept this data.

Definition:

```
<!ELEMENT supported-calendar-data (calendar-data+)>
```

Example:

```
<C:supported-calendar-data
   xmlns:C="urn:ietf:params:xml:ns:caldav">
  <C:calendar-data content-type="text/calendar" version="2.0"/>
</C:supported-calendar-data>
```

5.2.5. CALDAV:max-resource-size Property

Name: max-resource-size

Namespace: urn:ietf:params:xml:ns:caldav

Purpose: Provides a numeric value indicating the maximum size of a
   resource in octets that the server is willing to accept when a
   calendar object resource is stored in a calendar collection.

Conformance: This property MAY be defined on any calendar
   collection. If defined, it MUST be protected and SHOULD NOT be
   returned by a PROPFIND DAV:allprop request (as defined in Section
   12.14.1 of [RFC2518]).

Description: The CALDAV:max-resource-size is used to specify a
   numeric value that represents the maximum size in octets that the
   server is willing to accept when a calendar object resource is
   stored in a calendar collection. Any attempt to store a calendar
   object resource exceeding this size MUST result in an error, with
   the CALDAV:max-resource-size precondition (Section 5.3.2.1) being
   violated. In the absence of this property, the client can assume
   that the server will allow storing a resource of any reasonable
   size.

Definition:

```
<!ELEMENT max-resource-size (#PCDATA)>
PCDATA value: a numeric value (positive integer)
```

   Example:

        <C:max-resource-size xmlns:C="urn:ietf:params:xml:ns:caldav"
        >102400</C:max-resource-size>

5.2.6. CALDAV:min-date-time Property

   Name: min-date-time

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Provides a DATE-TIME value indicating the earliest date and
      time (in UTC) that the server is willing to accept for any DATE or
      DATE-TIME value in a calendar object resource stored in a calendar
      collection.

   Conformance: This property MAY be defined on any calendar
      collection. If defined, it MUST be protected and SHOULD NOT be
      returned by a PROPFIND DAV:allprop request (as defined in Section
      12.14.1 of [RFC2518]).

   Description: The CALDAV:min-date-time is used to specify an
      iCalendar DATE-TIME value in UTC that indicates the earliest
      inclusive date that the server is willing to accept for any
      explicit DATE or DATE-TIME value in a calendar object resource
      stored in a calendar collection. Any attempt to store a calendar
      object resource using a DATE or DATE-TIME value earlier than this
      value MUST result in an error, with the CALDAV:min-date-time
      precondition (Section 5.3.2.1) being violated. Note that servers
      MUST accept recurring components that specify instances beyond
      this limit, provided none of those instances have been overridden.
      In that case, the server MAY simply ignore those instances outside
      of the acceptable range when processing reports on the calendar
      object resource. In the absence of this property, the client can
      assume any valid iCalendar date may be used at least up to the
      CALDAV:max-date-time value, if that is defined.

   Definition:

        <!ELEMENT min-date-time (#PCDATA)>
        PCDATA value: an iCalendar format DATE-TIME value in UTC

   Example:

        <C:min-date-time xmlns:C="urn:ietf:params:xml:ns:caldav"
        >19000101T000000Z</C:min-date-time>

5.2.7. CALDAV:max-date-time Property

   Name: max-date-time

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Provides a DATE-TIME value indicating the latest date and
      time (in UTC) that the server is willing to accept for any DATE or
      DATE-TIME value in a calendar object resource stored in a calendar
      collection.

   Conformance: This property MAY be defined on any calendar
      collection. If defined, it MUST be protected and SHOULD NOT be
      returned by a PROPFIND DAV:allprop request (as defined in Section
      12.14.1 of [RFC2518]).

   Description: The CALDAV:max-date-time is used to specify an
      iCalendar DATE-TIME value in UTC that indicates the inclusive
      latest date that the server is willing to accept for any date or
      time value in a calendar object resource stored in a calendar
      collection. Any attempt to store a calendar object resource using
      a DATE or DATE-TIME value later than this value MUST result in an
      error, with the CALDAV:max-date-time precondition
      (Section 5.3.2.1) being violated. Note that servers MUST accept
      recurring components that specify instances beyond this limit,
      provided none of those instances have been overridden. In that
      case, the server MAY simply ignore those instances outside of the
      acceptable range when processing reports on the calendar object
      resource. In the absence of this property, the client can assume
      any valid iCalendar date may be used at least down to the CALDAV:
      min-date-time value, if that is defined.

   Definition:

        <!ELEMENT max-date-time (#PCDATA)>
        PCDATA value: an iCalendar format DATE-TIME value in UTC

   Example:

        <C:max-date-time xmlns:C="urn:ietf:params:xml:ns:caldav"
        >20491231T235959Z</C:max-date-time>

5.2.8. CALDAV:max-instances Property

   Name: max-instances

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Provides a numeric value indicating the maximum number of
      recurrence instances that a calendar object resource stored in a
      calendar collection can generate.

   Conformance: This property MAY be defined on any calendar
      collection. If defined, it MUST be protected and SHOULD NOT be
      returned by a PROPFIND DAV:allprop request (as defined in Section
      12.14.1 of [RFC2518]).

   Description: The CALDAV:max-instances is used to specify a numeric
      value that indicates the maximum number of recurrence instances
      that a calendar object resource stored in a calendar collection
      can generate. Any attempt to store a calendar object resource
      with a recurrence pattern that generates more instances than this
      value MUST result in an error, with the CALDAV:max-instances
      precondition (Section 5.3.2.1) being violated. In the absence of
      this property, the client can assume that the server has no limits
      on the number of recurrence instances it can handle or expand.

   Definition:

        <!ELEMENT max-instances (#PCDATA)>
        PCDATA value: a numeric value (integer greater than zero)

   Example:

        <C:max-instances xmlns:C="urn:ietf:params:xml:ns:caldav"
        >100</C:max-instances>

5.2.9. CALDAV:max-attendees-per-instance Property

   Name: max-attendees-per-instance

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Provides a numeric value indicating the maximum number of
      ATTENDEE properties in any instance of a calendar object resource
      stored in a calendar collection.

   Conformance: This property MAY be defined on any calendar
      collection. If defined, it MUST be protected and SHOULD NOT be

returned by a PROPFIND DAV:allprop request (as defined in Section
12.14.1 of [RFC2518]).

Description: The CALDAV:max-attendees-per-instance is used to
specify a numeric value that indicates the maximum number of
iCalendar ATTENDEE properties on any one instance of a calendar
object resource stored in a calendar collection. Any attempt to
store a calendar object resource with more ATTENDEE properties per
instance than this value MUST result in an error, with the CALDAV:
max-attendees-per-instance precondition (Section 5.3.2.1) being
violated. In the absence of this property, the client can assume
that the server can handle any number of ATTENDEE properties in a
calendar component.

Definition:

```
<!ELEMENT max-attendees-per-instance (#PCDATA)>
PCDATA value: a numeric value (integer greater than zero)
```

Example:

```
<C:max-attendees-per-instance
    xmlns:C="urn:ietf:params:xml:ns:caldav"
>25</C:max-attendees-per-instance>
```

5.2.10. Additional Precondition for PROPPATCH

This specification requires an additional Precondition for the
PROPPATCH method. The precondition is:

(CALDAV:valid-calendar-data): The time zone specified in CALDAV:
calendar-timezone property MUST be a valid iCalendar object
containing a single valid VTIMEZONE component.

5.3. Creating Resources

Calendar collections and calendar object resources may be created by
either a CalDAV client or by the CalDAV server. This specification
defines restrictions and a data model that both clients and servers
MUST adhere to when manipulating such calendar data.

5.3.1. MKCALENDAR Method

An HTTP request using the MKCALENDAR method creates a new calendar
collection resource. A server MAY restrict calendar collection
creation to particular collections.

Support for MKCALENDAR on the server is only RECOMMENDED and not
REQUIRED because some calendar stores only support one calendar per
user (or principal), and those are typically pre-created for each
account. However, servers and clients are strongly encouraged to
support MKCALENDAR whenever possible to allow users to create
multiple calendar collections to help organize their data better.

Clients SHOULD use the DAV:displayname property for a human-readable
name of the calendar. Clients can either specify the value of the
DAV:displayname property in the request body of the MKCALENDAR
request, or alternatively issue a PROPPATCH request to change the
DAV:displayname property to the appropriate value immediately after
issuing the MKCALENDAR request. Clients SHOULD NOT set the DAV:
displayname property to be the same as any other calendar collection
at the same URI "level". When displaying calendar collections to
users, clients SHOULD check the DAV:displayname property and use that
value as the name of the calendar. In the event that the DAV:
displayname property is empty, the client MAY use the last part of
the calendar collection URI as the name; however, that path segment
may be "opaque" and not represent any meaningful human-readable text.

If a MKCALENDAR request fails, the server state preceding the request
MUST be restored.

Marshalling:
    If a request body is included, it MUST be a CALDAV:mkcalendar XML
    element. Instruction processing MUST occur in the order
    instructions are received (i.e., from top to bottom).
    Instructions MUST either all be executed or none executed. Thus,
    if any error occurs during processing, all executed instructions
    MUST be undone and a proper error result returned. Instruction
    processing details can be found in the definition of the DAV:set
    instruction in Section 12.13.2 of [RFC2518].

        <!ELEMENT mkcalendar (DAV:set)>

    If a response body for a successful request is included, it MUST
    be a CALDAV:mkcalendar-response XML element.

        <!ELEMENT mkcalendar-response ANY>

    The response MUST include a Cache-Control:no-cache header.

Preconditions:

    (DAV:resource-must-be-null): A resource MUST NOT exist at the
    Request-URI;

      (CALDAV:calendar-collection-location-ok): The Request-URI MUST
      identify a location where a calendar collection can be created;

      (CALDAV:valid-calendar-data): The time zone specified in the
      CALDAV:calendar-timezone property MUST be a valid iCalendar object
      containing a single valid VTIMEZONE component;

      (DAV:needs-privilege): The DAV:bind privilege MUST be granted to
      the current user on the parent collection of the Request-URI.

   Postconditions:

      (CALDAV:initialize-calendar-collection): A new calendar collection
      exists at the Request-URI. The DAV:resourcetype of the calendar
      collection MUST contain both DAV:collection and CALDAV:calendar
      XML elements.

5.3.1.1. Status Codes

   The following are examples of response codes one would expect to get
   in a response to a MKCALENDAR request. Note that this list is by no
   means exhaustive.

      201 (Created) - The calendar collection resource was created in
      its entirety;

      207 (Multi-Status) - The calendar collection resource was not
      created since one or more DAV:set instructions specified in the
      request body could not be processed successfully. The following
      are examples of response codes one would expect to be used in a
      207 (Multi-Status) response in this situation:

         403 (Forbidden) - The client, for reasons the server chooses
         not to specify, cannot alter one of the properties;

         409 (Conflict) - The client has provided a value whose
         semantics are not appropriate for the property. This includes
         trying to set read-only properties;

         424 (Failed Dependency) - The DAV:set instruction on the
         specified resource would have succeeded if it were not for the
         failure of another DAV:set instruction specified in the request
         body;

         423 (Locked) - The specified resource is locked and the client
         either is not a lock owner or the lock type requires a lock
         token to be submitted and the client did not submit it; and

    507 (Insufficient Storage) - The server did not have sufficient
    space to record the property;

    403 (Forbidden) - This indicates at least one of two conditions:
    1) the server does not allow the creation of calendar collections
    at the given location in its namespace, or 2) the parent
    collection of the Request-URI exists but cannot accept members;

    409 (Conflict) - A collection cannot be made at the Request-URI
    until one or more intermediate collections have been created;

    415 (Unsupported Media Type) - The server does not support the
    request type of the body; and

    507 (Insufficient Storage) - The resource does not have sufficient
    space to record the state of the resource after the execution of
    this method.

5.3.1.2. Example: Successful MKCALENDAR Request

    This example creates a calendar collection called /home/lisa/
    calendars/events/ on the server cal.example.com with specific values
    for the properties DAV:displayname, CALDAV:calendar-description,
    CALDAV:supported-calendar-component-set, and CALDAV:calendar-
    timezone.

```
   >> Request <<

   MKCALENDAR /home/lisa/calendars/events/ HTTP/1.1
   Host: cal.example.com
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <C:mkcalendar xmlns:D="DAV:"
               xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:set>
       <D:prop>
         <D:displayname>Lisa's Events</D:displayname>
         <C:calendar-description xml:lang="en"
   >Calendar restricted to events.</C:calendar-description>
         <C:supported-calendar-component-set>
           <C:comp name="VEVENT"/>
         </C:supported-calendar-component-set>
         <C:calendar-timezone><![CDATA[BEGIN:VCALENDAR
   PRODID:-//Example Corp.//CalDAV Client//EN
   VERSION:2.0
   BEGIN:VTIMEZONE
   TZID:US-Eastern
   LAST-MODIFIED:19870101T000000Z
   BEGIN:STANDARD
   DTSTART:19671029T020000
   RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
   TZOFFSETFROM:-0400
   TZOFFSETTO:-0500
   TZNAME:Eastern Standard Time (US & Canada)
   END:STANDARD
   BEGIN:DAYLIGHT
   DTSTART:19870405T020000
   RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
   TZOFFSETFROM:-0500
   TZOFFSETTO:-0400
   TZNAME:Eastern Daylight Time (US & Canada)
   END:DAYLIGHT
   END:VTIMEZONE
   END:VCALENDAR
   ]]></C:calendar-timezone>
       </D:prop>
     </D:set>
   </C:mkcalendar>
```

   >> Response <<

   HTTP/1.1 201 Created
   Cache-Control: no-cache
   Date: Sat, 11 Nov 2006 09:32:12 GMT
   Content-Length: 0

5.3.2. Creating Calendar Object Resources

   Clients populate calendar collections with calendar object resources.
   The URL for each calendar object resource is entirely arbitrary and
   does not need to bear a specific relationship to the calendar object
   resource's iCalendar properties or other metadata. New calendar
   object resources MUST be created with a PUT request targeted at an
   unmapped URI. A PUT request targeted at a mapped URI updates an
   existing calendar object resource.

   When servers create new resources, it's not hard for the server to
   choose an unmapped URI. It's slightly tougher for clients, because a
   client might not want to examine all resources in the collection and
   might not want to lock the entire collection to ensure that a new
   resource isn't created with a name collision. However, there is an
   HTTP feature to mitigate this. If the client intends to create a new
   non-collection resource, such as a new VEVENT, the client SHOULD use
   the HTTP request header "If-None-Match: *" on the PUT request. The
   Request-URI on the PUT request MUST include the target collection,
   where the resource is to be created, plus the name of the resource in
   the last path segment. The "If-None-Match: *" request header ensures
   that the client will not inadvertently overwrite an existing resource
   if the last path segment turned out to already be used.

```
>> Request <<

PUT /home/lisa/calendars/events/qwue23489.ics HTTP/1.1
If-None-Match: *
Host: cal.example.com
Content-Type: text/calendar
Content-Length: xxxx

BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VEVENT
UID:20010712T182145Z-123401@example.com
DTSTAMP:20060712T182145Z
DTSTART:20060714T170000Z
DTEND:20060715T040000Z
SUMMARY:Bastille Day Party
END:VEVENT
END:VCALENDAR

>> Response <<

HTTP/1.1 201 Created
Content-Length: 0
Date: Sat, 11 Nov 2006 09:32:12 GMT
ETag: "123456789-000-111"
```

The request to change an existing event is the same, but with a
specific ETag in the "If-Match" header, rather than the "If-None-
Match" header.

As indicated in Section 3.10 of [RFC2445], the URL of calendar object
resources containing (an arbitrary set of) calendaring and scheduling
information may be suffixed by ".ics", and the URL of calendar object
resources containing free or busy time information may be suffixed by
".ifb".

5.3.2.1. Additional Preconditions for PUT, COPY, and MOVE

   This specification creates additional Preconditions for PUT, COPY,
   and MOVE methods. These preconditions apply when a PUT operation of
   a calendar object resource into a calendar collection occurs, or when
   a COPY or MOVE operation of a calendar object resource into a
   calendar collection occurs, or when a COPY or MOVE operation occurs
   on a calendar collection.

