          Locating Services for Calendaring Extensions to
       WebDAV (CalDAV) and vCard Extensions to WebDAV (CardDAV)

Abstract

   This specification describes how DNS SRV records, DNS TXT records,
   and well-known URIs can be used together or separately to locate
   CalDAV (Calendaring Extensions to Web Distributed Authoring and
   Versioning (WebDAV)) or CardDAV (vCard Extensions to WebDAV)
   services.

Status of This Memo

   This is an Internet Standards Track document.

   This document is a product of the Internet Engineering Task Force
   (IETF). It represents the consensus of the IETF community. It has
   received public review and has been approved for publication by the
   Internet Engineering Steering Group (IESG). Further information on
   Internet Standards is available in Section 2 of RFC 5741.

   Information about the current status of this document, any errata,
   and how to provide feedback on it may be obtained at
   http://www.rfc-editor.org/info/rfc6764.

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1. Introduction

   [RFC4791] defines the CalDAV calendar access protocol, based on HTTP
   [RFC2616], for accessing calendar data stored on a server. CalDAV
   clients need to be able to discover appropriate CalDAV servers within
   their local area network and at other domains, e.g., to minimize the
   need for end users to know specific details such as the fully
   qualified domain name (FQDN) and port number for their servers.

   [RFC6352] defines the CardDAV address book access protocol based on
   HTTP [RFC2616], for accessing contact data stored on a server. As
   with CalDAV, clients also need to be able to discover CardDAV
   servers.

   [RFC2782] defines a DNS-based service discovery protocol that has
   been widely adopted as a means of locating particular services within
   a local area network and beyond, using DNS SRV Resource Records
   (RRs). This has been enhanced to provide additional service meta-
   data by use of DNS TXT RRs as per [RFC6763].

This specification defines new SRV service types for the CalDAV
protocol and gives an example of how clients can use this together
with other protocol features to enable simple client configuration.
SRV service types for CardDAV are already defined in Section 11 of
[RFC6352].

Another issue with CalDAV or CardDAV service discovery is that the
service might not be located at the "root" URI of the HTTP server
hosting it. Thus, a client needs to be able to determine the
complete path component of the Request-URI to use in HTTP requests:
the "context path". For example, if CalDAV is implemented as a
"servlet" in a web server "container", the servlet "context path"
might be "/caldav/". So the URI for the CalDAV service would be,
e.g., "http://caldav.example.com/caldav/" rather than
"http://caldav.example.com/". SRV RRs by themselves only provide an
FQDN and port number for the service, not a path. Since the client
"bootstrapping" process requires initial access to the "context path"
of the service, there needs to be a simple way for clients to also
discover what that path is.

This specification makes use of the "well-known URI" feature
[RFC5785] of HTTP servers to provide a well-known URI for CalDAV or
CardDAV services that clients can use. The well-known URI will point
to a resource on the server that is simply a "stub" resource that
provides a redirect to the actual "context path" resource
representing the service endpoint.

2. Conventions Used in This Document

   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].

3. CalDAV SRV Service Labels

   This specification adds two SRV service labels for use with CalDAV:

   _caldav: Identifies a CalDAV server that uses HTTP without
      Transport Layer Security (TLS) [RFC2818].

   _caldavs: Identifies a CalDAV server that uses HTTP with TLS
      [RFC2818].

   Clients MUST honor Priority and Weight values in the SRV RRs, as
   described by [RFC2782].

   Example: service record for server without TLS

      _caldav._tcp   SRV 0 1 80 calendar.example.com.

   Example: service record for server with TLS

      _caldavs._tcp   SRV 0 1 443 calendar.example.com.

4. CalDAV and CardDAV Service TXT Records

   When SRV RRs are used to advertise CalDAV and CardDAV services, it is
   also convenient to be able to specify a "context path" in the DNS to
   be retrieved at the same time. To enable that, this specification
   uses a TXT RR that follows the syntax defined in Section 6 of
   [RFC6763] and defines a "path" key for use in that record. The value
   of the key MUST be the actual "context path" to the corresponding
   service on the server.

   A site might provide TXT records in addition to SRV records for each
   service. When present, clients MUST use the "path" value as the
   "context path" for the service in HTTP requests. When not present,
   clients use the ".well-known" URI approach described next.

