

Network Working Group  
Internet-Draft  
Intended status: Standards Track  
Expires: October 15, 2012

M. Douglass  
RPI  
C. Daboo  
Apple  
April 13, 2012

Timezone Service Protocol  
draft-douglass-timezone-service-05

Abstract

This document defines a timezone service protocol that allows reliable, secure and fast delivery of timezone information to client systems such as calendaring and scheduling applications or operating systems.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on October 15, 2012.

Copyright Notice

Copyright (c) 2012 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

## Table of Contents

1.	Introduction . . . . .	5
1.1.	Conventions . . . . .	5
1.2.	Glossary of terms . . . . .	6
2.	Architectural Overview . . . . .	6
3.	Timezone Naming . . . . .	8
3.1.	Timezone Identifiers . . . . .	8
3.2.	Timezone Identifier Aliases . . . . .	8
3.3.	Timezone Localized Names . . . . .	9
3.4.	Timezone Name Searches . . . . .	9
4.	Timezones Service Protocol . . . . .	9
4.1.	General Considerations . . . . .	10
4.1.1.	Timezone Formats . . . . .	10
4.1.2.	Inactive Timezones . . . . .	10
4.1.3.	Conditional Timezone Requests . . . . .	10
4.1.4.	Expanded Timezone Data . . . . .	10
4.1.5.	Server Requirements . . . . .	11
4.1.6.	Extensions . . . . .	11
4.2.	Server Protocol . . . . .	11
4.2.1.	Error Responses . . . . .	12
4.3.	Client Guidelines . . . . .	12
4.3.1.	Discovery . . . . .	12
4.3.1.1.	Timezone Service SRV Service Labels . . . . .	12
4.3.1.2.	Timezone Service TXT records . . . . .	13
4.3.1.3.	Timezone Service Well-Known URI . . . . .	13
4.3.1.3.1.	Example: well-known URI redirects to actual context path . . . . .	14
4.3.2.	Initial Synchronization of All Timezones . . . . .	14
4.3.3.	Subsequent Synchronization of All Timezones . . . . .	14
5.	Operation Parameters . . . . .	14
5.1.	"action" Parameter . . . . .	15
5.2.	"format" Parameter . . . . .	15
5.3.	"changesince" Parameter . . . . .	15
5.4.	"start" Parameter . . . . .	15
5.5.	"end" Parameter . . . . .	16
5.6.	"lang" Parameter . . . . .	16
5.7.	"returnall" Parameter . . . . .	16
5.8.	"tzid" Parameter . . . . .	16
5.9.	"name" Parameter . . . . .	17
6.	Operations . . . . .	17
6.1.	"capabilities" Operation . . . . .	17
6.1.1.	Example: Get Capabilities . . . . .	17
6.2.	"list" Operation . . . . .	20
6.2.1.	Example: List timezone identifiers . . . . .	21
6.3.	"get" Operation . . . . .	21
6.3.1.	Example: Get timezone . . . . .	23
6.4.	"expand" Operation . . . . .	23

6.4.1.	Example: Expanded XML Data Format	24
6.5.	"find" Operation	26
6.5.1.	Example: Find operation	26
7.	XML Definitions	26
7.1.	TZ:capabilities XML element	27
7.2.	TZ:info XML element	27
7.3.	TZ:source XML element	27
7.4.	TZ:primary-source XML element	28
7.5.	TZ:contact XML element	28
7.6.	TZ:operation XML element	28
7.7.	TZ:action XML element	29
7.8.	TZ:description XML element	29
7.9.	TZ:accept-parameter XML element	29
7.10.	TZ:required XML element	30
7.11.	TZ:multi XML element	30
7.12.	TZ:value XML element	30
7.13.	TZ:timezone-list XML element	31
7.14.	TZ:dststamp XML element	31
7.15.	TZ:summary XML element	31
7.16.	TZ:tzid XML element	32
7.17.	TZ:last-modified XML element	32
7.18.	TZ:inactive XML element	32
7.19.	TZ:local-name XML element	33
7.20.	TZ:alias XML element	33
7.21.	TZ:timezones XML element	34
7.22.	TZ:tzdata XML element	34
7.23.	TZ:calscale XML element	34
7.24.	TZ:observance XML element	35
7.25.	TZ:name XML element	35
7.26.	TZ:onset XML element	35
7.27.	TZ:utc-offset-from XML element	36
7.28.	TZ:utc-offset-to XML element	36
7.29.	TZ:error element	37
8.	XML Schema	37
9.	Security Considerations	44
10.	IANA Considerations	45
10.1.	XML namespace	45
10.2.	Service Operations Registration	45
10.2.1.	Service Operations Registration Procedure	45
10.2.2.	Registration Template for Operations	46
10.2.3.	Registration Template for Operation Parameters	46
10.3.	Initial Timezone Service Registries	46
10.3.1.	Operations Registry	46
10.3.2.	Operation Parameters Registry	47
10.4.	timezone Well-Known URI Registration	47
10.5.	Service Name Registrations	47
10.5.1.	timezone Service Name Registration	47
10.5.2.	timezones Service Name Registration	48

11. Acknowledgements . . . . . 48  
12. Normative References . . . . . 48  
Appendix A. Changes for version 05 . . . . . 50  
Appendix B. Changes for version 04 . . . . . 50  
Appendix C. Changes for version 03 . . . . . 50  
Appendix D. Changes for version 02 . . . . . 51  
Authors' Addresses . . . . . 51

## 1. Introduction

Timezone information, in general, combines a Universal Coordinated Time (UTC) offset with daylight saving time (DST) rules. Timezones are typically tied to specific geographic and geopolitical regions. Whilst the UTC offset for particular regions changes infrequently, DST rules can change frequently and sometimes with very little notice (sometimes hours before a change comes into effect).