The new preconditions are:

(CALDAV:supported-calendar-data): The resource submitted in the
PUT request, or targeted by a COPY or MOVE request, MUST be a
supported media type (i.e., iCalendar) for calendar object
resources;

(CALDAV:valid-calendar-data): The resource submitted in the PUT
request, or targeted by a COPY or MOVE request, MUST be valid data
for the media type being specified (i.e., MUST contain valid
iCalendar data);

(CALDAV:valid-calendar-object-resource): The resource submitted in
the PUT request, or targeted by a COPY or MOVE request, MUST obey
all restrictions specified in Section 4.1 (e.g., calendar object
resources MUST NOT contain more than one type of calendar
component, calendar object resources MUST NOT specify the
iCalendar METHOD property, etc.);

(CALDAV:supported-calendar-component): The resource submitted in
the PUT request, or targeted by a COPY or MOVE request, MUST
contain a type of calendar component that is supported in the
targeted calendar collection;

(CALDAV:no-uid-conflict): The resource submitted in the PUT
request, or targeted by a COPY or MOVE request, MUST NOT specify
an iCalendar UID property value already in use in the targeted
calendar collection or overwrite an existing calendar object
resource with one that has a different UID property value.
Servers SHOULD report the URL of the resource that is already
making use of the same UID property value in the DAV:href element;

            <!ELEMENT no-uid-conflict (DAV:href)>

(CALDAV:calendar-collection-location-ok): In a COPY or MOVE
request, when the Request-URI is a calendar collection, the
Destination-URI MUST identify a location where a calendar
collection can be created;

(CALDAV:max-resource-size): The resource submitted in the PUT
request, or targeted by a COPY or MOVE request, MUST have an octet
size less than or equal to the value of the CALDAV:max-resource-
size property value (Section 5.2.5) on the calendar collection
where the resource will be stored;

(CALDAV:min-date-time): The resource submitted in the PUT request,
or targeted by a COPY or MOVE request, MUST have all of its
iCalendar DATE or DATE-TIME property values (for each recurring

instance) greater than or equal to the value of the CALDAV:min-
date-time property value (Section 5.2.6) on the calendar
collection where the resource will be stored;

(CALDAV:max-date-time): The resource submitted in the PUT request,
or targeted by a COPY or MOVE request, MUST have all of its
iCalendar DATE or DATE-TIME property values (for each recurring
instance) less than the value of the CALDAV:max-date-time property
value (Section 5.2.7) on the calendar collection where the
resource will be stored;

(CALDAV:max-instances): The resource submitted in the PUT request,
or targeted by a COPY or MOVE request, MUST generate a number of
recurring instances less than or equal to the value of the CALDAV:
max-instances property value (Section 5.2.8) on the calendar
collection where the resource will be stored;

(CALDAV:max-attendees-per-instance): The resource submitted in the
PUT request, or targeted by a COPY or MOVE request, MUST have a
number of ATTENDEE properties on any one instance less than or
equal to the value of the CALDAV:max-attendees-per-instance
property value (Section 5.2.9) on the calendar collection where
the resource will be stored;

5.3.3. Non-Standard Components, Properties, and Parameters

   iCalendar provides a "standard mechanism for doing non-standard
   things". This extension support allows implementers to make use of
   non-standard components, properties, and parameters whose names are
   prefixed with the text "X-".

   Servers MUST support the use of non-standard components, properties,
   and parameters in calendar object resources stored via the PUT
   method.

   Servers may need to enforce rules for their own "private" components,
   properties, or parameters, so servers MAY reject any attempt by the
   client to change those or use values for those outside of any
   restrictions the server may have. Servers SHOULD ensure that any
   "private" components, properties, or parameters it uses follow the
   convention of including a vendor id in the "X-" name, as described in
   Section 4.2 of [RFC2445], e.g., "X-ABC-PRIVATE".

5.3.4. Calendar Object Resource Entity Tag

   The DAV:getetag property MUST be defined and set to a strong entity
   tag on all calendar object resources.

A response to a GET request targeted at a calendar object resource
MUST contain an ETag response header field indicating the current
value of the strong entity tag of the calendar object resource.

Servers SHOULD return a strong entity tag (ETag header) in a PUT
response when the stored calendar object resource is equivalent by
octet equality to the calendar object resource submitted in the body
of the PUT request. This allows clients to reliably use the returned
strong entity tag for data synchronization purposes. For instance,
the client can do a PROPFIND request on the stored calendar object
resource and have the DAV:getetag property returned, and compare that
value with the strong entity tag it received on the PUT response, and
know that if they are equal, then the calendar object resource on the
server has not been changed.

In the case where the data stored by a server as a result of a PUT
request is not equivalent by octet equality to the submitted calendar
object resource, the behavior of the ETag response header is not
specified here, with the exception that a strong entity tag MUST NOT
be returned in the response. As a result, clients may need to
retrieve the modified calendar object resource (and ETag) as a basis
for further changes, rather than use the calendar object resource it
had sent with the PUT request.

6. Calendaring Access Control

6.1. Calendaring Privilege

   CalDAV servers MUST support and adhere to the requirements of WebDAV
   ACL [RFC3744]. WebDAV ACL provides a framework for an extensible set
   of privileges that can be applied to WebDAV collections and ordinary
   resources. CalDAV servers MUST also support the calendaring
   privilege defined in this section.

6.1.1. CALDAV:read-free-busy Privilege

   Calendar users often wish to allow other users to see their busy time
   information, without viewing the other details of the calendar
   components (e.g., location, summary, attendees). This allows a
   significant amount of privacy while still allowing other users to
   schedule meetings at times when the user is likely to be free.

   The CALDAV:read-free-busy privilege controls which calendar
   collections, regular collections, and calendar object resources are
   examined when a CALDAV:free-busy-query REPORT request is processed
   (see Section 7.10). This privilege can be granted on calendar
   collections, regular collections, or calendar object resources.

Servers MUST support this privilege on all calendar collections,
regular collections, and calendar object resources.

```
<!ELEMENT read-free-busy EMPTY>
```

The CALDAV:read-free-busy privilege MUST be aggregated in the DAV:
read privilege. Servers MUST allow the CALDAV:read-free-busy to be
granted without the DAV:read privilege being granted.

Clients should note that when only the CALDAV:read-free-busy
privilege has been granted on a resource, access to GET, HEAD,
OPTIONS, and PROPFIND on the resource is not implied (those
operations are governed by the DAV:read privilege).

6.2. Additional Principal Property

This section defines an additional property for WebDAV principal
resources, as defined in [RFC3744].

6.2.1. CALDAV:calendar-home-set Property

Name: calendar-home-set

Namespace: urn:ietf:params:xml:ns:caldav

Purpose: Identifies the URL of any WebDAV collections that contain
   calendar collections owned by the associated principal resource.

Conformance: This property SHOULD be defined on a principal
   resource. If defined, it MAY be protected and SHOULD NOT be
   returned by a PROPFIND DAV:allprop request (as defined in Section
   12.14.1 of [RFC2518]).

Description: The CALDAV:calendar-home-set property is meant to allow
   users to easily find the calendar collections owned by the
   principal. Typically, users will group all the calendar
   collections that they own under a common collection. This
   property specifies the URL of collections that are either calendar
   collections or ordinary collections that have child or descendant
   calendar collections owned by the principal.

Definition:

```
<!ELEMENT calendar-home-set (DAV:href*)>
```

   Example:

```
   <C:calendar-home-set xmlns:D="DAV:"
                        xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:href>http://cal.example.com/home/bernard/calendars/</D:href>
   </C:calendar-home-set>
```

7. Calendaring Reports

   This section defines the reports that CalDAV servers MUST support on
   calendar collections and calendar object resources.

   CalDAV servers MUST advertise support for these reports on all
   calendar collections and calendar object resources with the DAV:
   supported-report-set property, defined in Section 3.1.5 of [RFC3253].
   CalDAV servers MAY also advertise support for these reports on
   ordinary collections.

   Some of these reports allow calendar data (from possibly multiple
   resources) to be returned.

7.1. REPORT Method

   The REPORT method (defined in Section 3.6 of [RFC3253]) provides an
   extensible mechanism for obtaining information about one or more
   resources. Unlike the PROPFIND method, which returns the value of
   one or more named properties, the REPORT method can involve more
   complex processing. REPORT is valuable in cases where the server has
   access to all of the information needed to perform the complex
   request (such as a query), and where it would require multiple
   requests for the client to retrieve the information needed to perform
   the same request.

   CalDAV servers MUST support the DAV:expand-property REPORT defined in
   Section 3.8 of [RFC3253].

7.2. Ordinary Collections

   Servers MAY support the reports defined in this document on ordinary
   collections (collections that are not calendar collections), in
   addition to calendar collections or calendar object resources. In
   computing responses to the reports on ordinary collections, servers
   MUST only consider calendar object resources contained in calendar
   collections that are targeted by the REPORT request, based on the
   value of the Depth request header.

7.3. Date and Floating Time

   iCalendar provides a way to specify DATE and DATE-TIME values that
   are not bound to any time zone in particular, hereafter called
   "floating date" and "floating time", respectively. These values are
   used to represent the same day, hour, minute, and second value,
   regardless of which time zone is being observed. For instance, the
   DATE value "20051111", represents November 11, 2005 in no specific
   time zone, while the DATE-TIME value "20051111T111100" represents
   November 11, 2005, at 11:11 A.M. in no specific time zone.

   CalDAV servers may need to convert "floating date" and "floating
   time" values in date with UTC time values in the processing of
   calendaring REPORT requests.

   For the CALDAV:calendar-query REPORT, CalDAV servers MUST rely on the
   value of the CALDAV:timezone XML element, if specified as part of the
   request body, to perform the proper conversion of "floating date" and
   "floating time" values to date with UTC time values. If the CALDAV:
   timezone XML element is not specified in the request body, CalDAV
   servers MUST rely on the value of the CALDAV:calendar-timezone
   property, if defined, or else the CalDAV servers MAY rely on the time
   zone of their choice.

   For the CALDAV:free-busy-query REPORT, CalDAV servers MUST rely on
   the value of the CALDAV:calendar-timezone property, if defined, to
   compute the proper FREEBUSY time period value as date with UTC time
   for calendar components scheduled with "floating date" or "floating
   time". If the CALDAV:calendar-timezone property is not defined,
   CalDAV servers MAY rely on the time zone of their choice.

7.4. Time Range Filtering

   Some of the reports defined in this section can include a time range
   filter that is used to restrict the set of calendar object resources
   returned to just those that overlap the specified time range. The
   time range filter can be applied to a calendar component as a whole,
   or to specific calendar component properties with DATE or DATE-TIME
   value types.

   To determine whether a calendar object resource matches the time
   range filter element, the start and end times for the targeted
   component or property are determined and then compared to the
   requested time range. If there is an overlap with the requested time
   range, then the calendar object resource matches the filter element.
   The rules defined in [RFC2445] for determining the actual start and
   end times of calendar components MUST be used, and these are fully
   enumerated in Section 9.9 of this document.

When such time range filtering is used, special consideration must be
given to recurring calendar components, such as VEVENT and VTODO.
The server MUST expand recurring components to determine whether any
recurrence instances overlap the specified time range. If one or
more recurrence instances overlap the time range, then the calendar
object resource matches the filter element.

7.5. Searching Text: Collations

Some of the reports defined in this section do text matches of
character strings provided by the client and are compared to stored
calendar data. Since iCalendar data is, by default, encoded in the
UTF-8 charset and may include characters outside the US-ASCII charset
range in some property and parameter values, there is a need to
ensure that text matching follows well-defined rules.

To deal with this, this specification makes use of the IANA Collation
Registry defined in [RFC4790] to specify collations that may be used
to carry out the text comparison operations with a well-defined rule.

The comparisons used in CalDAV are all "substring" matches, as per
[RFC4790], Section 4.2. Collations supported by the server MUST
support "substring" match operations.

CalDAV servers are REQUIRED to support the "i;ascii-casemap" and
"i;octet" collations, as described in [RFC4790], and MAY support
other collations.

Servers MUST advertise the set of collations that they support via
the CALDAV:supported-collation-set property defined on any resource
that supports reports that use collations.

Clients MUST only use collations from the list advertised by the
server.

In the absence of a collation explicitly specified by the client, or
if the client specifies the "default" collation identifier (as
defined in [RFC4790], Section 3.1), the server MUST default to using
"i;ascii-casemap" as the collation.

Wildcards (as defined in [RFC4790], Section 3.2) MUST NOT be used in
the collation identifier.

If the client chooses a collation not supported by the server, the
server MUST respond with a CALDAV:supported-collation precondition
error response.

7.5.1. CALDAV:supported-collation-set Property

   Name: supported-collation-set

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Identifies the set of collations supported by the server
      for text matching operations.

   Conformance: This property MUST be defined on any resource that
      supports a report that does text matching. If defined, it MUST be
      protected and SHOULD NOT be returned by a PROPFIND DAV:allprop
      request (as defined in Section 12.14.1 of [RFC2518]).

   Description: The CALDAV:supported-collation-set property contains
      zero or more CALDAV:supported-collation elements, which specify
      the collection identifiers of the collations supported by the
      server.

   Definition:

       <!ELEMENT supported-collation-set (supported-collation*)>

       <!ELEMENT supported-collation (#PCDATA)>

   Example:

      <C:supported-collation-set
         xmlns:C="urn:ietf:params:xml:ns:caldav">
       <C:supported-collation>i;ascii-casemap</C:supported-collation>
       <C:supported-collation>i;octet</C:supported-collation>
      </C:supported-collation-set>

7.6. Partial Retrieval

   Some calendaring reports defined in this document allow partial
   retrieval of calendar object resources. A CalDAV client can specify
   what information to return in the body of a calendaring REPORT
   request.

   A CalDAV client can request particular WebDAV property values, all
   WebDAV property values, or a list of the names of the resource's
   WebDAV properties. A CalDAV client can also request calendar data to
   be returned and specify whether all calendar components and
   properties should be returned, or only particular ones. See CALDAV:
   calendar-data in Section 9.6.

By default, the returned calendar data will include the component
that defines the recurrence set, referred to as the "master
component", as well as the components that define exceptions to the
recurrence set, referred to as the "overridden components".

A CalDAV client that is only interested in the recurrence instances
that overlap a specified time range can request to receive only the
"master component", along with the "overridden components" that
impact the specified time range, and thus, limit the data returned by
the server (see CALDAV:limit-recurrence-set in Section 9.6.6). An
overridden component impacts a time range if its current start and
end times overlap the time range, or if the original start and end
times -- the ones that would have been used if the instance were not
overridden -- overlap the time range, or if it affects other
instances that overlap the time range.

A CalDAV client with no support for recurrence properties (i.e.,
EXDATE, EXRULE, RDATE, and RRULE) and possibly VTIMEZONE components,
or a client unwilling to perform recurrence expansion because of
limited processing capability, can request to receive only the
recurrence instances that overlap a specified time range as separate
calendar components that each define exactly one recurrence instance
(see CALDAV:expand in Section 9.6.5.)

Finally, in the case of VFREEBUSY components, a CalDAV client can
request to receive only the FREEBUSY property values that overlap a
specified time range (see CALDAV:limit-freebusy-set in
Section 9.6.7.)

7.7. Non-Standard Components, Properties, and Parameters

Servers MUST support the use of non-standard component, property, or
parameter names in the CALDAV:calendar-data XML element in
calendaring REPORT requests to allow clients to request that non-
standard components, properties, and parameters be returned in the
calendar data provided in the response.

Servers MAY support the use of non-standard component, property, or
parameter names in the CALDAV:comp-filter, CALDAV:prop-filter, and
CALDAV:param-filter XML elements specified in the CALDAV:filter XML
element of calendaring REPORT requests.

Servers MUST fail with the CALDAV:supported-filter precondition if a
calendaring REPORT request uses a CALDAV:comp-filter, CALDAV:prop-
filter, or CALDAV:param-filter XML element that makes reference to a
non-standard component, property, or parameter name on which the
server does not support queries.

7.8. CALDAV:calendar-query REPORT

   The CALDAV:calendar-query REPORT performs a search for all calendar
   object resources that match a specified filter. The response of this
   report will contain all the WebDAV properties and calendar object
   resource data specified in the request. In the case of the CALDAV:
   calendar-data XML element, one can explicitly specify the calendar
   components and properties that should be returned in the calendar
   object resource data that matches the filter.

   The format of this report is modeled on the PROPFIND method. The
   request and response bodies of the CALDAV:calendar-query REPORT use
   XML elements that are also used by PROPFIND. In particular, the
   request can include XML elements to request WebDAV properties to be
   returned. When that occurs, the response should follow the same
   behavior as PROPFIND with respect to the DAV:multistatus response
   elements used to return specific property results. For instance, a
   request to retrieve the value of a property that does not exist is an
   error and MUST be noted with a response XML element that contains a
   404 (Not Found) status value.

   Support for the CALDAV:calendar-query REPORT is REQUIRED.

   Marshalling:

      The request body MUST be a CALDAV:calendar-query XML element, as
      defined in Section 9.5.

      The request MAY include a Depth header. If no Depth header is
      included, Depth:0 is assumed.

      The response body for a successful request MUST be a DAV:
      multistatus XML element (i.e., the response uses the same format
      as the response for PROPFIND). In the case where there are no
      response elements, the returned DAV:multistatus XML element is
      empty.

      The response body for a successful CALDAV:calendar-query REPORT
      request MUST contain a DAV:response element for each iCalendar
      object that matched the search filter. Calendar data is being
      returned in the CALDAV:calendar-data XML element inside the DAV:
      propstat XML element.