   Example: text record for service with TLS

      _caldavs._tcp   TXT path=/caldav

5. CalDAV and CardDAV Service Well-Known URI

   Two ".well-known" URIs are registered by this specification for
   CalDAV and CardDAV services, "caldav" and "carddav" respectively (see
   Section 9). These URIs point to a resource that the client can use
   as the initial "context path" for the service they are trying to
   connect to. The server MUST redirect HTTP requests for that resource
   to the actual "context path" using one of the available mechanisms
   provided by HTTP (e.g., using a 301, 303, or 307 response). Clients
   MUST handle HTTP redirects on the ".well-known" URI. Servers MUST
   NOT locate the actual CalDAV or CardDAV service endpoint at the
   ".well-known" URI as per Section 1.1 of [RFC5785].

   Servers SHOULD set an appropriate Cache-Control header value (as per
   Section 14.9 of [RFC2616]) in the redirect response to ensure caching
   occurs or does not occur as needed or as required by the type of
   response generated. For example, if it is anticipated that the

location of the redirect might change over time, then a "no-cache"
value would be used.

To facilitate "context paths" that might differ from user to user,
the server MAY require authentication when a client tries to access
the ".well-known" URI (i.e., the server would return a 401 status
response to the unauthenticated request from the client, then return
the redirect response only after a successful authentication by the
client).

5.1. Example: Well-Known URI Redirects to Actual "Context Path"

A CalDAV server has a "context path" that is "/servlet/caldav". The
client will use "/.well-known/caldav" as the path for its
"bootstrapping" process after it has first found the FQDN and port
number via an SRV lookup or via manual entry of information by the
user, from which the client can parse suitable information. When the
client makes an HTTP request against "/.well-known/caldav", the
server would issue an HTTP redirect response with a Location response
header using the path "/servlet/caldav". The client would then
"follow" this redirect to the new resource and continue making HTTP
requests there to complete its "bootstrapping" process.

6. Client "Bootstrapping" Procedures

This section describes a procedure that CalDAV or CardDAV clients
SHOULD use to do their initial configuration based on minimal user
input. The goal is to determine an http: or https: URI that
describes the full path to the user's principal-URL [RFC3744].

1. Processing user input:

    * For a CalDAV server:

       + Minimal input from a user would consist of a calendar user
          address and a password. A calendar user address is defined
          by iCalendar [RFC5545] to be a URI [RFC3986]. Provided a
          user identifier and a domain name can be extracted from the
          URI, this simple "bootstrapping" configuration can be done.

       + If the calendar user address is a "mailto:" [RFC6068] URI,
          the "mailbox" portion of the URI is examined, and the
          "local-part" and "domain" portions are extracted.

       + If the calendar user address is an "http:" [RFC2616] or
          "https:" [RFC2818] URI, the "userinfo" and "host" portion
          of the URI [RFC3986] is extracted.

* For a CardDAV server:

  + Minimal input from a user would consist of their email
    address [RFC5322] for the domain where the CardDAV service
    is hosted, and a password. The "mailbox" portion of the
    email address is examined, and the "local-part" and
    "domain" portions are extracted.

2. Determination of service FQDN and port number:

  * An SRV lookup for _caldavs._tcp (for CalDAV) or _carddavs._tcp
    (for CardDAV) is done with the extracted "domain" as the
    service domain.

  * If no result is found, the client can try _caldav._tcp (for
    CalDAV) or _carddav._tcp (for CardDAV) provided non-TLS
    connections are appropriate.

  * If an SRV record is returned, the client extracts the target
    FQDN and port number. If multiple SRV records are returned,
    the client MUST use the Priority and Weight fields in the
    record to determine which one to pick (as per [RFC2782]).

  * If an SRV record is not found, the client will need to prompt
    the user to enter the FQDN and port number information
    directly or use some other heuristic, for example, using the
    extracted "domain" as the FQDN and default HTTPS or HTTP port
    numbers. In this situation, clients MUST first attempt an
    HTTP connection with TLS.

3. Determination of initial "context path":

  * When an SRV lookup is done and a valid SRV record returned,
    the client MUST also query for a corresponding TXT record and
    check for the presence of a "path" key in its response. If
    present, the value of the "path" key is used for the initial
    "context path".