Calendaring and scheduling systems, such as those that use iCalendar [RFC5545], as well as operating systems, critically rely on timezone information to determine the correct local time. As such they need to be kept up to date with changes to timezone information. To date there has been no fast and easy way to do that. Timezone data is often supplied in the form of a set of data files that have to be "compiled" into a suitable database format for use by the client application or operating system. In the case of operating systems, those changes often only get propagated out to client machines when there is an operating system update and those may not be frequent enough to ensure accurate timezone data is always in place.

This specification defines a timezone service protocol that allows for fast, reliable and accurate delivery of timezone information to client systems. This protocol is based on HTTP [RFC2616] using a REST style API.

This specification does not specify the source of the timezone information. It is assumed that a reliable and accurate source is available. One such source is the Olson database - see [RFC6557] for a proposal to host the data in IANA.

This specification does not address the need for global timezone identifiers for timezone data.

Discussion of this document should take place on the calsify mailing list [calsify@ietf.org](mailto:calsify@ietf.org)

### 1.1. 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].

This document uses XML DTD fragments ([W3C.REC-xml-20081126], Section 3.2) as a purely notational convention.

The namespace "urn:ietf:params:xml:ns:timezone-service" is reserved for the XML elements defined in this specification, its revisions,

and related specifications. XML elements defined by individual implementations MUST NOT use the "urn:ietf:params:xml:ns:timezone-service" namespace, and instead should use a namespace that they control.

When XML element types in the "urn:ietf:params:xml:ns:timezone-service" namespace are referenced in this document outside of the context of an XML fragment, the string "TZ:" will be prefixed to the element types.

## 1.2. Glossary of terms

The following terms with the given meanings are used throughout this document.

**Timezone Server:** A server implementing the Timezone Service Protocol defined by this specification;

**Timezone Identifier:** A globally unique name which identifies timezone information.

## 2. Architectural Overview

The overall process for the delivery of timezone information can be visualized via the diagram shown below.

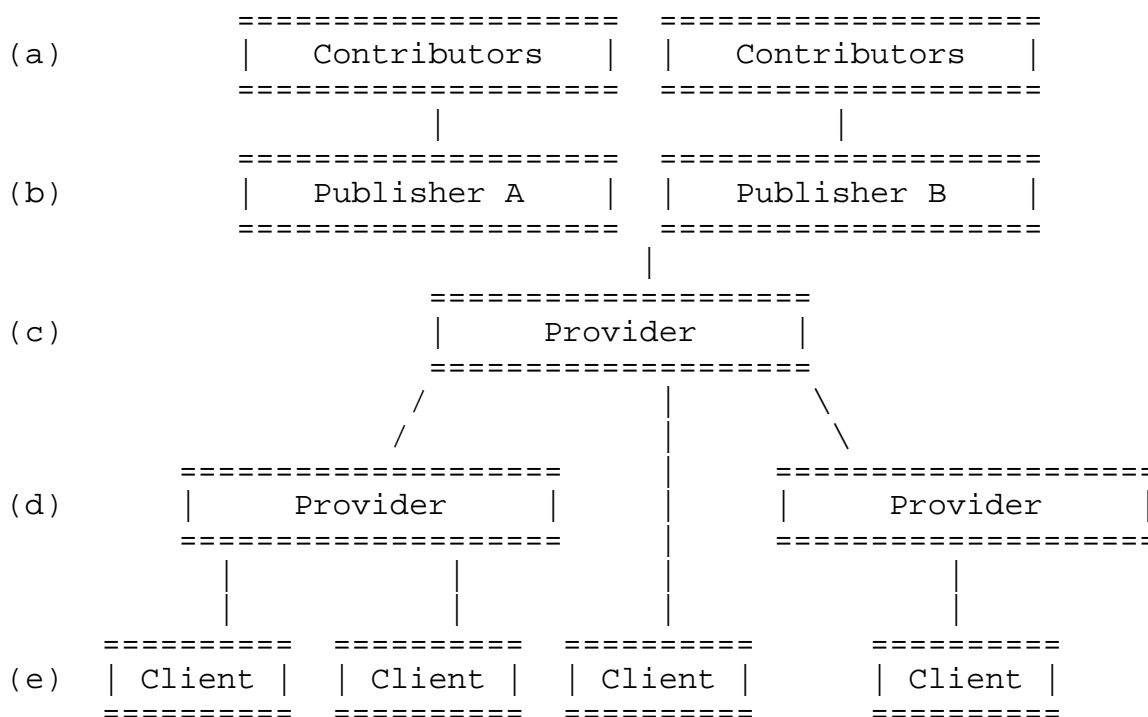


Figure 1: Timezone Service Architecture

The overall service is made up of several layers:

- (a) Contributors: Individuals, governments or organizations which provide information about timezone definitions to the publishing process. There can be many contributors.
- (b) Publishers: Publishers aggregate information from contributors, determine the reliability of the information and, based on that, generate timezone definitions. There can be many publishers, each getting data from many different contributors. In some cases a publisher may choose to "re-publish" data from another publisher.
- (c) Root Providers: Servers which obtain and then provide the timezone data from publishers and make that available to other servers or clients. There can be many root providers. Root providers can choose to supply timezone data from one or more (or all) publishers.
- (d) Local Providers: Servers which handle the bulk of the requests and reduce the load on root servers. These will typically be simple caches of the root server, located closer to clients. For example a large Internet Service Provider (ISP) may choose to setup their own local provider to allow clients within their network to make requests of that server rather than making

requests of servers outside their network. Local servers will cache and periodically refresh data from the root servers.

(e) Clients: Applications, operating systems etc., that make use of timezone data and retrieve that from either root or local providers.

Some of those layers may be coalesced by implementors. For example, a vendor may choose to implement the entire service as a single monolithic virtual server with the address embedded in distributed systems. Others may choose to provide a service consisting of multiple layers of providers, many local servers and a small number of root servers.

This specification is only concerned with the protocol used to exchange data between providers and from provider to client. This specification does not specify how contributors pass their information to publishers, nor how those publishers vet that information to obtain the level of trust required of the final result.

### 3. Timezone Naming

#### 3.1. Timezone Identifiers

Timezone identifiers are the canonical names for identifiers. There MUST be one and only one identifier per specification. iCalendar Section 3.8.3.1 [RFC5545] has this text on the identifier:

This is the label by which a time zone calendar component is referenced by any iCalendar properties whose value type is either DATE-TIME or TIME and not intended to specify a UTC or a "floating" time. The presence of the SOLIDUS character as a prefix, indicates that this "TZID" represents an unique ID in a globally defined time zone registry (when such registry is defined).

This specification does not define what identifiers should be used. While the above specifies that names must start with "/" to be globally unique, it is assumed that a set of timezone identifiers will be considered the default set with an implied "/" preceding the identifier.

#### 3.2. Timezone Identifier Aliases

Timezone identifier aliases map one timezone identifier onto another. Aliases allow the timezone service to map old timezone specifications



onto a new specification.

A timezone alias can be provided in the timezone data and should be mapped on to the target timezone specification. This can be done by the client or by the server.

The client can request that aliases be returned along with summary information when listing timezones provided by the timezone service. Clients can then map received timezone identifiers on to the target perhaps avoiding a fetch of the target specification.

Alternatively, the client can just fetch the timezone specification by supplying the timezone identifier alias. The service will return the target timezone specification with the tzid optionally set to that requested.

Aliases are identifiers and as such are NOT localized names. They are also inexact matches to canonical names and may vary over time. For example US/Eastern is usually mapped on to America/New\_York even though it covers many more local timezones.

### 3.3. Timezone Localized Names

Localized names are names for timezones which can be presented to a user in their own language. Each timezone specification may have one or more localized names associated with it. Each name SHOULD be unique in its locale as it may be used in a list presented to the user.

The timezone service can be requested to return localized names for timezones by the addition of request parameters. Names in multiple languages can be returned in a single request.

### 3.4. Timezone Name Searches

When requesting information from the timezone service identifiers, aliases or names may be used depending on context. This will be more explicitly defined below for each action. In general however, if a "tzid" request parameter is used then the value may be an identifier or an alias. When the "name" parameter is used it may be an identifier, an alias or a localized name.

## 4. Timezones Service Protocol

## 4.1. General Considerations

### 4.1.1. Timezone Formats

The default format for returning timezone definitions is the iCalendar [RFC5545] data format. In addition, the iCalendar-in-XML [RFC6321] representation is also available.

### 4.1.2. Inactive Timezones

Over time zone timezone definitions are replaced by others, but are maintained for historical purposes. Often times clients are only concerned with timezone whose definitions are valid for current and future dates and times. When listing timezones provided by a timezone service, the server will by default only provide the list of "active" timezones. However, clients can use a request parameter to have the server also return details for "inactive" timezones.

### 4.1.3. Conditional Timezone Requests

Timezone information is generally slow moving. However, changes need to be distributed in a timely manner. The list of timezones that change from even year-to-year will typically be relatively small.

When listing timezones, a global timestamp is returned by the server, and that can be used later by clients to determine if any "substantive" change has occurred in the timezone data. Clients can use a conditional list request, supplying a previous global timestamp value, to limit the results to timezones which have changed in a "substantive" manner since that previous global timestamp. This allows clients to cache the last global timestamp and to periodically poll the server for possible changes.