   Preconditions:

      (CALDAV:supported-calendar-data): The attributes "content-type"
      and "version" of the CALDAV:calendar-data XML element (see

Section 9.6) specify a media type supported by the server for
calendar object resources.

(CALDAV:valid-filter): The CALDAV:filter XML element (see
Section 9.7) specified in the REPORT request MUST be valid. For
instance, a CALDAV:filter cannot nest a <C:comp name="VEVENT">
element in a <C:comp name="VTODO"> element, and a CALDAV:filter
cannot nest a <C:time-range start="..." end="..."> element in a
<C:prop name="SUMMARY"> element.

(CALDAV:supported-filter): The CALDAV:comp-filter (see
Section 9.7.1), CALDAV:prop-filter (see Section 9.7.2), and
CALDAV:param-filter (see Section 9.7.3) XML elements used in the
CALDAV:filter XML element (see Section 9.7) in the REPORT request
only make reference to components, properties, and parameters for
which queries are supported by the server, i.e., if the CALDAV:
filter element attempts to reference an unsupported component,
property, or parameter, this precondition is violated. Servers
SHOULD report the CALDAV:comp-filter, CALDAV:prop-filter, or
CALDAV:param-filter for which it does not provide support.

```
<!ELEMENT supported-filter (comp-filter*,
                            prop-filter*,
                            param-filter*)>
```

(CALDAV:valid-calendar-data): The time zone specified in the
REPORT request MUST be a valid iCalendar object containing a
single valid VTIMEZONE component.

(CALDAV:min-date-time): Any XML element specifying a range of time
MUST have its start or end DATE or DATE-TIME values greater than
or equal to the value of the CALDAV:min-date-time property value
(Section 5.2.6) on the calendar collections being targeted by the
REPORT request;

(CALDAV:max-date-time): Any XML element specifying a range of time
MUST have its start or end DATE or DATE-TIME values less than or
equal to the value of the CALDAV:max-date-time property value
(Section 5.2.7) on the calendar collections being targeted by the
REPORT request;

(CALDAV:supported-collation): Any XML attribute specifying a
collation MUST specify a collation supported by the server as
described in Section 7.5.

   Postconditions:

      (DAV:number-of-matches-within-limits): The number of matching
      calendar object resources must fall within server-specific,
      predefined limits. For example, this condition might be triggered
      if a search specification would cause the return of an extremely
      large number of responses.

7.8.1. Example: Partial Retrieval of Events by Time Range

   In this example, the client requests the server to return specific
   components and properties of the VEVENT components that overlap the
   time range from January 4, 2006, at 00:00:00 A.M. UTC to January 5,
   2006, at 00:00:00 A.M. UTC. In addition, the DAV:getetag property is
   also requested and returned as part of the response. Note that the
   first calendar object returned is a recurring event whose first
   instance lies outside the requested time range, but whose third
   instance does overlap the time range. Note that due to the CALDAV:
   calendar-data element restrictions, the DTSTAMP property in VEVENT
   components has not been returned, and the only property returned in
   the VCALENDAR object is VERSION.

   See Appendix B for the calendar data being targeted by this example.

```
   >> Request <<

   REPORT /bernard/work/ HTTP/1.1
   Host: cal.example.com
   Depth: 1
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <C:calendar-query xmlns:D="DAV:"
                 xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:prop>
       <D:getetag/>
       <C:calendar-data>
         <C:comp name="VCALENDAR">
           <C:prop name="VERSION"/>
           <C:comp name="VEVENT">
             <C:prop name="SUMMARY"/>
             <C:prop name="UID"/>
             <C:prop name="DTSTART"/>
             <C:prop name="DTEND"/>
             <C:prop name="DURATION"/>
             <C:prop name="RRULE"/>
             <C:prop name="RDATE"/>
             <C:prop name="EXRULE"/>
             <C:prop name="EXDATE"/>
             <C:prop name="RECURRENCE-ID"/>
           </C:comp>
           <C:comp name="VTIMEZONE"/>
         </C:comp>
       </C:calendar-data>
     </D:prop>
     <C:filter>
       <C:comp-filter name="VCALENDAR">
         <C:comp-filter name="VEVENT">
           <C:time-range start="20060104T000000Z"
                         end="20060105T000000Z"/>
         </C:comp-filter>
       </C:comp-filter>
     </C:filter>
   </C:calendar-query>

   >> Response <<

   HTTP/1.1 207 Multi-Status
   Date: Sat, 11 Nov 2006 09:32:12 GMT
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx
```

```
   <?xml version="1.0" encoding="utf-8" ?>
   <D:multistatus xmlns:D="DAV:"
              xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:response>
       <D:href>http://cal.example.com/bernard/work/abcd2.ics</D:href>
       <D:propstat>
         <D:prop>
           <D:getetag>"fffff-abcd2"</D:getetag>
           <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
BEGIN:VTIMEZONE
LAST-MODIFIED:20040110T032845Z
TZID:US/Eastern
BEGIN:DAYLIGHT
DTSTART:20000404T020000
RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
TZNAME:EDT
TZOFFSETFROM:-0500
TZOFFSETTO:-0400
END:DAYLIGHT
BEGIN:STANDARD
DTSTART:20001026T020000
RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
TZNAME:EST
TZOFFSETFROM:-0400
TZOFFSETTO:-0500
END:STANDARD
END:VTIMEZONE
BEGIN:VEVENT
DTSTART;TZID=US/Eastern:20060102T120000
DURATION:PT1H
RRULE:FREQ=DAILY;COUNT=5
SUMMARY:Event #2
UID:00959BC664CA650E933C892C@example.com
END:VEVENT
BEGIN:VEVENT
DTSTART;TZID=US/Eastern:20060104T140000
DURATION:PT1H
RECURRENCE-ID;TZID=US/Eastern:20060104T120000
SUMMARY:Event #2 bis
UID:00959BC664CA650E933C892C@example.com
END:VEVENT
BEGIN:VEVENT
DTSTART;TZID=US/Eastern:20060106T140000
DURATION:PT1H
RECURRENCE-ID;TZID=US/Eastern:20060106T120000
SUMMARY:Event #2 bis bis
UID:00959BC664CA650E933C892C@example.com
```

```
      END:VEVENT
      END:VCALENDAR
      </C:calendar-data>
            </D:prop>
            <D:status>HTTP/1.1 200 OK</D:status>
         </D:propstat>
       </D:response>
       <D:response>
         <D:href>http://cal.example.com/bernard/work/abcd3.ics</D:href>
         <D:propstat>
           <D:prop>
             <D:getetag>"fffff-abcd3"</D:getetag>
             <C:calendar-data>BEGIN:VCALENDAR
   VERSION:2.0
   PRODID:-//Example Corp.//CalDAV Client//EN
   BEGIN:VTIMEZONE
   LAST-MODIFIED:20040110T032845Z
   TZID:US/Eastern
   BEGIN:DAYLIGHT
   DTSTART:20000404T020000
   RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
   TZNAME:EDT
   TZOFFSETFROM:-0500
   TZOFFSETTO:-0400
   END:DAYLIGHT
   BEGIN:STANDARD
   DTSTART:20001026T020000
   RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
   TZNAME:EST
   TZOFFSETFROM:-0400
   TZOFFSETTO:-0500
   END:STANDARD
   END:VTIMEZONE
   BEGIN:VEVENT
   DTSTART;TZID=US/Eastern:20060104T100000
   DURATION:PT1H
   SUMMARY:Event #3
   UID:DC6C50A017428C5216A2F1CD@example.com
   END:VEVENT
   END:VCALENDAR
      </C:calendar-data>
            </D:prop>
            <D:status>HTTP/1.1 200 OK</D:status>
         </D:propstat>
       </D:response>
     </D:multistatus>
```

7.8.2. Example: Partial Retrieval of Recurring Events

   In this example, the client requests the server to return VEVENT
   components that overlap the time range from January 3, 2006, at 00:
   00:00 A.M. UTC to January 5, 2006, at 00:00:00 A.M. UTC. Use of the
   CALDAV:limit-recurrence-set element causes the server to only return
   overridden recurrence components that overlap the time range
   specified in that element or that affect other instances that overlap
   the time range (e.g., in the case of a THISANDFUTURE behavior). In
   this example, the first overridden component in the matching resource
   is returned, but the second one is not.

   See Appendix B for the calendar data being targeted by this example.

   >> Request <<

   REPORT /bernard/work/ HTTP/1.1
   Host: cal.example.com
   Depth: 1
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <C:calendar-query xmlns:D="DAV:"
                     xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:prop>
       <C:calendar-data>
         <C:limit-recurrence-set start="20060103T000000Z"
                                 end="20060105T000000Z"/>
       </C:calendar-data>
     </D:prop>
     <C:filter>
       <C:comp-filter name="VCALENDAR">
         <C:comp-filter name="VEVENT">
           <C:time-range start="20060103T000000Z"
                         end="20060105T000000Z"/>
         </C:comp-filter>
       </C:comp-filter>
     </C:filter>
   </C:calendar-query>

   >> Response <<

   HTTP/1.1 207 Multi-Status
   Date: Sat, 11 Nov 2006 09:32:12 GMT
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

```
      <?xml version="1.0" encoding="utf-8" ?>
      <D:multistatus xmlns:D="DAV:"
                 xmlns:C="urn:ietf:params:xml:ns:caldav">
        <D:response>
          <D:href>http://cal.example.com/bernard/work/abcd2.ics</D:href>
          <D:propstat>
            <D:prop>
              <D:getetag>"fffff-abcd2"</D:getetag>
              <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VTIMEZONE
LAST-MODIFIED:20040110T032845Z
TZID:US/Eastern
BEGIN:DAYLIGHT
DTSTART:20000404T020000
RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
TZNAME:EDT
TZOFFSETFROM:-0500
TZOFFSETTO:-0400
END:DAYLIGHT
BEGIN:STANDARD
DTSTART:20001026T020000
RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
TZNAME:EST
TZOFFSETFROM:-0400
TZOFFSETTO:-0500
END:STANDARD
END:VTIMEZONE
BEGIN:VEVENT
DTSTAMP:20060206T001121Z
DTSTART;TZID=US/Eastern:20060102T120000
DURATION:PT1H
RRULE:FREQ=DAILY;COUNT=5
SUMMARY:Event #2
UID:00959BC664CA650E933C892C@example.com
END:VEVENT
BEGIN:VEVENT
DTSTAMP:20060206T001121Z
DTSTART;TZID=US/Eastern:20060104T140000
DURATION:PT1H
RECURRENCE-ID;TZID=US/Eastern:20060104T120000
SUMMARY:Event #2 bis
UID:00959BC664CA650E933C892C@example.com
END:VEVENT
END:VCALENDAR
</C:calendar-data>
            </D:prop>
```

```
              <D:status>HTTP/1.1 200 OK</D:status>
          </D:propstat>
      </D:response>
      <D:response>
        <D:href>http://cal.example.com/bernard/work/abcd3.ics</D:href>
        <D:propstat>
          <D:prop>
            <D:getetag>"fffff-abcd3"</D:getetag>
            <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VTIMEZONE
LAST-MODIFIED:20040110T032845Z
TZID:US/Eastern
BEGIN:DAYLIGHT
DTSTART:20000404T020000
RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
TZNAME:EDT
TZOFFSETFROM:-0500
TZOFFSETTO:-0400
END:DAYLIGHT
BEGIN:STANDARD
DTSTART:20001026T020000
RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
TZNAME:EST
TZOFFSETFROM:-0400
TZOFFSETTO:-0500
END:STANDARD
END:VTIMEZONE
BEGIN:VEVENT
ATTENDEE;PARTSTAT=ACCEPTED;ROLE=CHAIR:mailto:cyrus@example.com
ATTENDEE;PARTSTAT=NEEDS-ACTION:mailto:lisa@example.com
DTSTAMP:20060206T001220Z
DTSTART;TZID=US/Eastern:20060104T100000
DURATION:PT1H
LAST-MODIFIED:20060206T001330Z
ORGANIZER:mailto:cyrus@example.com
SEQUENCE:1
STATUS:TENTATIVE
SUMMARY:Event #3
UID:DC6C50A017428C5216A2F1CD@example.com
X-ABC-GUID:E1CX5Dr-0007ym-Hz@example.com
END:VEVENT
END:VCALENDAR
</C:calendar-data>
          </D:prop>
          <D:status>HTTP/1.1 200 OK</D:status>
        </D:propstat>
```

```
      </D:response>
   </D:multistatus>
```

7.8.3. Example: Expanded Retrieval of Recurring Events

   In this example, the client requests the server to return VEVENT
   components that overlap the time range from January 2, 2006, at 00:
   00:00 A.M. UTC to January 5, 2006, at 00:00:00 A.M. UTC and to return
   recurring calendar components expanded into individual recurrence
   instance calendar components. Use of the CALDAV:expand element
   causes the server to only return overridden recurrence instances that
   overlap the time range specified in that element.

   See Appendix B for the calendar data being targeted by this example.

   >> Request <<

```
REPORT /bernard/work/ HTTP/1.1
Host: cal.example.com
Depth: 1
Content-Type: application/xml; charset="utf-8"
Content-Length: xxxx

<?xml version="1.0" encoding="utf-8" ?>
<C:calendar-query xmlns:D="DAV:"
                  xmlns:C="urn:ietf:params:xml:ns:caldav">
  <D:prop>
    <C:calendar-data>
      <C:expand start="20060103T000000Z"
                end="20060105T000000Z"/>
    </C:calendar-data>
  </D:prop>
  <C:filter>
    <C:comp-filter name="VCALENDAR">
      <C:comp-filter name="VEVENT">
        <C:time-range start="20060103T000000Z"
                      end="20060105T000000Z"/>
      </C:comp-filter>
    </C:comp-filter>
  </C:filter>
</C:calendar-query>
```

   >> Response <<

```
HTTP/1.1 207 Multi-Status
Date: Sat, 11 Nov 2006 09:32:12 GMT
Content-Type: application/xml; charset="utf-8"
Content-Length: xxxx
```

```
   <?xml version="1.0" encoding="utf-8" ?>
   <D:multistatus xmlns:D="DAV:"
              xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:response>
       <D:href>http://cal.example.com/bernard/work/abcd2.ics</D:href>
       <D:propstat>
         <D:prop>
           <D:getetag>"fffff-abcd2"</D:getetag>
           <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VEVENT
DTSTAMP:20060206T001121Z
DTSTART:20060103T170000
DURATION:PT1H
RECURRENCE-ID:20060103T170000
SUMMARY:Event #2
UID:00959BC664CA650E933C892C@example.com
END:VEVENT
BEGIN:VEVENT
DTSTAMP:20060206T001121Z
DTSTART:20060104T190000
DURATION:PT1H
RECURRENCE-ID:20060104T170000
SUMMARY:Event #2 bis
UID:00959BC664CA650E933C892C@example.com
END:VEVENT
END:VCALENDAR
</C:calendar-data>
         </D:prop>
         <D:status>HTTP/1.1 200 OK</D:status>
       </D:propstat>
     </D:response>
     <D:response>
       <D:href>http://cal.example.com/bernard/work/abcd3.ics</D:href>
       <D:propstat>
         <D:prop>
           <D:getetag>"fffff-abcd3"</D:getetag>
           <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VEVENT
ATTENDEE;PARTSTAT=ACCEPTED;ROLE=CHAIR:mailto:cyrus@example.com
ATTENDEE;PARTSTAT=NEEDS-ACTION:mailto:lisa@example.com
DTSTAMP:20060206T001220Z
DTSTART:20060104T150000
DURATION:PT1H
LAST-MODIFIED:20060206T001330Z
```

```
      ORGANIZER:mailto:cyrus@example.com
      SEQUENCE:1
      STATUS:TENTATIVE
      SUMMARY:Event #3
      UID:DC6C50A017428C5216A2F1CD@example.com
      X-ABC-GUID:E1CX5Dr-0007ym-Hz@example.com
      END:VEVENT
      END:VCALENDAR
   </C:calendar-data>
         </D:prop>
         <D:status>HTTP/1.1 200 OK</D:status>
       </D:propstat>
     </D:response>
   </D:multistatus>
```

7.8.4. Example: Partial Retrieval of Stored Free Busy Components

   In this example, the client requests the server to return the
   VFREEBUSY components that have free busy information that overlap the
   time range from January 2, 2006, at 00:00:00 A.M. UTC (inclusively)
   to January 3, 2006, at 00:00:00 A.M. UTC (exclusively). Use of the
   CALDAV:limit-freebusy-set element causes the server to only return
   the FREEBUSY property values that overlap the time range specified in
   that element. Note that this is not an example of discovering when
   the calendar owner is busy.

   See Appendix B for the calendar data being targeted by this example.