  * When an initial "context path" has not been determined from a
    TXT record, the initial "context path" is taken to be
    "/.well-known/caldav" (for CalDAV) or "/.well-known/carddav"
    (for CardDAV).

  * If the initial "context path" derived from a TXT record
    generates HTTP errors when targeted by requests, the client
    SHOULD repeat its "bootstrapping" procedure using the
    appropriate ".well-known" URI instead.

   4. Determination of user identifier:

       * The client will need to make authenticated HTTP requests to
          the service. Typically, a "user identifier" is required for
          some form of user/password authentication. When a user
          identifier is required, clients MUST first use the "mailbox"
          portion of the calendar user address provided by the user in
          the case of a "mailto:" address and, if that results in an
          authentication failure, SHOULD fall back to using the "local-
          part" extracted from the "mailto:" address. For an "http:" or
          "https:" calendar user address, the "userinfo" portion is used
          as the user identifier for authentication. This is in line
          with the guidance outlined in Section 7. If these user
          identifiers result in authentication failure, the client
          SHOULD prompt the user for a valid identifier.

   5. Connecting to the service:

       * Subsequent to configuration, the client will make HTTP
          requests to the service. When using "_caldavs" or "_carddavs"
          services, a TLS negotiation is done immediately upon
          connection. The client MUST do certificate verification using
          the procedure outlined in Section 6 of [RFC6125] in regard to
          verification with an SRV RR as the starting point.

       * The client does a "PROPFIND" [RFC4918] request with the
          request URI set to the initial "context path". The body of
          the request SHOULD include the DAV:current-user-principal
          [RFC5397] property as one of the properties to return. Note
          that clients MUST properly handle HTTP redirect responses for
          the request. The server will use the HTTP authentication
          procedure outlined in [RFC2617] or use some other appropriate
          authentication schemes to authenticate the user.

       * If the server returns a 404 ("Not Found") HTTP status response
          to the request on the initial "context path", clients MAY try
          repeating the request on the "root" URI "/" or prompt the user
          for a suitable path.

       * If the DAV:current-user-principal property is returned on the
          request, the client uses that value for the principal-URL of
          the authenticated user. With that, it can execute a
          "PROPFIND" request on the principal-URL and discover
          additional properties for configuration (e.g., calendar or
          address book "home" collections).

         * If the DAV:current-user-principal property is not returned,
            then the client will need to request the principal-URL path
            from the user in order to continue with configuration.

   Once a successful account discovery step has been done, clients
   SHOULD cache the service details that were successfully used (user
   identity, principal-URL with full scheme/host/port details) and reuse
   those when connecting again at a later time.

   If a subsequent connection attempt fails, or authentication fails
   persistently, clients SHOULD retry the SRV lookup and account
   discovery to "refresh" the cached data.

7. Guidance for Service Providers

   Service providers wanting to offer CalDAV or CardDAV services that
   can be configured by clients using SRV records need to follow certain
   procedures to ensure proper operation.

   o CalDAV or CardDAV servers SHOULD be configured to allow
      authentication with calendar user addresses (just taking the
      "mailbox" portion of any "mailto:" URI) or email addresses
      respectively, or with "user identifiers" extracted from them. In
      the former case, the addresses MUST NOT conflict with other forms
      of a permitted user login name. In the latter case, the extracted
      "user identifiers" need to be unique across the server and MUST
      NOT conflict with any login name on the server.

   o Servers MUST force authentication for "PROPFIND" requests that
      retrieve the DAV:current-user-principal property to ensure that
      the value of the DAV:current-user-principal property returned
      corresponds to the principal-URL of the user making the request.

   o If the service provider uses TLS, the service provider MUST ensure
      a certificate is installed that can be verified by clients using
      the procedure outlined in Section 6 of [RFC6125] in regard to
      verification with an SRV RR as the starting point. In particular,
      certificates SHOULD include SRV-ID and DNS-ID identifiers as
      appropriate, as described in Section 8.

   o Service providers should install the appropriate SRV records for
      the offered services and optionally include TXT records.