A "substantive" change is one which affects the calculated onsets for a timezone or a change to the region it covers. Changes to properties such as description are not treated as a "substantive" change.

Clients SHOULD NOT poll for such changes too frequently. See Section 9 on expected client and server behavior regarding high request rates.

### 4.1.4. Expanded Timezone Data

Determining timezone offsets at a particular point in time is often a complicated process as the rules for daylight saving time can be complex. To help with this, the timezone service provides an operation that allows clients to request the server to expand a

timezone definition into a set of "observances" over a fixed period of time. Each of these observances describes a local onset time and UTC offsets for the prior time and the observance time. Together, these provide a quick way for "thin" clients to determine an appropriate UTF offset for an arbitrary date without having to do full timezone expansion themselves.

#### 4.1.5. Server Requirements

All servers MUST deliver timezone information for all timezones. This means that any client API implementation can go to a single server to get all timezone information. In turn, any server can refresh any of the data from any other server - though the root servers may provide the most up-to-date copy of the data.

All service providers MUST deliver functionally equivalent data for all timezones. This ensures that all parties in a contract agree on the UTC time. Service providers (or publishers) may choose to map a particular region on to a different timezone identifier to correct a deficiency in the original timezone specification.

With opaque timezone identifiers this remapping may be short lived and the mapping can revert to the original identifier once the deficiency has been addressed by the publisher.

#### 4.1.6. Extensions

This protocol is designed to be extensible through a standards based registration mechanism (see Section 10). It is anticipated, that other useful timezone operations will be added in the future (e.g., mapping a geographical location to timezone identifiers, getting change history for timezones). To that end, servers MUST return a description of their capabilities. This will allow clients to determine if new features have been installed and, if not, fall back on earlier features or disable some client capabilities.

#### 4.2. Server Protocol

The interactions are simple HTTP [RFC2616] requests. Most security considerations are already handled adequately by HTTP. However, given the nature of the data being transferred and the requirement it be correct all interactions between client and server SHOULD use an HTTP connection protected with TLS [RFC5246] as defined in [RFC2818].

The HTTP GET request method is used, with information passed in request parameters. The "action" request parameter specifies which operation is to take place, other request parameters act as arguments to that operation.

#### 4.2.1. Error Responses

The following are examples of response codes one would expect to be used by the server. Note, however, that unless explicitly prohibited any 2/3/4/5xx series response code may be used in a response.

200 (OK) - The command succeeded.

400 (Bad Request) - The Sender has provided an invalid request parameter.

404 (Not Found) - The timezone was not found.

When an error status is set the server SHOULD respond with some descriptive text in an error element Section 7.29

#### 4.3. Client Guidelines

##### 4.3.1. Discovery

Client implementations need to either know where the timezone service is located or discover it through some mechanism. To use a timezone service, a client needs an FQDN, port and HTTP request-URI path.

##### 4.3.1.1. Timezone Service SRV Service Labels

[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 SRV RR records. This can be used to discover a service's FQDN and port.

This specification adds two service types for use with SRV records:

timezone: Identifies a Timezone server that uses HTTP without transport layer security ([RFC2818]).

timezones: Identifies a Timezone server that uses HTTP with transport layer security ([RFC2818]).

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

Example: service record for server without transport layer security

```
_timezone._tcp      SRV 0 1 80 tz.example.com.
```

Example: service record for server with transport layer security

```
_timezones._tcp      SRV 0 1 443 tz.example.com.
```

#### 4.3.1.2. Timezone Service TXT records

When SRV RRs are used to advertise a timezone service, 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 [I-D.cheshire-dnsext-dns-sd] 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 transport layer security

```
_timezones._tcp      TXT path=/timezones
```

#### 4.3.1.3. Timezone Service Well-Known URI

A "well-known" URI [RFC5785] is registered by this specification for the Timezone service, "timezone" (see Section 10). This URI points 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, 307 response). Clients MUST handle HTTP redirects on the ".well-known" URI. Servers MUST NOT locate the actual timezone 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 path's" 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).

#### 4.3.1.3.1. Example: well-known URI redirects to actual context path

A Timezone server has a "context path" that is `"/servlet/timezone"`. The client will use `"/.well-known/timezone"` as the path for the service 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 its initial HTTP request against `"/.well-known/timezone"`, the server would issue an HTTP 301 redirect response with a Location response header using the path `"/servlet/timezone"`. The client would then "follow" this redirect to the new resource and continue making HTTP requests there.

#### 4.3.2. Initial Synchronization of All Timezones

When a secondary service or a client wishing to cache all timezone data first starts or wishes to do a full refresh it synchronizes with another server by first issuing a list operation with `returnall="true"`. The client should preserve the returned datestamp for subsequent use. Each timezone in the returned list can then be fetched and stored locally. In addition a mapping of aliases to timezones can be built.

#### 4.3.3. Subsequent Synchronization of All Timezones

Periodically a secondary service or a client caching all timezone data needs to synchronize with another server. To do so it should issue a list operation with the `changedsince` parameter set to the value of the datestamp returned at the last synchronization. The client should again preserve the returned datestamp for subsequent use. Each timezone in the returned list can then be fetched and stored locally.