   >> Request <<

   REPORT /bernard/work/ HTTP/1.1
   Host: cal.example.com
   Depth: 1
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <C:calendar-query xmlns:D="DAV:"
                 xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:prop>
       <C:calendar-data>
         <C:limit-freebusy-set start="20060102T000000Z"
                                 end="20060103T000000Z"/>
       </C:calendar-data>
     </D:prop>
     <C:filter>
       <C:comp-filter name="VCALENDAR">
         <C:comp-filter name="VFREEBUSY">
           <C:time-range start="20060102T000000Z"
                           end="20060103T000000Z"/>
         </C:comp-filter>
       </C:comp-filter>
     </C:filter>
   </C:calendar-query>

```
   >> Response <<

   HTTP/1.1 207 Multi-Status
   Date: Sat, 11 Nov 2006 09:32:12 GMT
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <D:multistatus xmlns:D="DAV:"
                  xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:response>
       <D:href>http://cal.example.com/bernard/work/abcd8.ics</D:href>
       <D:propstat>
         <D:prop>
           <D:getetag>"fffff-abcd8"</D:getetag>
           <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VFREEBUSY
ORGANIZER;CN="Bernard Desruisseaux":mailto:bernard@example.com
UID:76ef34-54a3d2@example.com
DTSTAMP:20050530T123421Z
DTSTART:20060101T100000Z
DTEND:20060108T100000Z
FREEBUSY;FBTYPE=BUSY-TENTATIVE:20060102T100000Z/20060102T120000Z
END:VFREEBUSY
END:VCALENDAR
</C:calendar-data>
         </D:prop>
         <D:status>HTTP/1.1 200 OK</D:status>
       </D:propstat>
     </D:response>
   </D:multistatus>
```

7.8.5. Example: Retrieval of To-Dos by Alarm Time Range

   In this example, the client requests the server to return the VTODO
   components that have an alarm trigger scheduled in the specified time
   range.

   See Appendix B for the calendar data being targeted by this example.

   >> Request <<

   REPORT /bernard/work/ HTTP/1.1
   Host: cal.example.com
   Depth: 1
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <C:calendar-query xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:prop xmlns:D="DAV:">
       <D:getetag/>
       <C:calendar-data/>
     </D:prop>
     <C:filter>
       <C:comp-filter name="VCALENDAR">
         <C:comp-filter name="VTODO">
           <C:comp-filter name="VALARM">
             <C:time-range start="20060106T100000Z"
                           end="20060107T100000Z"/>
           </C:comp-filter>
         </C:comp-filter>
       </C:comp-filter>
     </C:filter>
   </C:calendar-query>

```
   >> Response <<

   HTTP/1.1 207 Multi-Status
   Date: Sat, 11 Nov 2006 09:32:12 GMT
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <D:multistatus xmlns:D="DAV:"
                  xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:response>
       <D:href>http://cal.example.com/bernard/work/abcd4.ics</D:href>
       <D:propstat>
         <D:prop>
           <D:getetag>"fffff-abcd4"</D:getetag>
           <C:calendar-data>BEGIN:VCALENDAR
   VERSION:2.0
   PRODID:-//Example Corp.//CalDAV Client//EN
   BEGIN:VTODO
   DTSTAMP:20060205T235300Z
   DUE;TZID=US/Eastern:20060106T120000
   LAST-MODIFIED:20060205T235308Z
   SEQUENCE:1
   STATUS:NEEDS-ACTION
   SUMMARY:Task #2
   UID:E10BA47467C5C69BB74E8720@example.com
   BEGIN:VALARM
   ACTION:AUDIO
   TRIGGER;RELATED=START:-PT10M
   END:VALARM
   END:VTODO
   END:VCALENDAR
   </C:calendar-data>
         </D:prop>
         <D:status>HTTP/1.1 200 OK</D:status>
       </D:propstat>
     </D:response>
   </D:multistatus>
```

7.8.6. Example: Retrieval of Event by UID

   In this example, the client requests the server to return the VEVENT
   component that has the UID property set to
   "DC6C50A017428C5216A2F1CD@example.com".

   See Appendix B for the calendar data being targeted by this example.

```
   >> Request <<

   REPORT /bernard/work/ HTTP/1.1
   Host: cal.example.com
   Depth: 1
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <C:calendar-query xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:prop xmlns:D="DAV:">
       <D:getetag/>
       <C:calendar-data/>
     </D:prop>
     <C:filter>
       <C:comp-filter name="VCALENDAR">
         <C:comp-filter name="VEVENT">
           <C:prop-filter name="UID">
             <C:text-match collation="i;octet"
             >DC6C50A017428C5216A2F1CD@example.com</C:text-match>
           </C:prop-filter>
         </C:comp-filter>
       </C:comp-filter>
     </C:filter>
   </C:calendar-query>

   >> Response <<

   HTTP/1.1 207 Multi-Status
   Date: Sat, 11 Nov 2006 09:32:12 GMT
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <D:multistatus xmlns:D="DAV:"
                  xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:response>
       <D:href>http://cal.example.com/bernard/work/abcd3.ics</D:href>
       <D:propstat>
         <D:prop>
           <D:getetag>"fffff-abcd3"</D:getetag>
           <C:calendar-data>BEGIN:VCALENDAR
   VERSION:2.0
   PRODID:-//Example Corp.//CalDAV Client//EN
   BEGIN:VTIMEZONE
   LAST-MODIFIED:20040110T032845Z
   TZID:US/Eastern
   BEGIN:DAYLIGHT
```

```
      DTSTART:20000404T020000
      RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
      TZNAME:EDT
      TZOFFSETFROM:-0500
      TZOFFSETTO:-0400
      END:DAYLIGHT
      BEGIN:STANDARD
      DTSTART:20001026T020000
      RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
      TZNAME:EST
      TZOFFSETFROM:-0400
      TZOFFSETTO:-0500
      END:STANDARD
      END:VTIMEZONE
      BEGIN:VEVENT
      ATTENDEE;PARTSTAT=ACCEPTED;ROLE=CHAIR:mailto:cyrus@example.com
      ATTENDEE;PARTSTAT=NEEDS-ACTION:mailto:lisa@example.com
      DTSTAMP:20060206T001220Z
      DTSTART;TZID=US/Eastern:20060104T100000
      DURATION:PT1H
      LAST-MODIFIED:20060206T001330Z
      ORGANIZER:mailto:cyrus@example.com
      SEQUENCE:1
      STATUS:TENTATIVE
      SUMMARY:Event #3
      UID:DC6C50A017428C5216A2F1CD@example.com
      X-ABC-GUID:E1CX5Dr-0007ym-Hz@example.com
      END:VEVENT
      END:VCALENDAR
      </C:calendar-data>
          </D:prop>
          <D:status>HTTP/1.1 200 OK</D:status>
        </D:propstat>
      </D:response>
    </D:multistatus>
```

7.8.7. Example: Retrieval of Events by PARTSTAT

   In this example, the client requests the server to return the VEVENT
   components that have the ATTENDEE property with the value
   "mailto:lisa@example.com" and for which the PARTSTAT parameter is set
   to NEEDS-ACTION.

   See Appendix B for the calendar data being targeted by this example.

```
>> Request <<

REPORT /bernard/work/ HTTP/1.1
Host: cal.example.com
Depth: 1
Content-Type: application/xml; charset="utf-8"
Content-Length: xxxx

<?xml version="1.0" encoding="utf-8" ?>
<C:calendar-query xmlns:C="urn:ietf:params:xml:ns:caldav">
  <D:prop xmlns:D="DAV:">
    <D:getetag/>
    <C:calendar-data/>
  </D:prop>
  <C:filter>
    <C:comp-filter name="VCALENDAR">
      <C:comp-filter name="VEVENT">
        <C:prop-filter name="ATTENDEE">
          <C:text-match collation="i;ascii-casemap"
           >mailto:lisa@example.com</C:text-match>
          <C:param-filter name="PARTSTAT">
            <C:text-match collation="i;ascii-casemap"
             >NEEDS-ACTION</C:text-match>
          </C:param-filter>
        </C:prop-filter>
      </C:comp-filter>
    </C:comp-filter>
  </C:filter>
</C:calendar-query>

>> Response <<

HTTP/1.1 207 Multi-Status
Date: Sat, 11 Nov 2006 09:32:12 GMT
Content-Type: application/xml; charset="utf-8"
Content-Length: xxxx

<?xml version="1.0" encoding="utf-8" ?>
<D:multistatus xmlns:D="DAV:"
               xmlns:C="urn:ietf:params:xml:ns:caldav">
  <D:response>
    <D:href>http://cal.example.com/bernard/work/abcd3.ics</D:href>
    <D:propstat>
      <D:prop>
        <D:getetag>"fffff-abcd3"</D:getetag>
        <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
```

```
   BEGIN:VTIMEZONE
   LAST-MODIFIED:20040110T032845Z
   TZID:US/Eastern
   BEGIN:DAYLIGHT
   DTSTART:20000404T020000
   RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
   TZNAME:EDT
   TZOFFSETFROM:-0500
   TZOFFSETTO:-0400
   END:DAYLIGHT
   BEGIN:STANDARD
   DTSTART:20001026T020000
   RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
   TZNAME:EST
   TZOFFSETFROM:-0400
   TZOFFSETTO:-0500
   END:STANDARD
   END:VTIMEZONE
   BEGIN:VEVENT
   ATTENDEE;PARTSTAT=ACCEPTED;ROLE=CHAIR:mailto:cyrus@example.com
   ATTENDEE;PARTSTAT=NEEDS-ACTION:mailto:lisa@example.com
   DTSTAMP:20060206T001220Z
   DTSTART;TZID=US/Eastern:20060104T100000
   DURATION:PT1H
   LAST-MODIFIED:20060206T001330Z
   ORGANIZER:mailto:cyrus@example.com
   SEQUENCE:1
   STATUS:TENTATIVE
   SUMMARY:Event #3
   UID:DC6C50A017428C5216A2F1CD@example.com
   X-ABC-GUID:E1CX5Dr-0007ym-Hz@example.com
   END:VEVENT
   END:VCALENDAR
   </C:calendar-data>
         </D:prop>
         <D:status>HTTP/1.1 200 OK</D:status>
       </D:propstat>
     </D:response>
   </D:multistatus>
```

7.8.8. Example: Retrieval of Events Only

   In this example, the client requests the server to return all VEVENT
   components.

   See Appendix B for the calendar data being targeted by this example.

```
   >> Request <<

   REPORT /bernard/work/ HTTP/1.1
   Host: cal.example.com
   Depth: 1
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <C:calendar-query xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:prop xmlns:D="DAV:">
       <D:getetag/>
       <C:calendar-data/>
     </D:prop>
     <C:filter>
       <C:comp-filter name="VCALENDAR">
         <C:comp-filter name="VEVENT"/>
       </C:comp-filter>
     </C:filter>
   </C:calendar-query>

   >> Response <<

   HTTP/1.1 207 Multi-Status
   Date: Sat, 11 Nov 2006 09:32:12 GMT
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <D:multistatus xmlns:D="DAV:"
                  xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:response>
       <D:href>http://cal.example.com/bernard/work/abcd1.ics</D:href>
       <D:propstat>
         <D:prop>
           <D:getetag>"fffff-abcd1"</D:getetag>
           <C:calendar-data>BEGIN:VCALENDAR
   VERSION:2.0
   PRODID:-//Example Corp.//CalDAV Client//EN
   BEGIN:VTIMEZONE
   LAST-MODIFIED:20040110T032845Z
   TZID:US/Eastern
   BEGIN:DAYLIGHT
   DTSTART:20000404T020000
   RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
   TZNAME:EDT
   TZOFFSETFROM:-0500
   TZOFFSETTO:-0400
```

```
   END:DAYLIGHT
   BEGIN:STANDARD
   DTSTART:20001026T020000
   RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
   TZNAME:EST
   TZOFFSETFROM:-0400
   TZOFFSETTO:-0500
   END:STANDARD
   END:VTIMEZONE
   BEGIN:VEVENT
   DTSTAMP:20060206T001102Z
   DTSTART;TZID=US/Eastern:20060102T100000
   DURATION:PT1H
   SUMMARY:Event #1
   Description:Go Steelers!
   UID:74855313FA803DA593CD579A@example.com
   END:VEVENT
   END:VCALENDAR
   </C:calendar-data>
         </D:prop>
         <D:status>HTTP/1.1 200 OK</D:status>
       </D:propstat>
     </D:response>
     <D:response>
       <D:href>http://cal.example.com/bernard/work/abcd2.ics</D:href>
       <D:propstat>
         <D:prop>
           <D:getetag>"fffff-abcd2"</D:getetag>
           <C:calendar-data>BEGIN:VCALENDAR
   VERSION:2.0
   PRODID:-//Example Corp.//CalDAV Client//EN
   BEGIN:VTIMEZONE
   LAST-MODIFIED:20040110T032845Z
   TZID:US/Eastern
   BEGIN:DAYLIGHT
   DTSTART:20000404T020000
   RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
   TZNAME:EDT
   TZOFFSETFROM:-0500
   TZOFFSETTO:-0400
   END:DAYLIGHT
   BEGIN:STANDARD
   DTSTART:20001026T020000
   RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
   TZNAME:EST
   TZOFFSETFROM:-0400
   TZOFFSETTO:-0500
   END:STANDARD
```

```
      END:VTIMEZONE
      BEGIN:VEVENT
      DTSTAMP:20060206T001121Z
      DTSTART;TZID=US/Eastern:20060102T120000
      DURATION:PT1H
      RRULE:FREQ=DAILY;COUNT=5
      SUMMARY:Event #2
      UID:00959BC664CA650E933C892C@example.com
      END:VEVENT
      BEGIN:VEVENT
      DTSTAMP:20060206T001121Z
      DTSTART;TZID=US/Eastern:20060104T140000
      DURATION:PT1H
      RECURRENCE-ID;TZID=US/Eastern:20060104T120000
      SUMMARY:Event #2 bis
      UID:00959BC664CA650E933C892C@example.com
      END:VEVENT
      BEGIN:VEVENT
      DTSTAMP:20060206T001121Z
      DTSTART;TZID=US/Eastern:20060106T140000
      DURATION:PT1H
      RECURRENCE-ID;TZID=US/Eastern:20060106T120000
      SUMMARY:Event #2 bis bis
      UID:00959BC664CA650E933C892C@example.com
      END:VEVENT
      END:VCALENDAR
      </C:calendar-data>
            </D:prop>
            <D:status>HTTP/1.1 200 OK</D:status>
          </D:propstat>
        </D:response>
        <D:response>
          <D:href>http://cal.example.com/bernard/work/abcd3.ics</D:href>
          <D:propstat>
            <D:prop>
              <D:getetag>"fffff-abcd3"</D:getetag>
              <C:calendar-data>BEGIN:VCALENDAR
      VERSION:2.0
      PRODID:-//Example Corp.//CalDAV Client//EN
      BEGIN:VTIMEZONE
      LAST-MODIFIED:20040110T032845Z
      TZID:US/Eastern
      BEGIN:DAYLIGHT
      DTSTART:20000404T020000
      RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
      TZNAME:EDT
      TZOFFSETFROM:-0500
      TZOFFSETTO:-0400
```

```
      END:DAYLIGHT
      BEGIN:STANDARD
      DTSTART:20001026T020000
      RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
      TZNAME:EST
      TZOFFSETFROM:-0400
      TZOFFSETTO:-0500
      END:STANDARD
      END:VTIMEZONE
      BEGIN:VEVENT
      ATTENDEE;PARTSTAT=ACCEPTED;ROLE=CHAIR:mailto:cyrus@example.com
      ATTENDEE;PARTSTAT=NEEDS-ACTION:mailto:lisa@example.com
      DTSTAMP:20060206T001220Z
      DTSTART;TZID=US/Eastern:20060104T100000
      DURATION:PT1H
      LAST-MODIFIED:20060206T001330Z
      ORGANIZER:mailto:cyrus@example.com
      SEQUENCE:1
      STATUS:TENTATIVE
      SUMMARY:Event #3
      UID:DC6C50A017428C5216A2F1CD@example.com
      X-ABC-GUID:E1CX5Dr-0007ym-Hz@example.com
      END:VEVENT
      END:VCALENDAR
      </C:calendar-data>
          </D:prop>
          <D:status>HTTP/1.1 200 OK</D:status>
        </D:propstat>
      </D:response>
    </D:multistatus>
```

7.8.9. Example: Retrieval of All Pending To-Dos

   In this example, the client requests the server to return all VTODO
   components that do not include a COMPLETED property and do not have a
   STATUS property value matching CANCELLED, i.e., VTODOs that still
   need to be worked on.