8. Security Considerations

   Clients that support TLS as defined by [RFC2818] SHOULD try the
   "_caldavs" or "_carddavs" services first before trying the "_caldav"
   or "_carddav" services respectively. If a user has explicitly
   requested a connection with TLS, the client MUST NOT use any service
   information returned for the "_caldav" or "_carddav" services.
   Clients MUST follow the certificate-verification process specified in
   [RFC6125].

   A malicious attacker with access to the DNS server data, or that is
   able to get spoofed answers cached in a recursive resolver, can
   potentially cause clients to connect to any server chosen by the
   attacker. In the absence of a secure DNS option, clients SHOULD
   check that the target FQDN returned in the SRV record matches the
   original service domain that was queried. If the target FQDN is not
   in the queried domain, clients SHOULD verify with the user that the
   SRV target FQDN is suitable for use before executing any connections
   to the host. Alternatively, if TLS is being used for the service,
   clients MUST use the procedure outlined in Section 6 of [RFC6125] to
   verify the service. When the target FQDN does not match the original
   service domain that was queried, clients MUST check the SRV-ID
   identifier in the server's certificate. If the FQDN does match,
   clients MUST check any SRV-ID identifiers in the server's certificate
   or, if no SRV-ID identifiers are present, MUST check the DNS-ID
   identifiers in the server's certificate.

   Implementations of TLS [RFC5246], used as the basis for TLS
   ([RFC2818]), typically support multiple versions of the protocol as
   well as the older SSL (Secure Sockets Layer) protocol. Because of
   known security vulnerabilities, clients and servers MUST NOT request,
   offer, or use SSL 2.0. See Appendix E.2 of [RFC5246] for further
   details.

9. IANA Considerations

9.1. Well-Known URI Registrations

   This document defines two ".well-known" URIs using the registration
   procedure and template from Section 5.1 of [RFC5785].

9.1.1. caldav Well-Known URI Registration

   URI suffix: caldav

   Change controller: IETF

   Specification document(s): This RFC

   Related information: See also [RFC4791].

9.1.2. carddav Well-Known URI Registration

   URI suffix: carddav

   Change controller: IETF

   Specification document(s): This RFC

   Related information: See also [RFC6352].

9.2. Service Name Registrations

   This document registers four new service names as per [RFC6335]. Two
   are defined in this document, and two are defined in [RFC6352],
   Section 11.

9.2.1. caldav Service Name Registration

   Service Name: caldav

   Transport Protocol(s): TCP

   Assignee: IESG <iesg@ietf.org>

   Contact: IETF Chair <chair@ietf.org>

   Description: Calendaring Extensions to WebDAV (CalDAV) - non-TLS

   Reference: [RFC6764]

   Assignment Note: This is an extension of the http service. Defined
      TXT keys: path=<context path>

9.2.2. caldavs Service Name Registration

   Service Name: caldavs

   Transport Protocol(s): TCP

   Assignee: IESG <iesg@ietf.org>

   Contact: IETF Chair <chair@ietf.org>

   Description: Calendaring Extensions to WebDAV (CalDAV) - over TLS

   Reference: [RFC6764]

   Assignment Note: This is an extension of the https service. Defined
      TXT keys: path=<context path>

9.2.3. carddav Service Name Registration

   Service Name: carddav

   Transport Protocol(s): TCP

   Assignee: IESG <iesg@ietf.org>

   Contact: IETF Chair <chair@ietf.org>

   Description: vCard Extensions to WebDAV (CardDAV) - non-TLS

   Reference: [RFC6352]

   Assignment Note: This is an extension of the http service. Defined
      TXT keys: path=<context path>

9.2.4. carddavs Service Name Registration

   Service Name: carddavs

   Transport Protocol(s): TCP

   Assignee: IESG <iesg@ietf.org>

   Contact: IETF Chair <chair@ietf.org>

   Description: vCard Extensions to WebDAV (CardDAV) - over TLS

   Reference: [RFC6352]

   Assignment Note: This is an extension of the https service. Defined
      TXT keys: path=<context path>

10. Acknowledgments

   This specification was suggested by discussion that took place within
   the Calendaring and Scheduling Consortium's CalDAV Technical
   Committee. The author thanks the following for their contributions:
   Stuart Cheshire, Bernard Desruisseaux, Eran Hammer-Lahav, Helge Hess,
   Arnaud Quillaud, Wilfredo Sanchez, and Joe Touch.

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