Note, this process makes no provision for handling deleted timezones. In general it is bad practice to delete timezones as they may now be in use by consumers of timezone data.

## 5. Operation Parameters

All requests require the "action" request parameter to define what action is required of the server.

Servers MUST support the following request parameters.

### 5.1. "action" Parameter

Name: action

Description: Specify the action to be carried out.

Value: Any IANA registered operation name.

### 5.2. "format" Parameter

Name: format

Description: Specify the format for the timezone data returned by the server as a standard MIME [RFC2046] media-type. If absent the iCalendar [RFC5545] format will be returned with the timezones contained within a "VCALENDAR" object (i.e., a default media-type of "text/calendar").

Value: A MIME [RFC2046] media-type. The server MUST support the following values:

text/calendar: Return data as "VTIMEZONE" components embedded in a "VCALENDAR" object as per [RFC5545].

application/calendar+xml: Return data using the XML representation of iCalendar data as per iCalendar in XML [RFC6321].

### 5.3. "changesince" Parameter

Name: changesince

Description: Specify the timestamp for a conditional timezone list request in order to restrict the result to timezones changed since the given timestamp (see Section 6.2).

Value: An XML [REF] UTC date-time value, typically a value returned in a previous "dtstamp" XML element.

### 5.4. "start" Parameter

Name: start

Description: Specify the inclusive start of a period.

Value: An iCalendar [RFC5545] "DATE" or "DATE-TIME" value. If an 'end' request parameter is also present, then both the 'start' and 'end' values MUST be of the same "DATE" or "DATE-TIME" value types.

#### 5.5. "end" Parameter

Name: end

Description: Specify the exclusive end of a period.

Value: An iCalendar [RFC5545] "DATE" or "DATE-TIME" value. If a 'start' request parameter is also present, then both the 'start' and 'end' values MUST be of the same "DATE" or "DATE-TIME" value types.

#### 5.6. "lang" Parameter

Name: lang

Description: Specify the language in which locale specific values are to be returned. e.g., when fetching display names, if a language is specified, only display names for that language will be returned.

Value: The value follows the specifications in [RFC5646].

#### 5.7. "returnall" Parameter

Name: returnall

Description: If present indicates that all timezones should be returned. When fetching the list of timezones the default action is to omit inactive timezones. The inclusion of this parameter causes inactive timezones to be returned in the list (see Section 6.2).

Value: This parameter takes no value.

#### 5.8. "tzid" Parameter

Name: tzid

Description: This parameter is used to identify a timezone to be targeted by an operation.



Value: A timezone identifier or alias. In some cases the special value "\*" is used to indicate that all timezones should be matched.

#### 5.9. "name" Parameter

Name: name

Description: This parameter is used to specify a name for queries.

Value: A timezone identifier, alias or localized name. This parameter is used when searching for matching specifications.

### 6. Operations

Servers MUST support the following operations.

#### 6.1. "capabilities" Operation

Name: capabilities

Description: This operation returns the capabilities of the server, allowing clients to determine if a specific feature has been deployed and/or enabled.

Parameters:

action REQUIRED, value MUST be "capabilities"

Response An XML document containing a "capabilities" (Section 7.1) element as the root element. Within that element there is an informational section describing the server and a section for each operation supported by the server.

##### 6.1.1. Example: Get Capabilities

In this example the client requests the server capabilities.

>> Request <<

```
GET /?action=capabilities HTTP/1.1
Host: tz.example.com
```

>> Response <<

```
HTTP/1.1 200 OK
Date: Wed, 4 Jun 2008 09:32:12 GMT
```

Content-Type: application/xml; charset="utf-8"

Content-Length: xxxx

```
<?xml version="1.0" encoding="utf-8" ?>
<capabilities xmlns="urn:ietf:params:xml:ns:timezone-service">
  <info>
    <primary-source>Olson:2011m</primary-source>
    <contact>mailto:tzs@example.org</contact>
  </info>

  <operation>
    <action>list</action>
    <description>List timezone identifiers and localized forms
    </description>

    <accept-parameter>
      <name>lang</name>
      <required>>false</required>
      <multi>>true</multi>
      <description>Specify desired localized form(s)</description>
    </accept-parameter>

    <accept-parameter>
      <name>changedsince</name>
      <required>>false</required>
      <multi>>false</multi>
      <description>Limit result to timezones changed since the
        given date
      </description>
    </accept-parameter>

    <accept-parameter>
      <name>returnall</name>
      <required>>false</required>
      <multi>>false</multi>
      <description>If present inactive timezones will be returned.
      </description>
    </accept-parameter>
  </operation>

  <operation>
    <action>get</action>
    <description>
      Returns one or more timezones as specified by the
      tzid parameter.
    </description>

    <accept-parameter>
```

```
<name>format</name>
<required>>false</required>
<multi>>false</multi>
<value>text/calendar</value>
<value>application/calendar+xml</value>
<description>Specify required format for timezone.
</description>
</accept-parameter>

<accept-parameter>
  <name>lang</name>
  <required>>false</required>
  <multi>>true</multi>
  <description>Specify desired localized form(s)</description>
</accept-parameter>

<accept-parameter>
  <name>tzid</name>
  <required>>true</required>
  <multi>>true</multi>
  <description>Specify desired timezone identifiers
  </description>
</accept-parameter>
</operation>

<operation>
  <action>expand</action>
  <description>
    Expands the specified timezone(s) into local onset and UTC
    offsets
  </description>

  <accept-parameter>
    <name>tzid</name>
    <required>>true</required>
    <multi>>true</multi>
    <description>Specify desired timezone identifiers</description>
  </accept-parameter>

  <accept-parameter>
    <name>start</name>
    <required>>false</required>
    <multi>>false</multi>
    <description>
      Specify start of the period of interest. If omitted the
      current year is assumed.
    </description>
  </accept-parameter>
</operation>
```

```

<accept-parameter>
  <name>end</name>
  <required>>false</required>
  <multi>>false</multi>
  <description>
    Specify end of the period of interest.
    If omitted the current year + 10 is assumed.
  </description>
</accept-parameter>
</operation>

<operation>
  <action>capabilities</action>
  <description>Gets the capabilities of the server</description>
</operation>
</capabilities>