   See Appendix B for the calendar data being targeted by this example.

```
   >> Request <<

   REPORT /bernard/work/ HTTP/1.1
   Host: cal.example.com
   Depth: 1
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <C:calendar-query xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:prop xmlns:D="DAV:">
       <D:getetag/>
       <C:calendar-data/>
     </D:prop>
     <C:filter>
       <C:comp-filter name="VCALENDAR">
         <C:comp-filter name="VTODO">
           <C:prop-filter name="COMPLETED">
             <C:is-not-defined/>
           </C:prop-filter>
           <C:prop-filter name="STATUS">
             <C:text-match
                 negate-condition="yes">CANCELLED</C:text-match>
           </C:prop-filter>
         </C:comp-filter>
       </C:comp-filter>
     </C:filter>
   </C:calendar-query>

   >> Response <<

   HTTP/1.1 207 Multi-Status
   Date: Sat, 11 Nov 2006 09:32:12 GMT
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <D:multistatus xmlns:D="DAV:"
                  xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:response>
       <D:href>http://cal.example.com/bernard/work/abcd4.ics</D:href>
       <D:propstat>
         <D:prop>
           <D:getetag>"fffff-abcd4"</D:getetag>
           <C:calendar-data>BEGIN:VCALENDAR
   VERSION:2.0
   PRODID:-//Example Corp.//CalDAV Client//EN
   BEGIN:VTODO
```

```
      DTSTAMP:20060205T235335Z
      DUE;VALUE=DATE:20060104
      STATUS:NEEDS-ACTION
      SUMMARY:Task #1
      UID:DDDEEB7915FA61233B861457@example.com
      BEGIN:VALARM
      ACTION:AUDIO
      TRIGGER;RELATED=START:-PT10M
      END:VALARM
      END:VTODO
      END:VCALENDAR
      </C:calendar-data>
           </D:prop>
           <D:status>HTTP/1.1 200 OK</D:status>
         </D:propstat>
       </D:response>

       <D:response>
         <D:href>http://cal.example.com/bernard/work/abcd5.ics</D:href>
         <D:propstat>
           <D:prop>
             <D:getetag>"fffff-abcd5"</D:getetag>
             <C:calendar-data>BEGIN:VCALENDAR
      VERSION:2.0
      PRODID:-//Example Corp.//CalDAV Client//EN
      BEGIN:VTODO
      DTSTAMP:20060205T235300Z
      DUE;VALUE=DATE:20060106
      LAST-MODIFIED:20060205T235308Z
      SEQUENCE:1
      STATUS:NEEDS-ACTION
      SUMMARY:Task #2
      UID:E10BA47467C5C69BB74E8720@example.com
      BEGIN:VALARM
      ACTION:AUDIO
      TRIGGER;RELATED=START:-PT10M
      END:VALARM
      END:VTODO
      END:VCALENDAR
      </C:calendar-data>
           </D:prop>
           <D:status>HTTP/1.1 200 OK</D:status>
         </D:propstat>
       </D:response>
      </D:multistatus>
```

7.8.10. Example: Attempt to Query Unsupported Property

   In this example, the client requests the server to return all VEVENT
   components that include an X-ABC-GUID property with a value matching
   "ABC". However, the server does not support querying that non-
   standard property, and instead returns an error response.

   See Appendix B for the calendar data being targeted by this example.

   >> Request <<

   REPORT /bernard/work/ HTTP/1.1
   Host: cal.example.com
   Depth: 1
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <C:calendar-query xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:prop xmlns:D="DAV:">
       <D:getetag/>
       <C:calendar-data/>
     </D:prop>
     <C:filter>
       <C:comp-filter name="VCALENDAR">
         <C:comp-filter name="VEVENT">
           <C:prop-filter name="X-ABC-GUID">
             <C:text-match>ABC</C:text-match>
           </C:prop-filter>
         </C:comp-filter>
       </C:comp-filter>
     </C:filter>
   </C:calendar-query>

   >> Response <<

   HTTP/1.1 403 Forbidden
   Date: Sat, 11 Nov 2005 09:32:12 GMT
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <D:error>
     <C:supported-filter>
       <C:prop-filter name="X-ABC-GUID"/>
     </C:supported-filter>
   </D:error>

7.9. CALDAV:calendar-multiget REPORT

   The CALDAV:calendar-multiget REPORT is used to retrieve specific
   calendar object resources from within a collection, if the Request-
   URI is a collection, or to retrieve a specific calendar object
   resource, if the Request-URI is a calendar object resource. This
   report is similar to the CALDAV:calendar-query REPORT (see
   Section 7.8), except that it takes a list of DAV:href elements,
   instead of a CALDAV:filter element, to determine which calendar
   object resources to return.

   Support for the CALDAV:calendar-multiget REPORT is REQUIRED.

   Marshalling:

      The request body MUST be a CALDAV:calendar-multiget XML element
      (see Section 9.10). If the Request-URI is a collection resource,
      then the DAV:href elements MUST refer to calendar object resources
      within that collection, and they MAY refer to calendar object
      resources at any depth within the collection. As a result, the
      "Depth" header MUST be ignored by the server and SHOULD NOT be
      sent by the client. If the Request-URI refers to a non-collection
      resource, then there MUST be a single DAV:href element that is
      equivalent to the Request-URI.

      The response body for a successful request MUST be a DAV:
      multistatus XML element.

      The response body for a successful CALDAV:calendar-multiget REPORT
      request MUST contain a DAV:response element for each calendar
      object resource referenced by the provided set of DAV:href
      elements. Calendar data is being returned in the CALDAV:calendar-
      data element inside the DAV:prop element.

      In the case of an error accessing any of the provided DAV:href
      resources, the server MUST return the appropriate error status
      code in the DAV:status element of the corresponding DAV:response
      element.

   Preconditions:

      (CALDAV:supported-calendar-data): The attributes "content-type"
      and "version" of the CALDAV:calendar-data XML elements (see
      Section 9.6) specify a media type supported by the server for
      calendar object resources.

      (CALDAV:min-date-time): Any XML element specifying a range of time
      MUST have its start or end DATE or DATE-TIME values greater than

   or equal to the value of the CALDAV:min-date-time property value
   (Section 5.2.6) on the calendar collections being targeted by the
   REPORT request;

   (CALDAV:max-date-time): Any XML element specifying a range of time
   MUST have its start or end DATE or DATE-TIME values less than or
   equal to the value of the CALDAV:max-date-time property value
   (Section 5.2.7) on the calendar collections being targeted by the
   REPORT request;

   Postconditions:

   None.

7.9.1. Example: Successful CALDAV:calendar-multiget REPORT

   In this example, the client requests the server to return specific
   properties of the VEVENT components referenced by specific URIs. In
   addition, the DAV:getetag property is also requested and returned as
   part of the response. Note that in this example, the resource at
   http://cal.example.com/bernard/work/mtg1.ics does not exist,
   resulting in an error status response.

   See Appendix B for the calendar data being targeted by this example.

   >> Request <<

```
REPORT /bernard/work/ HTTP/1.1
Host: cal.example.com
Content-Type: application/xml; charset="utf-8"
Content-Length: xxxx

<?xml version="1.0" encoding="utf-8" ?>
<C:calendar-multiget xmlns:D="DAV:"
                 xmlns:C="urn:ietf:params:xml:ns:caldav">
  <D:prop>
    <D:getetag/>
    <C:calendar-data/>
  </D:prop>
  <D:href>/bernard/work/abcd1.ics</D:href>
  <D:href>/bernard/work/mtg1.ics</D:href>
</C:calendar-multiget>
```

   >> Response <<

```
HTTP/1.1 207 Multi-Status
Date: Sat, 11 Nov 2006 09:32:12 GMT
Content-Type: application/xml; charset="utf-8"
```

```
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <D:multistatus xmlns:D="DAV:"
                  xmlns:C="urn:ietf:params:xml:ns:caldav">
     <D:response>
       <D:href>http://cal.example.com/bernard/work/abcd1.ics</D:href>
       <D:propstat>
         <D:prop>
           <D:getetag>"fffff-abcd1"</D:getetag>
           <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VTIMEZONE
LAST-MODIFIED:20040110T032845Z
TZID:US/Eastern
BEGIN:DAYLIGHT
DTSTART:20000404T020000
RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
TZNAME:EDT
TZOFFSETFROM:-0500
TZOFFSETTO:-0400
END:DAYLIGHT
BEGIN:STANDARD
DTSTART:20001026T020000
RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
TZNAME:EST
TZOFFSETFROM:-0400
TZOFFSETTO:-0500
END:STANDARD
END:VTIMEZONE
BEGIN:VEVENT
DTSTAMP:20060206T001102Z
DTSTART;TZID=US/Eastern:20060102T100000
DURATION:PT1H
SUMMARY:Event #1
Description:Go Steelers!
UID:74855313FA803DA593CD579A@example.com
END:VEVENT
END:VCALENDAR
</C:calendar-data>
         </D:prop>
         <D:status>HTTP/1.1 200 OK</D:status>
       </D:propstat>
     </D:response>
     <D:response>
       <D:href>http://cal.example.com/bernard/work/mtg1.ics</D:href>
       <D:status>HTTP/1.1 404 Not Found</D:status>
```

```
      </D:response>
   </D:multistatus>
```

7.10. CALDAV:free-busy-query REPORT

   The CALDAV:free-busy-query REPORT generates a VFREEBUSY component
   containing free busy information for all the calendar object
   resources targeted by the request and that have the CALDAV:read-free-
   busy or DAV:read privilege granted to the current user.

   Only VEVENT components without a TRANSP property or with the TRANSP
   property set to OPAQUE, and VFREEBUSY components SHOULD be considered
   in generating the free busy time information.

   In the case of VEVENT components, the free or busy time type (FBTYPE)
   of the FREEBUSY properties in the returned VFREEBUSY component SHOULD
   be derived from the value of the TRANSP and STATUS properties, as
   outlined in the table below:

```
        +---------------------------++------------------+
        |           VEVENT          ||    VFREEBUSY     |
        +------------+--------------++------------------+
        | TRANSP     | STATUS       || FBTYPE           |
        +============+============++==================+
        |            | CONFIRMED    || BUSY             |
        |            | (default)    ||                  |
        | OPAQUE     +------------++------------------+
        | (default)  | CANCELLED    || FREE             |
        |            +------------++------------------+
        |            | TENTATIVE    || BUSY-TENTATIVE   |
        |            +------------++------------------+
        |            | x-name       || BUSY or          |
        |            |              || x-name           |
        +------------+------------++------------------+
        |            | CONFIRMED    ||                  |
        | TRANSPARENT| CANCELLED    || FREE             |
        |            | TENTATIVE    ||                  |
        |            | x-name       ||                  |
        +------------+------------++------------------+
```

   Duplicate busy time periods with the same FBTYPE parameter value
   SHOULD NOT be specified in the returned VFREEBUSY component. Servers
   SHOULD coalesce consecutive or overlapping busy time periods of the
   same type. Busy time periods with different FBTYPE parameter values
   MAY overlap.

   Support for the CALDAV:free-busy-query REPORT is REQUIRED.

Marshalling:

   The request body MUST be a CALDAV:free-busy-query XML element (see
   Section 9.11), which MUST contain exactly one CALDAV:time-range
   XML element, as defined in Section 9.9.

   The request MAY include a Depth header. If no Depth header is
   included, Depth:0 is assumed.

   The response body for a successful request MUST be an iCalendar
   object that contains exactly one VFREEBUSY component that
   describes the busy time intervals for the calendar object
   resources containing VEVENT, or VFREEBUSY components that satisfy
   the Depth value and for which the current user is at least granted
   the CALDAV:read-free-busy privilege. If no calendar object
   resources are found to satisfy these conditions, a VFREEBUSY
   component with no FREEBUSY property MUST be returned. This report
   only returns busy time information. Free time information can be
   inferred from the returned busy time information.

   If the current user is not granted the CALDAV:read-free-busy or
   DAV:read privileges on the Request-URI, the CALDAV:free-busy-query
   REPORT request MUST fail and return a 404 (Not Found) status
   value. This restriction will prevent users from discovering URLs
   of resources for which they are only granted the CALDAV:read-free-
   busy privilege.

   The CALDAV:free-busy-query REPORT request can only be run against
   a collection (either a regular collection or a calendar
   collection). An attempt to run the report on a calendar object
   resource MUST fail and return a 403 (Forbidden) status value.

Preconditions:

   None.

Postconditions:

   (DAV:number-of-matches-within-limits): The number of matching
   calendar object resources must fall within server-specific,
   predefined limits. For example, this postcondition might fail if
   the specified CALDAV:time-range would cause an extremely large
   number of calendar object resources to be considered in computing
   the response.

7.10.1. Example: Successful CALDAV:free-busy-query REPORT

   In this example, the client requests the server to return free busy
   information on the calendar collection /bernard/work/, between 9:00
   A.M. and 5:00 P.M. EST (2:00 P.M. and 10:00 P.M. UTC) on the January
   4, 2006. The server responds, indicating two busy time intervals of
   one hour, one of which is tentative.

   See Appendix B for the calendar data being targeted by this example.

   >> Request <<

   REPORT /bernard/work/ HTTP/1.1
   Host: cal.example.com
   Depth: 1
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <C:free-busy-query xmlns:C="urn:ietf:params:xml:ns:caldav">
     <C:time-range start="20060104T140000Z"
                     end="20060105T220000Z"/>
   </C:free-busy-query>

   >> Response <<

   HTTP/1.1 200 OK
   Date: Sat, 11 Nov 2006 09:32:12 GMT
   Content-Type: text/calendar
   Content-Length: xxxx

   BEGIN:VCALENDAR
   VERSION:2.0
   PRODID:-//Example Corp.//CalDAV Server//EN
   BEGIN:VFREEBUSY
   DTSTAMP:20050125T090000Z
   DTSTART:20060104T140000Z
   DTEND:20060105T220000Z
   FREEBUSY;FBTYPE=BUSY-TENTATIVE:20060104T150000Z/PT1H
   FREEBUSY:20060104T190000Z/PT1H
   END:VFREEBUSY
   END:VCALENDAR

8. Guidelines

8.1. Client-to-Client Interoperability

   There are a number of actions clients can take that will be legal
   (the server will not return errors), but that can degrade
   interoperability with other client implementations accessing the same
   data. For example, a recurrence rule could be replaced with a set of
   recurrence dates, a single recurring event could be replaced with a
   set of independent resources to represent each recurrence, or the
   start/end time values can be translated from the original time zone
   to another time zone. Although this advice amounts to iCalendar
   interoperability best practices and is not limited only to CalDAV
   usage, interoperability problems are likely to be more evident in
   CalDAV use cases.

8.2. Synchronization Operations

   WebDAV already provides functionality required to synchronize a
   collection or set of collections, to make changes offline, and
   provides a simple way to resolve conflicts when reconnected. ETags
   are the key to making this work, but these are not required of all
   WebDAV servers. Since offline functionality is more important to
   calendar applications than to some other WebDAV applications, CalDAV
   servers MUST support ETags, as specified in Section 5.3.4.

8.2.1. Use of Reports

8.2.1.1. Restrict the Time Range

   The reports provided in CalDAV can be used by clients to optimize
   their performance in terms of network bandwidth usage and resource
   consumption on the local client machine. Both are certainly major
   considerations for mobile or handheld devices with limited capacity,
   but they are also relevant to desktop client applications in cases
   where the calendar collections contain large amounts of data.

   Typically, clients present calendar data to users in views that span
   a finite time interval, so whenever possible, clients should only
   retrieve calendar components from the server using CALDAV:calendar-
   query REPORT, combined with a CALDAV:time-range element, to limit the
   set of returned components to just those needed to populate the
   current view.

8.2.1.2. Synchronize by Time Range

   Typically in a calendar, historical data (events, to-dos, etc. that
   have completed prior to the current date) do not change, though they
   may be deleted. As a result, a client can speed up the
   synchronization process by only considering data for the present time
   and the future up to a reasonable limit (e.g., one week, one month).
   If the user then tries to examine a portion of the calendar outside
   the range that has been synchronized, the client can perform another
   synchronization operation on the new time interval being examined.
   This "just-in-time" synchronization can minimize bandwidth for common
   user interaction behaviors.

8.2.1.3. Synchronization Process

   If a client wants to support calendar data synchronization, as
   opposed to downloading calendar data each time it is needed, the
   client needs to cache the calendar object resource's URI and ETag,
   along with the actual calendar data. While the URI remains static
   for the lifetime of the calendar object resource, the ETag will
   change with each successive change to the calendar object resource.
   Thus, to synchronize a local data cache with the server, the client
   can first fetch the URI/ETag pairs for the time interval being
   considered, and compare those results with the cached data. Any
   cached component whose ETag differs from that on the server needs to
   be refreshed.

   In order to properly detect the changes between the server and client
   data, the client will need to keep a record of which calendar object
   resources have been created, changed, or deleted since the last
   synchronization operation so that it can reconcile those changes with
   the data on the server.

   Here's an example of how to do that:

   The client issues a CALDAV:calendar-query REPORT request for a
   specific time range and asks for only the DAV:getetag property to be
   returned:

```
REPORT /bernard/work/ HTTP/1.1
Host: cal.example.com
Depth: 1
Content-Type: application/xml; charset="utf-8"
Content-Length: xxxx

<?xml version="1.0" encoding="utf-8" ?>
<C:calendar-query xmlns:D="DAV:"
                  xmlns:C="urn:ietf:params:xml:ns:caldav">
  <D:prop>
    <D:getetag/>
  </D:prop>
  <C:filter>
    <C:comp-filter name="VCALENDAR">
      <C:comp-filter name="VEVENT">
        <C:time-range start="20040902T000000Z"
                        end="20040903T000000Z"/>
      </C:comp-filter>
    </C:comp-filter>
  </C:filter>
</C:calendar-query>
```

The client then uses the results to determine which calendar object
resources have changed, been created, or deleted on the server, and
how those relate to locally cached calendar object resources that may
have changed, been created, or deleted. If the client determines
that there are calendar object resources on the server that need to
be fetched, the client issues a CALDAV:calendar-multiget REPORT
request to fetch its calendar data:

```
REPORT /bernard/work/ HTTP/1.1
Host: cal.example.com
Content-Type: application/xml; charset="utf-8"
Content-Length: xxxx

<?xml version="1.0" encoding="utf-8" ?>
<C:calendar-multiget xmlns:D="DAV:"
                     xmlns:C="urn:ietf:params:xml:ns:caldav">
  <D:prop>
    <D:getetag/>
    <C:calendar-data/>
  </D:prop>
  <D:href>/bernard/work/abcd1.ics</D:href>
  <D:href>/bernard/work/mtg1.ics</D:href>
</C:calendar-multiget>
```

8.2.2. Restrict the Properties Returned

   A client may not need all the calendar properties of a calendar
   object resource when presenting information to the user. Since some
   calendar property values can be large (e.g., ATTACH or ATTENDEE), a
   client can choose to restrict the calendar properties to be returned
   in a calendaring REPORT request to those it knows it will use.

   However, if a client needs to make a change to a calendar object
   resource, it can only change the entire calendar object resource via
   a PUT request. There is currently no way to incrementally make a
   change to a set of calendar properties of a calendar object resource.
   As a result, the client will have to get the entire calendar object
   resource that is being changed.

8.3. Use of Locking

   WebDAV locks can be used to prevent two clients that are modifying
   the same resource from either overwriting each others' changes
   (though that problem can also be solved by using ETags) or wasting
   time making changes that will conflict with another set of changes.
   In a multi-user calendar system, an interactive calendar client could
   lock an event while the user is editing the event, and unlock the
   event when the user finishes or cancels. Locks can also be used to
   prevent changes while data is being reorganized. For example, a
   calendar client might lock two calendar collections prior to moving a
   bunch of calendar resources from one to another.

   Clients are responsible for requesting a lock timeout period that is
   appropriate to the use case. When the user explicitly decides to
   reserve a resource and prevent other changes, a long timeout might be
   appropriate, but in cases where the client automatically decides to
   lock the resource, the timeout should be short (and the client can
   always refresh the lock should it need to). A short lock timeout
   means that if the client is unable to remove the lock, the other
   calendar users aren't prevented from making changes.

8.4. Finding Calendars

   Much of the time, a calendar client (or agent) will discover a new
   calendar's location by being provided directly with the URL. For
   example, a user will type his or her own calendar location into
   client configuration information or copy and paste a URL from email
   into the calendar application. The client need only confirm that the
   URL points to a resource that is a calendar collection. The client
   may also be able to browse WebDAV collections to find calendar
   collections.

   The choice of HTTP URLs means that calendar object resources are
   backward compatible with existing software, but does have the
   disadvantage that existing software does not usually know to look at
   the OPTIONS response to that URL to determine what can be done with
   it. This is somewhat of a barrier for WebDAV usage as well as with
   CalDAV usage. This specification does not offer a way through this
   other than making the information available in the OPTIONS response
   should this be requested.

   For calendar sharing and scheduling use cases, one might wish to find
   the calendar belonging to another user. If the other user has a
   calendar in the same repository, that calendar can be found by using
   the principal namespace required by WebDAV ACL support. For other
   cases, the authors have no universal solution, but implementers can
   consider whether to use vCard [RFC2426] or LDAP [RFC4511] standards
   together with calendar attributes [RFC2739].

   Because CalDAV requires servers to support WebDAV ACL [RFC3744],
   including principal namespaces, and with the addition of the CALDAV:
   calendar-home-set property, there are a couple options for CalDAV
   clients to find one's own calendar or another user's calendar.

   In this case, a DAV:principal-match REPORT is used to find a named
   property (the CALDAV:calendar-home-set) on the Principal-URL of the
   current user. Using this, a WebDAV client can learn "who am I" and
   "where are my calendars". The REPORT request body looks like this:

```
<?xml version="1.0" encoding="utf-8" ?>
<D:principal-match xmlns:D="DAV:">
  <D:self/>
  <D:prop>
    <C:calendar-home-set
       xmlns:C="urn:ietf:params:xml:ns:caldav"/>
  </D:prop>
</D:principal-match>
```

   To find other users' calendars, the DAV:principal-property-search
   REPORT can be used to filter on some properties and return others.
   To search for a calendar owned by a user named "Laurie", the REPORT
   request body would look like this:

```
<?xml version="1.0" encoding="utf-8" ?>
<D:principal-property-search xmlns:D="DAV:">
  <D:property-search>
    <D:prop>
      <D:displayname/>
    </D:prop>
    <D:match>Laurie</D:match>
  </D:property-search>
  <D:prop>
    <C:calendar-home-set
        xmlns:C="urn:ietf:params:xml:ns:caldav"/>
    <D:displayname/>
  </D:prop>
</D:principal-property-search>
```

The server performs a case-sensitive or caseless search for a
matching string subset of "Laurie" within the DAV:displayname
property. Thus, the server might return "Laurie Dusseault", "Laurier
Desruisseaux", or "Wilfrid Laurier" as matching DAV:displayname
values, and return the calendars for each of these.

8.5. Storing and Using Attachments

   CalDAV clients MAY create attachments in calendar components either
   as inline or external. This section contains some guidelines for
   creating and managing attachments.

8.5.1. Inline Attachments

   CalDAV clients MUST support inline attachments as specified in
   iCalendar [RFC2445]. CalDAV servers MUST support inline attachments,
   so clients can rely on being able to create attachments this way. On
   the other hand, inline attachments have some drawbacks:

   o Servers MAY impose limitations on the size of calendar object
      resources (i.e., refusing PUT requests of very large iCalendar
      objects). Servers that impose such limitations MUST use the
      CALDAV:max-resource-size property on a calendar collection to
      inform the client as to what the limitation is (see
      Section 5.2.5).

   o Servers MAY impose storage quota limitations on calendar
      collections (See [RFC4331]).

   o Any change to a calendar object resource containing an inline
      attachment requires the entire inline attachment to be re-
      uploaded.

      o Clients synchronizing a changed calendar object resource have to
         download the entire calendar object resource, even if the
         attachment is unchanged.

8.5.2. External Attachments

   CalDAV clients SHOULD support downloading of external attachments
   referenced by arbitrary URI schemes, by either processing them
   directly, or by passing the attachment URI to a suitable "helper
   application" for processing, if such an application exists. CalDAV
   clients MUST support downloading of external attachments referenced
   by the "http" or "https" URI schemes. An external attachment could
   be:

   o In a collection in the calendar collection containing the calendar
      object resource;

   o Somewhere else in the same repository that hosts the calendar
      collection; or

   o On an HTTP or FTP server elsewhere.

   CalDAV servers MAY provide support for child collections in calendar
   collections. CalDAV servers MAY allow the MKCOL method to create
   child collections in calendar collections. Child collections of
   calendar collections MAY contain any type of resource except calendar
   collections that they MUST NOT contain. Some CalDAV servers won't
   allow child collections in calendar collections, and it may be
   possible on such a server to discover other locations where
   attachments can be stored.

   Clients are entirely responsible for maintaining reference
   consistency with calendar components that link to external
   attachments. A client deleting a calendar component with an external
   attachment might therefore also delete the attachment if that's
   appropriate; however, appropriateness can be very hard to determine.
   A new component might easily reference some pre-existing Web resource
   that is intended to have independent existence from the calendar
   component (the "attachment" could be a major proposal to be discussed
   in a meeting, for instance). Best practices will probably emerge and
   should probably be documented, but for now, clients should be wary of
   engaging in aggressive "cleanup" of external attachments. A client
   could involve the user in making decisions about removing
   unreferenced documents, or a client could be conservative in only
   deleting attachments it had created.

   Also, clients are responsible for consistency of permissions when
   using external attachments. One reason for servers to support the

storage of attachments within child collections of calendar
collections is that ACL inheritance might make it easier to grant the
same permissions to attachments that are granted on the calendar
collection. Otherwise, it can be very difficult to keep permissions
synchronized. With attachments stored on separate repositories, it
can be impossible to keep permissions consistent -- the two
repositories may not support the same permissions or have the same
set of principals. Some systems have used tickets or other anonymous
access control mechanisms to provide partially satisfactory solutions
to these kinds of problems.

8.6. Storing and Using Alarms

   Note that all CalDAV calendar collections (including those the user
   might treat as public or group calendars) can contain alarm
   information on events and to-dos. Users can synchronize a calendar
   between multiple devices and decide to have alarms execute on a
   different device than the device that created the alarm. Not all
   alarm action types are completely interoperable (e.g., those that
   name a sound file to play).

      When the action is AUDIO and the client is configured to execute
      the alarm, the client SHOULD play the suggested sound if it's
      available or play another sound, but SHOULD NOT rewrite the alarm
      just to replace the suggested sound with a sound that's locally
      available.

      When the action is DISPLAY and the client is configured to execute
      the alarm, the client SHOULD execute a display alarm by displaying
      according to the suggested description or some reasonable
      replacement, but SHOULD NOT rewrite the alarm for its own
      convenience.

      When the action is EMAIL and the client is incapable of sending
      email, it SHOULD ignore the alarm, but it MUST continue to
      synchronize the alarm itself.

      This specification makes no recommendations about executing alarms
      of type PROCEDURE, except to note that clients are advised to take
      care to avoid creating security holes by executing these.

   Non-interoperable alarm information (e.g., should somebody define a
   color to be used in a display alarm) should be put in non-standard
   properties inside the VALARM component in order to keep the basic
   alarm usable on all devices.

   Clients that allow changes to calendar object resources MUST
   synchronize the alarm data that already exists in the resources.

Clients MAY execute alarms that are downloaded in this fashion,
possibly based on user preference. If a client is only doing read
operations on a calendar and there is no risk of losing alarm
information, then the client MAY discard alarm information.

This specification makes no attempt to provide multi-user alarms on
group calendars or to find out for whom an alarm is intended.
Addressing those issues might require extensions to iCalendar; for
example, to store alarms per-user, or to indicate for which user a
VALARM was intended. In the meantime, clients might maximize
interoperability by generally not uploading alarm information to
public, group, or resource calendars.

9. XML Element Definitions

9.1. CALDAV:calendar XML Element

   Name: calendar

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Specifies the resource type of a calendar collection.

   Description: See Section 4.2.

   Definition:

        <!ELEMENT calendar EMPTY>

9.2. CALDAV:mkcalendar XML Element

   Name: mkcalendar

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Specifies a request that includes the WebDAV property
      values to be set for a calendar collection resource when it is
      created.

   Description: See Section 5.3.1.

   Definition:

        <!ELEMENT mkcalendar (DAV:set)>

9.3. CALDAV:mkcalendar-response XML Element

   Name: mkcalendar-response

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Specifies a response body for a successful MKCALENDAR
      request.

   Description: See Section 5.3.1.

   Definition:

         <!ELEMENT mkcalendar-response ANY>

9.4. CALDAV:supported-collation XML Element

   Name: supported-collation

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Identifies a single collation via its collation identifier,
      as defined by [RFC4790].

   Description: The CALDAV:supported-collation contains the text of a
      collation identifier, as described in Section 7.5.1.

   Definition:

         <!ELEMENT supported-collation (#PCDATA)>
         PCDATA value: collation identifier

9.5. CALDAV:calendar-query XML Element

   Name: calendar-query

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Defines a report for querying calendar object resources.

   Description: See Section 7.8.

   Definition:

         <!ELEMENT calendar-query ((DAV:allprop |
                                    DAV:propname |
                                    DAV:prop)?, filter, timezone?)>

9.6. CALDAV:calendar-data XML Element

   Name: calendar-data

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Specified one of the following:

      1. A supported media type for calendar object resources when
          nested in the CALDAV:supported-calendar-data property;

      2. The parts of a calendar object resource should be returned by
          a calendaring report;

      3. The content of a calendar object resource in a response to a
          calendaring report.

   Description: When nested in the CALDAV:supported-calendar-data
      property, the CALDAV:calendar-data XML element specifies a media
      type supported by the CalDAV server for calendar object resources.

      When used in a calendaring REPORT request, the CALDAV:calendar-
      data XML element specifies which parts of calendar object
      resources need to be returned in the response. If the CALDAV:
      calendar-data XML element doesn't contain any CALDAV:comp element,
      calendar object resources will be returned in their entirety.

      Finally, when used in a calendaring REPORT response, the CALDAV:
      calendar-data XML element specifies the content of a calendar
      object resource. Given that XML parsers normalize the two-
      character sequence CRLF (US-ASCII decimal 13 and US-ASCII decimal
      10) to a single LF character (US-ASCII decimal 10), the CR
      character (US-ASCII decimal 13) MAY be omitted in calendar object
      resources specified in the CALDAV:calendar-data XML element.
      Furthermore, calendar object resources specified in the CALDAV:
      calendar-data XML element MAY be invalid per their media type
      specification if the CALDAV:calendar-data XML element part of the
      calendaring REPORT request did not specify required properties
      (e.g., UID, DTSTAMP, etc.), or specified a CALDAV:prop XML element
      with the "novalue" attribute set to "yes".

   Note: The CALDAV:calendar-data XML element is specified in requests
      and responses inside the DAV:prop XML element as if it were a
      WebDAV property. However, the CALDAV:calendar-data XML element is
      not a WebDAV property and, as such, is not returned in PROPFIND
      responses, nor used in PROPPATCH requests.

   Note: The iCalendar data embedded within the CALDAV:calendar-data
      XML element MUST follow the standard XML character data encoding
      rules, including use of <, >, & etc. entity encoding or
      the use of a <![CDATA[...]]> construct. In the later case, the
      iCalendar data cannot contain the character sequence "]]>", which
      is the end delimiter for the CDATA section.

   Definition:

        <!ELEMENT calendar-data EMPTY>

        when nested in the CALDAV:supported-calendar-data property
        to specify a supported media type for calendar object
        resources;

        <!ELEMENT calendar-data (comp?,
                              (expand | limit-recurrence-set)?,
                              limit-freebusy-set?)>

        when nested in the DAV:prop XML element in a calendaring
        REPORT request to specify which parts of calendar object
        resources should be returned in the response;

        <!ELEMENT calendar-data (#PCDATA)>
        PCDATA value: iCalendar object

        when nested in the DAV:prop XML element in a calendaring
        REPORT response to specify the content of a returned
        calendar object resource.

        <!ATTLIST calendar-data content-type CDATA "text/calendar"
                             version CDATA "2.0">
        content-type value: a MIME media type
        version value: a version string

        attributes can be used on all three variants of the
        CALDAV:calendar-data XML element.

9.6.1. CALDAV:comp XML Element

   Name: comp

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Defines which component types to return.

   Description: The name value is a calendar component name (e.g.,
      VEVENT).

   Definition:

        <!ELEMENT comp ((allprop | prop*), (allcomp | comp*))>

        <!ATTLIST comp name CDATA #REQUIRED>
        name value: a calendar component name

   Note: The CALDAV:prop and CALDAV:allprop elements have the same name
      as the DAV:prop and DAV:allprop elements defined in [RFC2518].
      However, the CALDAV:prop and CALDAV:allprop elements are defined
      in the "urn:ietf:params:xml:ns:caldav" namespace instead of the
      "DAV:" namespace.

9.6.2. CALDAV:allcomp XML Element

   Name: allcomp

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Specifies that all components shall be returned.

   Description: The CALDAV:allcomp XML element can be used when the
      client wants all types of components returned by a calendaring
      REPORT request.

   Definition:

        <!ELEMENT allcomp EMPTY>

9.6.3. CALDAV:allprop XML Element

   Name: allprop

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Specifies that all properties shall be returned.

   Description: The CALDAV:allprop XML element can be used when the
      client wants all properties of components returned by a
      calendaring REPORT request.

   Definition:

        <!ELEMENT allprop EMPTY>

   Note: The CALDAV:allprop element has the same name as the DAV:
      allprop element defined in [RFC2518]. However, the CALDAV:allprop
      element is defined in the "urn:ietf:params:xml:ns:caldav"
      namespace instead of the "DAV:" namespace.

9.6.4. CALDAV:prop XML Element

   Name: prop

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Defines which properties to return in the response.

   Description: The "name" attribute specifies the name of the calendar
      property to return (e.g., ATTENDEE). The "novalue" attribute can
      be used by clients to request that the actual value of the
      property not be returned (if the "novalue" attribute is set to
      "yes"). In that case, the server will return just the iCalendar
      property name and any iCalendar parameters and a trailing ":"
      without the subsequent value data.