```

## 6.2. "list" Operation

Name: list

Description: This operation lists all non alias timezone identifiers in summary format with aliases and optional localized data. In addition, it returns a timestamp which is the current server global last modification value.

Parameters:

action REQUIRED, value MUST be "list"

lang=<lang-code> OPTIONAL, but MAY occur multiple times.  
Specifies the language or languages for localized information.

returnall OPTIONAL, but MUST occur only once. If present, indicates that all, including inactive, timezones should be returned in the response. The TZ:inactive XML element will flag those timezones no longer in use.

changedsince OPTIONAL, but MUST occur only once. If present, limits the response to timezones changed since the given timestamp. MUST NOT be specified with the tzid parameter.

tzid=<identifier> OPTIONAL, and MAY occur once or more. If specified identifies timezone(s) for which information is to be returned. If this parameter is specified changedsince MUST NOT be specified.

If `tzid` is specified the `dtstamp` element will be returned in the response. This `dtstamp` is for the entire set of data and allows the client to determine if it should refresh its full set.

Response: An XML document containing a "timezone-list" (Section 7.13) element as the root element.

#### 6.2.1. Example: List timezone identifiers

In this example the client requests the timezone identifiers and in addition requests that the US-English local names be returned.

>> Request <<

```
GET /?action=list&lang=en_US HTTP/1.1
Host: tz.example.com
```

>> Response <<

```
HTTP/1.1 200 OK
Date: Wed, 4 Jun 2008 09:32:12 GMT
Content-Type: application/xml; charset="utf-8"
Content-Length: xxxx
```

```
<?xml version="1.0" encoding="utf-8" ?>
<timezone-list xmlns="urn:ietf:params:xml:ns:timezone-service">
  <dtstamp>2009-10-11T09:32:11Z</dtstamp>
  <summary>
    <tzid>America/New_York</tzid>
    <last-modified>2009-09-17T01:39:34Z</last-modified>
    <alias>US/Eastern</alias>
    <local-name lang="en_US">America/New_York</local-name>
  </summary>
  ...
</timezone-list>
```

#### 6.3. "get" Operation

Name: get

Description: This operation returns a timezone. If a single timezone is specified the response MUST contain an ETag response header field indicating the current value of the strong entity tag of the timezone resource.

If the identifier is actually an alias to a canonical name the server will return the specification associated with that identifier. The substitute-alias parameter specifies whether or not the alias is to be substituted for the identifier.

Parameters:

action REQUIRED, value MUST be "get"

format=<media-type> OPTIONAL, but MUST occur only once. Return information using the specified media-type. In the absence of this parameter, the value "text/calendar" MUST be assumed.

lang=<lang-code> OPTIONAL, but MAY occur multiple times. If present, specifies the language or languages for localized information.

tzid=<identifier> REQUIRED, and MUST occur only once. Identifies the timezone for which information is returned. The server MUST return an Etag header. Alternatively, if a value of "\*" is given, returns information for all timezones. The "\*" option will typically be used by servers that wish to retrieve the entire set of timezones supported by another server to re-synchronize their entire data cache. Clients will typically only retrieve individual timezone data on a case-by-case basis.

substitute-alias=<true|false> OPTIONAL and defaults to false. If true and the tzid is an alias it will replace the tzid in the returned specification. If false, the returned specification will have the canonical identifier.

Response: A document containing all the requested timezone data in the format specified.