   Definition:

        <!ELEMENT prop EMPTY>

        <!ATTLIST prop name CDATA #REQUIRED
                       novalue (yes | no) "no">
        name value: a calendar property name
        novalue value: "yes" or "no"

   Note: The CALDAV:prop element has the same name as the DAV:prop
      element defined in [RFC2518]. However, the CALDAV:prop element is
      defined in the "urn:ietf:params:xml:ns:caldav" namespace instead
      of the "DAV:" namespace.

9.6.5. CALDAV:expand XML Element

   Name: expand

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Forces the server to expand recurring components into
      individual recurrence instances.

   Description: The CALDAV:expand XML element specifies that for a
      given calendaring REPORT request, the server MUST expand the
      recurrence set into calendar components that define exactly one

recurrence instance, and MUST return only those whose scheduled
time intersect a specified time range.

The "start" attribute specifies the inclusive start of the time
range, and the "end" attribute specifies the non-inclusive end of
the time range. Both attributes are specified as date with UTC
time value. The value of the "end" attribute MUST be greater than
the value of the "start" attribute.

The server MUST use the same logic as defined for CALDAV:time-
range to determine if a recurrence instance intersects the
specified time range.

Recurring components, other than the initial instance, MUST
include a RECURRENCE-ID property indicating which instance they
refer to.

The returned calendar components MUST NOT use recurrence
properties (i.e., EXDATE, EXRULE, RDATE, and RRULE) and MUST NOT
have reference to or include VTIMEZONE components. Date and local
time with reference to time zone information MUST be converted
into date with UTC time.

Definition:

    <!ELEMENT expand EMPTY>

    <!ATTLIST expand start CDATA #REQUIRED
                     end   CDATA #REQUIRED>
    start value: an iCalendar "date with UTC time"
    end value: an iCalendar "date with UTC time"

9.6.6. CALDAV:limit-recurrence-set XML Element

Name: limit-recurrence-set

Namespace: urn:ietf:params:xml:ns:caldav

Purpose: Specifies a time range to limit the set of "overridden
   components" returned by the server.

Description: The CALDAV:limit-recurrence-set XML element specifies
   that for a given calendaring REPORT request, the server MUST
   return, in addition to the "master component", only the
   "overridden components" that impact a specified time range. An
   overridden component impacts a time range if its current start and
   end times overlap the time range, or if the original start and end

times -- the ones that would have been used if the instance were
not overridden -- overlap the time range.

The "start" attribute specifies the inclusive start of the time
range, and the "end" attribute specifies the non-inclusive end of
the time range. Both attributes are specified as date with UTC
time value. The value of the "end" attribute MUST be greater than
the value of the "start" attribute.

The server MUST use the same logic as defined for CALDAV:time-
range to determine if the current or original scheduled time of an
"overridden" recurrence instance intersects the specified time
range.

Overridden components that have a RANGE parameter on their
RECURRENCE-ID property may specify one or more instances in the
recurrence set, and some of those instances may fall within the
specified time range or may have originally fallen within the
specified time range prior to being overridden. If that is the
case, the overridden component MUST be included in the results, as
it has a direct impact on the interpretation of instances within
the specified time range.

   Definition:

```
<!ELEMENT limit-recurrence-set EMPTY>

<!ATTLIST limit-recurrence-set start CDATA #REQUIRED
                               end   CDATA #REQUIRED>
start value: an iCalendar "date with UTC time"
end value: an iCalendar "date with UTC time"
```

9.6.7. CALDAV:limit-freebusy-set XML Element

   Name: limit-freebusy-set

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Specifies a time range to limit the set of FREEBUSY values
      returned by the server.

   Description: The CALDAV:limit-freebusy-set XML element specifies
      that for a given calendaring REPORT request, the server MUST only
      return the FREEBUSY property values of a VFREEBUSY component that
      intersects a specified time range.

      The "start" attribute specifies the inclusive start of the time
      range, and the "end" attribute specifies the non-inclusive end of

the time range. Both attributes are specified as "date with UTC
time" value. The value of the "end" attribute MUST be greater
than the value of the "start" attribute.

The server MUST use the same logic as defined for CALDAV:time-
range to determine if a FREEBUSY property value intersects the
specified time range.

Definition:

```
<!ELEMENT limit-freebusy-set EMPTY>

<!ATTLIST limit-freebusy-set start CDATA #REQUIRED
                             end   CDATA #REQUIRED>
start value: an iCalendar "date with UTC time"
end value: an iCalendar "date with UTC time"
```

9.7. CALDAV:filter XML Element

Name: filter

Namespace: urn:ietf:params:xml:ns:caldav

Purpose: Specifies a filter to limit the set of calendar components
   returned by the server.

Description: The CALDAV:filter XML element specifies the search
   filter used to limit the calendar components returned by a
   calendaring REPORT request.

Definition:

```
<!ELEMENT filter (comp-filter)>
```

9.7.1. CALDAV:comp-filter XML Element

Name: comp-filter

Namespace: urn:ietf:params:xml:ns:caldav

Purpose: Specifies search criteria on calendar components.

Description: The CALDAV:comp-filter XML element specifies a query
   targeted at the calendar object (i.e., VCALENDAR) or at a specific
   calendar component type (e.g., VEVENT). The scope of the
   CALDAV:comp-filter XML element is the calendar object when used as
   a child of the CALDAV:filter XML element. The scope of the
   CALDAV:comp-filter XML element is the enclosing calendar component

when used as a child of another CALDAV:comp-filter XML element. A
CALDAV:comp-filter is said to match if:

* The CALDAV:comp-filter XML element is empty and the calendar
   object or calendar component type specified by the "name"
   attribute exists in the current scope;

   or:

* The CALDAV:comp-filter XML element contains a CALDAV:is-not-
   defined XML element and the calendar object or calendar
   component type specified by the "name" attribute does not exist
   in the current scope;

   or:

* The CALDAV:comp-filter XML element contains a CALDAV:time-range
   XML element and at least one recurrence instance in the
   targeted calendar component is scheduled to overlap the
   specified time range, and all specified CALDAV:prop-filter and
   CALDAV:comp-filter child XML elements also match the targeted
   calendar component;

   or:

* The CALDAV:comp-filter XML element only contains CALDAV:prop-
   filter and CALDAV:comp-filter child XML elements that all match
   the targeted calendar component.

Definition:

    <!ELEMENT comp-filter (is-not-defined | (time-range?,
                        prop-filter*, comp-filter*))>

    <!ATTLIST comp-filter name CDATA #REQUIRED>
    name value: a calendar object or calendar component
                type (e.g., VEVENT)

9.7.2. CALDAV:prop-filter XML Element

   Name: prop-filter

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Specifies search criteria on calendar properties.

   Description: The CALDAV:prop-filter XML element specifies a query
      targeted at a specific calendar property (e.g., CATEGORIES) in the

scope of the enclosing calendar component. A calendar property is
said to match a CALDAV:prop-filter if:

*   The CALDAV:prop-filter XML element is empty and a property of
    the type specified by the "name" attribute exists in the
    enclosing calendar component;

or:

*   The CALDAV:prop-filter XML element contains a CALDAV:is-not-
    defined XML element and no property of the type specified by
    the "name" attribute exists in the enclosing calendar
    component;

or:

*   The CALDAV:prop-filter XML element contains a CALDAV:time-range
    XML element and the property value overlaps the specified time
    range, and all specified CALDAV:param-filter child XML elements
    also match the targeted property;

or:

*   The CALDAV:prop-filter XML element contains a CALDAV:text-match
    XML element and the property value matches it, and all
    specified CALDAV:param-filter child XML elements also match the
    targeted property;

Definition:

```
<!ELEMENT prop-filter (is-not-defined |
                      ((time-range | text-match)?,
                       param-filter*))>

<!ATTLIST prop-filter name CDATA #REQUIRED>
name value: a calendar property name (e.g., ATTENDEE)
```

9.7.3. CALDAV:param-filter XML Element

Name: param-filter

Namespace: urn:ietf:params:xml:ns:caldav

Purpose: Limits the search to specific parameter values.

Description: The CALDAV:param-filter XML element specifies a query
   targeted at a specific calendar property parameter (e.g.,
   PARTSTAT) in the scope of the calendar property on which it is

defined. A calendar property parameter is said to match a CALDAV:
param-filter if:

* The CALDAV:param-filter XML element is empty and a parameter of
  the type specified by the "name" attribute exists on the
  calendar property being examined;

or:

* The CALDAV:param-filter XML element contains a CALDAV:is-not-
  defined XML element and no parameter of the type specified by
  the "name" attribute exists on the calendar property being
  examined;

Definition:

        <!ELEMENT param-filter (is-not-defined | text-match?)>

        <!ATTLIST param-filter name CDATA #REQUIRED>
        name value: a property parameter name (e.g., PARTSTAT)

9.7.4. CALDAV:is-not-defined XML Element

Name: is-not-defined

Namespace: urn:ietf:params:xml:ns:caldav

Purpose: Specifies that a match should occur if the enclosing
   component, property, or parameter does not exist.

Description: The CALDAV:is-not-defined XML element specifies that a
   match occurs if the enclosing component, property, or parameter
   value specified in a calendaring REPORT request does not exist in
   the calendar data being tested.

Definition:

        <!ELEMENT is-not-defined EMPTY>

9.7.5. CALDAV:text-match XML Element

Name: text-match

Namespace: urn:ietf:params:xml:ns:caldav

Purpose: Specifies a substring match on a property or parameter
   value.

   Description: The CALDAV:text-match XML element specifies text used
      for a substring match against the property or parameter value
      specified in a calendaring REPORT request.

      The "collation" attribute is used to select the collation that the
      server MUST use for character string matching. In the absence of
      this attribute, the server MUST use the "i;ascii-casemap"
      collation.

      The "negate-condition" attribute is used to indicate that this
      test returns a match if the text matches when the attribute value
      is set to "no", or return a match if the text does not match, if
      the attribute value is set to "yes". For example, this can be
      used to match components with a STATUS property not set to
      CANCELLED.

   Definition:

        <!ELEMENT text-match (#PCDATA)>
        PCDATA value: string

        <!ATTLIST text-match collation   CDATA "i;ascii-casemap"
                             negate-condition (yes | no) "no">

9.8. CALDAV:timezone XML Element

   Name: timezone

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Specifies the time zone component to use when determining
      the results of a report.

   Description: The CALDAV:timezone XML element specifies that for a
      given calendaring REPORT request, the server MUST rely on the
      specified VTIMEZONE component instead of the CALDAV:calendar-
      timezone property of the calendar collection, in which the
      calendar object resource is contained to resolve "date" values and
      "date with local time" values (i.e., floating time) to "date with
      UTC time" values. The server will require this information to
      determine if a calendar component scheduled with "date" values or
      "date with local time" values intersects a CALDAV:time-range
      specified in a CALDAV:calendar-query REPORT.

   Note: The iCalendar data embedded within the CALDAV:timezone XML
      element MUST follow the standard XML character data encoding
      rules, including use of <, >, & etc. entity encoding or
      the use of a <![CDATA[...]]> construct. In the later case, the

        iCalendar data cannot contain the character sequence "]]>", which
        is the end delimiter for the CDATA section.

   Definition:

        <!ELEMENT timezone (#PCDATA)>
        PCDATA value: an iCalendar object with exactly one VTIMEZONE

9.9. CALDAV:time-range XML Element

   Name: time-range

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: Specifies a time range to limit the set of calendar
      components returned by the server.

   Description: The CALDAV:time-range XML element specifies that for a
      given calendaring REPORT request, the server MUST only return the
      calendar object resources that, depending on the context, have a
      component or property whose value intersects a specified time
      range.

      The "start" attribute specifies the inclusive start of the time
      range, and the "end" attribute specifies the non-inclusive end of
      the time range. Both attributes MUST be specified as "date with
      UTC time" value. Time ranges open at one end can be specified by
      including only one attribute; however, at least one attribute MUST
      always be present in the CALDAV:time-range element. If either the
      "start" or "end" attribute is not specified in the CALDAV:time-
      range XML element, assume "-infinity" and "+infinity" as their
      value, respectively. If both "start" and "end" are present, the
      value of the "end" attribute MUST be greater than the value of the
      "start" attribute.

      Time range tests MUST consider every recurrence instance when
      testing the time range condition; if any one instance matches,
      then the test returns true. Testing recurrence instances requires
      the server to infer an effective value for DTSTART, DTEND,
      DURATION, and DUE properties for an instance based on the
      recurrence patterns and any overrides.

      A VEVENT component overlaps a given time range if the condition
      for the corresponding component state specified in the table below
      is satisfied. Note that, as specified in [RFC2445], the DTSTART
      property is REQUIRED in the VEVENT component. The conditions
      depend on the presence of the DTEND and DURATION properties in the
      VEVENT component. Furthermore, the value of the DTEND property

MUST be later in time than the value of the DTSTART property. The
duration of a VEVENT component with no DTEND and DURATION
properties is 1 day (+P1D) when the DTSTART is a DATE value, and 0
seconds when the DTSTART is a DATE-TIME value.

```
+------------------------------------------------------------------+
| VEVENT has the DTEND property?                                   |
|    +-------------------------------------------------------------+
|    | VEVENT has the DURATION property?                           |
|    |    +--------------------------------------------------------+
|    |    | DURATION property value is greater than 0 seconds?     |
|    |    |    +---------------------------------------------------+
|    |    |    | DTSTART property is a DATE-TIME value?            |
|    |    |    |    +----------------------------------------------+
|    |    |    |    | Condition to evaluate                        |
+---+---+---+---+----------------------------------------------------+
| Y | N | N | * | (start <  DTEND AND end > DTSTART)                 |
+---+---+---+---+----------------------------------------------------+
| N | Y | Y | * | (start <  DTSTART+DURATION AND end > DTSTART)      |
|   |   +---+---+----------------------------------------------------+
|   |   | N | * | (start <= DTSTART AND end > DTSTART)               |
+---+---+---+---+----------------------------------------------------+
| N | N | N | Y | (start <= DTSTART AND end > DTSTART)               |
+---+---+---+---+----------------------------------------------------+
| N | N | N | N | (start <  DTSTART+P1D AND end > DTSTART)           |
+---+---+---+---+----------------------------------------------------+
```

A VTODO component is said to overlap a given time range if the
condition for the corresponding component state specified in the
table below is satisfied. The conditions depend on the presence
of the DTSTART, DURATION, DUE, COMPLETED, and CREATED properties
in the VTODO component. Note that, as specified in [RFC2445], the
DUE value MUST be a DATE-TIME value equal to or after the DTSTART
value if specified.

```
+----------------------------------------------------------------+
| VTODO has the DTSTART property?                                 |
|   +------------------------------------------------------------+
|   |    VTODO has the DURATION property?                        |
|   |   +--------------------------------------------------------+
|   |   | VTODO has the DUE property?                            |
|   |   |   +----------------------------------------------------+
|   |   |   | VTODO has the COMPLETED property?                  |
|   |   |   |   +------------------------------------------------+
|   |   |   |   | VTODO has the CREATED property?               |
|   |   |   |   |   +--------------------------------------------+
|   |   |   |   |   | Condition to evaluate                     |
+---+---+---+---+---+--------------------------------------------+
| Y | Y | N | * | * | (start  <= DTSTART+DURATION)  AND          |
|   |   |   |   |   | ((end   >  DTSTART)  OR                    |
|   |   |   |   |   |  (end   >= DTSTART+DURATION))              |
+---+---+---+---+---+--------------------------------------------+
| Y | N | Y | * | * | ((start <  DUE)       OR  (start <= DTSTART)) |
|   |   |   |   |   | AND                                       |
|   |   |   |   |   | ((end   >  DTSTART) OR  (end   >= DUE))   |
+---+---+---+---+---+--------------------------------------------+
| Y | N | N | * | * | (start  <= DTSTART)  AND (end >  DTSTART)  |
+---+---+---+---+---+--------------------------------------------+
| N | N | Y | * | * | (start  <  DUE)       AND (end >= DUE)     |
+---+---+---+---+---+--------------------------------------------+
| N | N | N | Y | Y | ((start <= CREATED)  OR  (start <= COMPLETED))|
|   |   |   |   |   | AND                                       |
|   |   |   |   |   | ((end   >= CREATED)  OR  (end   >= COMPLETED))|
+---+---+---+---+---+--------------------------------------------+
| N | N | N | Y | N | (start  <= COMPLETED) AND (end  >= COMPLETED) |
+---+---+---+---+---+--------------------------------------------+
| N | N | N | N | Y | (end    >  CREATED)                        |
+---+---+---+---+---+--------------------------------------------+
| N | N | N | N | N | TRUE                                       |
+---+---+---+---+---+--------------------------------------------+
```

   A VJOURNAL component overlaps a given time range if the condition
   for the corresponding component state specified in the table below
   is satisfied. The conditions depend on the presence of the
   DTSTART property in the VJOURNAL component and on whether the
   DTSTART is a DATE-TIME or DATE value. The effective "duration" of
   a VJOURNAL component is 1 day (+P1D) when the DTSTART is a DATE
   value, and 0 seconds when the DTSTART is a DATE-TIME value.

```
+--------------------------------------------------+
| VJOURNAL has the DTSTART property?               |
|    +---------------------------------------------+
|    | DTSTART property is a DATE-TIME value?      |
|    |    +----------------------------------------+
|    |    | Condition to evaluate                 |
+---+---+------------------------------------------+
| Y | Y | (start <= DTSTART)    AND (end > DTSTART) |
+---+---+------------------------------------------+
| Y | N | (start <  DTSTART+P1D) AND (end > DTSTART) |
+---+---+------------------------------------------+
| N | * | FALSE                                    |
+---+---+------------------------------------------+
```

A VFREEBUSY component overlaps a given time range if the condition
for the corresponding component state specified in the table below
is satisfied. The conditions depend on the presence in the
VFREEBUSY component of the DTSTART and DTEND properties, and any
FREEBUSY properties in the absence of DTSTART and DTEND. Any
DURATION property is ignored, as it has a special meaning when
used in a VFREEBUSY component.

When only FREEBUSY properties are used, each period in each
FREEBUSY property is compared against the time range, irrespective
of the type of free busy information (free, busy, busy-tentative,
busy-unavailable) represented by the property.

```
+----------------------------------------------------+
| VFREEBUSY has both the DTSTART and DTEND properties? |
|    +-----------------------------------------------+
|    | VFREEBUSY has the FREEBUSY property?          |
|    |    +------------------------------------------+
|    |    | Condition to evaluate                   |
+---+---+--------------------------------------------+
| Y | * | (start <= DTEND) AND (end > DTSTART)       |
+---+---+--------------------------------------------+
| N | Y | (start <  freebusy-period-end) AND         |
|   |   | (end   >  freebusy-period-start)           |
+---+---+--------------------------------------------+
| N | N | FALSE                                      |
+---+---+--------------------------------------------+
```

A VALARM component is said to overlap a given time range if the
following condition holds:

    (start <= trigger-time) AND (end > trigger-time)

A VALARM component can be defined such that it triggers repeatedly. Such a VALARM component is said to overlap a given time range if at least one of its triggers overlaps the time range.

The calendar properties COMPLETED, CREATED, DTEND, DTSTAMP, DTSTART, DUE, and LAST-MODIFIED overlap a given time range if the following condition holds:

        (start <= date-time) AND (end > date-time)

Note that if DTEND is not present in a VEVENT, but DURATION is, then the test should instead operate on the 'effective' DTEND, i.e., DTSTART+DURATION. Similarly, if DUE is not present in a VTODO, but DTSTART and DURATION are, then the test should instead operate on the 'effective' DUE, i.e., DTSTART+DURATION.

The semantic of CALDAV:time-range is not defined for any other calendar components and properties.

Definition:

        <!ELEMENT time-range EMPTY>

        <!ATTLIST time-range start CDATA #IMPLIED
                             end   CDATA #IMPLIED>
        start value: an iCalendar "date with UTC time"
        end value: an iCalendar "date with UTC time"

9.10. CALDAV:calendar-multiget XML Element

   Name: calendar-multiget

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: CalDAV report used to retrieve specific calendar object
      resources.

   Description: See Section 7.9.

   Definition:

        <!ELEMENT calendar-multiget ((DAV:allprop |
                                      DAV:propname |
                                      DAV:prop)?, DAV:href+)>

9.11. CALDAV:free-busy-query XML Element

   Name: free-busy-query

   Namespace: urn:ietf:params:xml:ns:caldav

   Purpose: CalDAV report used to generate a VFREEBUSY to determine
      busy time over a specific time range.

   Description: See Section 7.10.

   Definition:

        <!ELEMENT free-busy-query (time-range)>

10. Internationalization Considerations

   CalDAV allows internationalized strings to be stored and retrieved
   for the description of calendar collections (see Section 5.2.1).

   The CALDAV:calendar-query REPORT (Section 7.8) includes a text
   searching option controlled by the CALDAV:text-match element, and
   details of character handling are covered in the description of that
   element (see Section 9.7.5).

11. Security Considerations

   HTTP protocol transactions are sent in the clear over the network
   unless protection from snooping is negotiated. This can be
   accomplished by use of TLS, as defined in [RFC2818]. In particular,
   HTTP Basic authentication MUST NOT be used unless TLS is in effect.

   Servers MUST take adequate precautions to ensure that malicious
   clients cannot consume excessive server resources (CPU, memory, disk,
   etc.) through carefully crafted reports. For example, a client could
   upload an event with a recurrence rule that specifies a recurring
   event occurring every second for the next 100 years, which would
   result in approximately 3 x 10^9 instances! A report that asks for
   recurrences to be expanded over that range would likely constitute a
   denial-of-service attack on the server.

   When creating new resources (including calendar collections), clients
   MUST ensure that the resource name (the last path segment of the
   resource URI) assigned to the new resource does not expose any data
   from within the iCalendar resource itself or information about the
   nature of a calendar collection. This is required to ensure that the
   presence of a specific iCalendar component or nature of components in
   a collection cannot be inferred based on the name of a resource.

When rolling up free-busy information, more information about a
user's events is exposed if busy periods overlap or are adjacent
(this tells the client requesting the free-busy information that the
calendar owner has at least two events, rather than knowing only that
the calendar owner has one or more events during the busy period).
Thus, a conservative approach to calendar data privacy would have
servers always coalesce such busy periods when they are the same
type.

Procedure alarms are a known security risk for either clients or
servers to handle, particularly when the alarm was created by another
agent. Clients and servers are not required to execute such
procedure alarms.

Security considerations described in iCalendar [RFC2445] and iTIP
[RFC2446] are also applicable to CalDAV.

Beyond these, CalDAV does not raise any security considerations that
are not present in HTTP [RFC2616] and WebDAV [RFC2518], [RFC3253],
[RFC3744].

12. IANA Considerations

This document uses one new URN to identify a new XML namespace. The
URN conforms to a registry mechanism described in [RFC3688].

12.1. Namespace Registration

Registration request for the CalDAV namespace:

URI: urn:ietf:params:xml:ns:caldav

Registrant Contact: See the "Authors' Addresses" section of this
document.

XML: None. Namespace URIs do not represent an XML specification.

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14. References

14.1. Normative References

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Appendix A. CalDAV Method Privilege Table (Normative)

   The following table extends the WebDAV Method Privilege Table
   specified in Appendix B of [RFC3744].

```
+------------+--------------------------------------------------------+
| METHOD     | PRIVILEGES                                             |
+------------+--------------------------------------------------------+
| MKCALENDAR | DAV:bind                                               |
| REPORT     | DAV:read or CALDAV:read-free-busy (on all referenced  |
|            | resources)                                             |
+------------+--------------------------------------------------------+
```

Appendix B. Calendar Collections Used in the Examples

   This appendix shows the calendar object resources contained in the
   calendar collection queried in the examples throughout this document.

   The content of the calendar collection is being shown as if it were
   returned by a CALDAV:calendar-query REPORT request designed to return
   all the calendar data in the collection:

   >> Request <<

   REPORT /bernard/work/ HTTP/1.1
   Host: cal.example.com
   Depth: 1
   Content-Type: application/xml; charset="utf-8"
   Content-Length: xxxx

   <?xml version="1.0" encoding="utf-8" ?>
   <C:calendar-query xmlns:D="DAV:"
                 xmlns:C="urn:ietf:params:xml:ns:caldav">
    <D:prop>
      <D:getetag/>
      <C:calendar-data/>
    </D:prop>
    <C:filter>
      <C:comp-filter name="VCALENDAR"/>
    </C:filter>
   </C:calendar-query>

   >> Response <<

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

```
   <?xml version="1.0" encoding="utf-8" ?>
   <D:multistatus xmlns:D="DAV:"
                  xmlns:C="urn:ietf:params:xml:ns:caldav">

     <D:response>
       <D:href>http://cal.example.com/bernard/work/abcd1.ics</D:href>
       <D:propstat>
         <D:prop>
           <D:getetag>"fffff-abcd1"</D:getetag>
           <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VTIMEZONE
LAST-MODIFIED:20040110T032845Z
TZID:US/Eastern
BEGIN:DAYLIGHT
DTSTART:20000404T020000
RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
TZNAME:EDT
TZOFFSETFROM:-0500
TZOFFSETTO:-0400
END:DAYLIGHT
BEGIN:STANDARD
DTSTART:20001026T020000
RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
TZNAME:EST
TZOFFSETFROM:-0400
TZOFFSETTO:-0500
END:STANDARD
END:VTIMEZONE
BEGIN:VEVENT
DTSTAMP:20060206T001102Z
DTSTART;TZID=US/Eastern:20060102T100000
DURATION:PT1H
SUMMARY:Event #1
Description:Go Steelers!
UID:74855313FA803DA593CD579A@example.com
END:VEVENT
END:VCALENDAR
</C:calendar-data>
         </D:prop>
         <D:status>HTTP/1.1 200 OK</D:status>
       </D:propstat>
     </D:response>

     <D:response>
       <D:href>http://cal.example.com/bernard/work/abcd2.ics</D:href>
       <D:propstat>
```

```
        <D:prop>
          <D:getetag>"fffff-abcd2"</D:getetag>
          <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VTIMEZONE
LAST-MODIFIED:20040110T032845Z
TZID:US/Eastern
BEGIN:DAYLIGHT
DTSTART:20000404T020000
RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
TZNAME:EDT
TZOFFSETFROM:-0500
TZOFFSETTO:-0400
END:DAYLIGHT
BEGIN:STANDARD
DTSTART:20001026T020000
RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
TZNAME:EST
TZOFFSETFROM:-0400
TZOFFSETTO:-0500
END:STANDARD
END:VTIMEZONE
BEGIN:VEVENT
DTSTAMP:20060206T001121Z
DTSTART;TZID=US/Eastern:20060102T120000
DURATION:PT1H
RRULE:FREQ=DAILY;COUNT=5
SUMMARY:Event #2
UID:00959BC664CA650E933C892C@example.com
END:VEVENT
BEGIN:VEVENT
DTSTAMP:20060206T001121Z
DTSTART;TZID=US/Eastern:20060104T140000
DURATION:PT1H
RECURRENCE-ID;TZID=US/Eastern:20060104T120000
SUMMARY:Event #2 bis
UID:00959BC664CA650E933C892C@example.com
END:VEVENT
END:VCALENDAR
</C:calendar-data>
        </D:prop>
        <D:status>HTTP/1.1 200 OK</D:status>
      </D:propstat>
    </D:response>

    <D:response>
      <D:href>http://cal.example.com/bernard/work/abcd3.ics</D:href>
```

```
         <D:propstat>
           <D:prop>
             <D:getetag>"fffff-abcd3"</D:getetag>
             <C:calendar-data>BEGIN:VCALENDAR
   VERSION:2.0
   PRODID:-//Example Corp.//CalDAV Client//EN
   BEGIN:VTIMEZONE
   LAST-MODIFIED:20040110T032845Z
   TZID:US/Eastern
   BEGIN:DAYLIGHT
   DTSTART:20000404T020000
   RRULE:FREQ=YEARLY;BYDAY=1SU;BYMONTH=4
   TZNAME:EDT
   TZOFFSETFROM:-0500
   TZOFFSETTO:-0400
   END:DAYLIGHT
   BEGIN:STANDARD
   DTSTART:20001026T020000
   RRULE:FREQ=YEARLY;BYDAY=-1SU;BYMONTH=10
   TZNAME:EST
   TZOFFSETFROM:-0400
   TZOFFSETTO:-0500
   END:STANDARD
   END:VTIMEZONE
   BEGIN:VEVENT
   ATTENDEE;PARTSTAT=ACCEPTED;ROLE=CHAIR:mailto:cyrus@example.com
   ATTENDEE;PARTSTAT=NEEDS-ACTION:mailto:lisa@example.com
   DTSTAMP:20060206T001220Z
   DTSTART;TZID=US/Eastern:20060104T100000
   DURATION:PT1H
   LAST-MODIFIED:20060206T001330Z
   ORGANIZER:mailto:cyrus@example.com
   SEQUENCE:1
   STATUS:TENTATIVE
   SUMMARY:Event #3
   UID:DC6C50A017428C5216A2F1CD@example.com
   END:VEVENT
   END:VCALENDAR
   </C:calendar-data>
           </D:prop>
           <D:status>HTTP/1.1 200 OK</D:status>
         </D:propstat>
       </D:response>

       <D:response>
         <D:href>http://cal.example.com/bernard/work/abcd4.ics</D:href>
         <D:propstat>
           <D:prop>
```

```
            <D:getetag>"fffff-abcd4"</D:getetag>
            <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VTODO
DTSTAMP:20060205T235335Z
DUE;VALUE=DATE:20060104
STATUS:NEEDS-ACTION
SUMMARY:Task #1
UID:DDDEEB7915FA61233B861457@example.com
BEGIN:VALARM
ACTION:AUDIO
TRIGGER;RELATED=START:-PT10M
END:VALARM
END:VTODO
END:VCALENDAR
</C:calendar-data>
          </D:prop>
          <D:status>HTTP/1.1 200 OK</D:status>
        </D:propstat>
      </D:response>

      <D:response>
        <D:href>http://cal.example.com/bernard/work/abcd5.ics</D:href>
        <D:propstat>
          <D:prop>
            <D:getetag>"fffff-abcd5"</D:getetag>
            <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VTODO
DTSTAMP:20060205T235300Z
DUE;VALUE=DATE:20060106
LAST-MODIFIED:20060205T235308Z
SEQUENCE:1
STATUS:NEEDS-ACTION
SUMMARY:Task #2
UID:E10BA47467C5C69BB74E8720@example.com
BEGIN:VALARM
ACTION:AUDIO
TRIGGER;RELATED=START:-PT10M
END:VALARM
END:VTODO
END:VCALENDAR
</C:calendar-data>
          </D:prop>
          <D:status>HTTP/1.1 200 OK</D:status>
        </D:propstat>
```

```
        </D:response>

        <D:response>
          <D:href>http://cal.example.com/bernard/work/abcd6.ics</D:href>
          <D:propstat>
            <D:prop>
              <D:getetag>"fffff-abcd6"</D:getetag>
              <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VTODO
COMPLETED:20051223T122322Z
DTSTAMP:20060205T235400Z
DUE;VALUE=DATE:20051225
LAST-MODIFIED:20060205T235308Z
SEQUENCE:1
STATUS:COMPLETED
SUMMARY:Task #3
UID:E10BA47467C5C69BB74E8722@example.com
END:VTODO
END:VCALENDAR
</C:calendar-data>
            </D:prop>
            <D:status>HTTP/1.1 200 OK</D:status>
          </D:propstat>
        </D:response>

        <D:response>
          <D:href>http://cal.example.com/bernard/work/abcd7.ics</D:href>
          <D:propstat>
            <D:prop>
              <D:getetag>"fffff-abcd7"</D:getetag>
              <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VTODO
DTSTAMP:20060205T235600Z
DUE;VALUE=DATE:20060101
LAST-MODIFIED:20060205T235308Z
SEQUENCE:1
STATUS:CANCELLED
SUMMARY:Task #4
UID:E10BA47467C5C69BB74E8725@example.com
END:VTODO
END:VCALENDAR
</C:calendar-data>
            </D:prop>
            <D:status>HTTP/1.1 200 OK</D:status>
```

```
        </D:propstat>
      </D:response>

      <D:response>
        <D:href>http://cal.example.com/bernard/work/abcd8.ics</D:href>
        <D:propstat>
          <D:prop>
            <D:getetag>"fffff-abcd8"</D:getetag>
            <C:calendar-data>BEGIN:VCALENDAR
VERSION:2.0
PRODID:-//Example Corp.//CalDAV Client//EN
BEGIN:VFREEBUSY
ORGANIZER;CN="Bernard Desruisseaux":mailto:bernard@example.com
UID:76ef34-54a3d2@example.com
DTSTAMP:20050530T123421Z
DTSTART:20060101T000000Z
DTEND:20060108T000000Z
FREEBUSY:20050531T230000Z/20050601T010000Z
FREEBUSY;FBTYPE=BUSY-TENTATIVE:20060102T100000Z/20060102T120000Z
FREEBUSY:20060103T100000Z/20060103T120000Z
FREEBUSY:20060104T100000Z/20060104T120000Z
FREEBUSY;FBTYPE=BUSY-UNAVAILABLE:20060105T100000Z/20060105T120000Z
FREEBUSY:20060106T100000Z/20060106T120000Z
END:VFREEBUSY
END:VCALENDAR
</C:calendar-data>
          </D:prop>
          <D:status>HTTP/1.1 200 OK</D:status>
        </D:propstat>
      </D:response>

    </D:multistatus>
```

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