### 6.3.1. Example: Get timezone

In this example the client requests the timezone with a specific timezone identifier to be returned

>> Request <<

```
GET /?action=get&tzid=America/New_York
    &format=text/calendar HTTP/1.1
Host: tz.example.com
```

>> Response <<

```
HTTP/1.1 200 OK
Date: Wed, 4 Jun 2008 09:32:12 GMT
Content-Type: text/calendar; charset="utf-8"
Content-Length: xxxx
ETag: "123456789-000-111"
```

```
BEGIN:VCALENDAR
...
BEGIN:VTIMEZONE
...
END:VTIMEZONE
END:VCALENDAR
```

### 6.4. "expand" Operation

Name: expand

Description: This operation expands the specified timezone into a list of onset start date/time and offset. The response MUST contain an ETag response header field indicating the current value of the strong entity tag for the expanded data.

Parameters:

action REQUIRED, value MUST be "expand"

tzid=<identifier> REQUIRED, but MUST only occur once. Identifies the timezone for which information is returned. The value "\*", which has a special meaning in the "get" operation, is not supported by this operation.

lang=<lang-code> OPTIONAL, but MAY occur multiple times. If present, specifies the language or languages for localized information.

start=date or date-time: OPTIONAL, but MUST occur only once. If present, specifies the start of the period of interest. If omitted, the current year is assumed.

end=date or date-time: OPTIONAL, but MUST occur only once. If present, specifies the end of the period of interest. If omitted, the current year + 10 is assumed.

Response: An XML document containing a "timezones" (Section 7.21) element as the root element.

#### 6.4.1. Example: Expanded XML Data Format



In this example the client requests a timezone in the expanded form.

>> Request <<

```
GET /?action=expand&tzid=America/New_York HTTP/1.1
Host: tz.example.com
```

>> Response <<

```
HTTP/1.1 200 OK
Date: Wed, 4 Jun 2008 09:32:12 GMT
Content-Type: application/xml; charset="utf-8"
Content-Length: xxxx
ETag: "123456789-000-111"
```

```
<?xml version="1.0" encoding="utf-8" ?>
<timezones xmlns="urn:ietf:params:xml:ns:timezone-service">
  <dtstamp>2009-10-11T09:32:11Z</dtstamp>
  <tzdata>
    <tzid>America/New_York</tzid>
    <calscale>Gregorian</calscale>

    <observance>
      <name>Daylight</name>
      <onset>2008-03-09T07:00:00Z</onset>
      <utc-offset-from>-05:00</utc-offset-from>
      <utc-offset-to>-04:00</utc-offset-to>
    </observance>

    <observance>
      <name>Standard</name>
      <onset>2008-11-02T07:00:00Z</onset>
      <utc-offset-from>-04:00</utc-offset-from>
      <utc-offset-to>-05:00</utc-offset-to>
    </observance>

    <observance>
      <name>Daylight</name>
      <onset>2009-03-08T07:00:00Z</onset>
      <utc-offset-from>-05:00</utc-offset-from>
      <utc-offset-to>-04:00</utc-offset-to>
    </observance>

    ...
  </tzdata>
</timezones>
```

## 6.5. "find" Operation

Name: find

Description: This operation allows a client to query the timezone service for a matching identifier, alias or localized name.

Parameters:

action REQUIRED, value MUST be "find"

name=<text> REQUIRED, but MUST only occur once. Identifies the name to search for. Only partial matching is supported.

lang=<lang-code> OPTIONAL, but MAY occur multiple times. If present, specifies the language or languages for localized information.

Response: The response has the same format as the "list" (Section 6.2) operation, with one result element per successful match.

### 6.5.1. Example: Find operation

In this example the client asks for information about "America/New\_York".

>> Request <<

```
GET /?action=find&name=America/New_York HTTP/1.1
Host: tz.example.com
```

>> Response <<

```
HTTP/1.1 200 OK
Date: Wed, 4 Jun 2008 09:32:12 GMT
Content-Type: application/xml; charset="utf-8"
Content-Length: xxxx
```

TBD

## 7. XML Definitions

XML elements used by this specification are defined here.

### 7.1. TZ:capabilities XML element

Name: capabilities

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Root element encapsulating timezone service capabilities information.

Description: This defines the root (top-level) element used as the container for capabilities information.

Definition:

```
<!ELEMENT capabilities (info, operation*)>
```

### 7.2. TZ:info XML element

Name: info

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Element encapsulating server information

Description: This defines the element used as the container for information about the servers source of data and contacts.

Definition:

```
<!ELEMENT info ((source | primary-source), contact*)>
```

### 7.3. TZ:source XML element

Name: source

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Supplied in capabilities to define the source for a secondary server

Description: This element contains the URL of the timezones server used to provide the data for this server.

Definition:

```
<!ELEMENT source (#PCDATA)>  
<!-- A valid URL -->
```

#### 7.4. TZ:primary-source XML element

Name: primary-source

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Supplied in capabilities to provide information about the data source for a primary server

Description: This element contains some descriptive text, for example a filename, to identify the source of the data for this server.

Definition:

```
<!ELEMENT primary-source (#PCDATA)>
<!-- Descriptive text -->
```

#### 7.5. TZ:contact XML element

Name: contact

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Supplied in capabilities to provide contact information

Description: This element can contain any useful contact information and may appear multiple times.

Definition:

```
<!ELEMENT source (#PCDATA)>
<!-- A valid URL -->
```

#### 7.6. TZ:operation XML element

Name: operation

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Element encapsulating timezone operation description

Description: This defines the element used as the container for information defining an operation and its parameters.

Definition:

```
<!ELEMENT operation (action, description?, accept-parameter*)>
```

#### 7.7. TZ:action XML element

Name: action

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Define name of an action

Description: Specify name of an operation's action.

Definition:

```
<!ELEMENT action (#PCDATA)>
<!-- A legal action value -->
```

#### 7.8. TZ:description XML element

Name: description

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: A description.

Description: This element specifies a description that refers to the enclosing element.

Definition:

```
<!ELEMENT description (#PCDATA)>
```

#### 7.9. TZ:accept-parameter XML element

Name: accept-parameter

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Element defining a timezone operation parameter

Description: This defines the name, type and characteristics of an operation parameter.

Definition:

```
<!ELEMENT accept-parameter (name, required, multi,  
                             value*, description?)>
```

#### 7.10. TZ:required XML element

Name: required

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Specify if timezone method parameter is required

Description: Specify if timezone method parameter is required. Same form as XML boolean, "true", "false", 0 or 1 are used.

Definition:

```
<!ELEMENT required (#PCDATA)>  
<!-- "true" or "false" -->
```

#### 7.11. TZ:multi XML element

Name: multi

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Specify if timezone method parameter is multi-valued

Description: Specify if timezone method parameter is multi-valued. Same form as XML boolean, "true", "false", 0 or 1 are used.

Definition:

```
<!ELEMENT multi (#PCDATA)>  
<!-- "true" or "false" -->
```

#### 7.12. TZ:value XML element

Name: value

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Allowed values for a parameter.

Description: This element specifies the allowed values for a parameter. If present, only the set of values specified will be allowed by the server.

Definition:

```
<!ELEMENT value (#PCDATA)>
```

#### 7.13. TZ:timezone-list XML element

Name: timezone-list

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Root element encapsulating timezone list information.

Description: This defines the root (top-level) element used as the container for timezone listing.

Definition:

```
<!ELEMENT timezone-list (dtstamp, summary*)>
```

#### 7.14. TZ:dtstamp XML element

Name: dtstamp

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Provide a timestamp value.

Description: Provides the UTC date and time when a substantive change was made to the timezone data.

Definition:

```
<!ELEMENT version (#PCDATA)>  
<!-- XML UTC DATE-TIME value -->
```

#### 7.15. TZ:summary XML element

Name: summary

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Defines a timezone summary.

Description: This defines the element that provides summary information for a timezone in the timezones list.

Definition:

```
<!ELEMENT summary (tzid, last-modified, inactive?,
                    local-name*, alias*)>
```

#### 7.16. TZ:tzid XML element

Name: tzid

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: The identifier for the timezone.

Description: The text value is the identifier of the timezone being referred to.

Definition:

```
<!ELEMENT tzid (#PCDATA)>
```

#### 7.17. TZ:last-modified XML element

Name: last-modified

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Provide a timestamp value.

Description: Provides the UTC date and time that the timezone data was last modified.

Definition:

```
<!ELEMENT last-modified (#PCDATA)>
<!-- XML UTC DATE-TIME value -->
```

#### 7.18. TZ:inactive XML element

Name: inactive



Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Flags an inactive timezone.

Description: If present indicates that the timezone is inactive, that is it does not apply to any current area or date/time.

Definition:

```
<!ELEMENT inactive >
```

#### 7.19. TZ:local-name XML element

Name: local-name

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: A localized name for the timezone.

Description: Defines one or more localized names that are used when a timezone identifier needs to be presented to a user. The xml:lang attribute is used to indicate the language associated with each value. If multiple names are provided for the same locale the preferred name should be flagged with the PREF="true" attribute. In the absence of any indication the client is free to choose.

Definition:

```
<!ELEMENT local-name (#PCDATA)>
```

```
<!ATTLIST local-name  
    xml:lang CDATA #REQUIRED  
    pref ("true"|"false") "false" >
```

#### 7.20. TZ:alias XML element

Name: alias

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: An alternative identifier for the timezone.

Description: Defines alternative identifiers that can be used for the timezone. This feature allows mapping of old identifiers onto new.

Definition:

```
<!ELEMENT alias (#PCDATA)>
```

#### 7.21. TZ:timezones XML element

Name: timezones

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Root element encapsulating expanded timezone information.

Description: This defines the root (top-level) element used as the container for expanded timezone data.

Definition:

```
<!ELEMENT timezones (dtstamp, tzdata*)>
```

#### 7.22. TZ:tzdata XML element

Name: tzdata

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Encapsulates expanded timezone information.

Description: This element specifies expanded timezone data for the range specified in a request.

Definition:

```
<!ELEMENT tzdata (tzid, calscale?, observance*)>
```

#### 7.23. TZ:calscale XML element

Name: calscale

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Identifies the calendar system for the timezone data.

Description: The calendar system defines how rules, dates and times are to be interpreted. Currently only the value "Gregorian" is supported, referring to the Gregorian calendar scale. If this element is not present in its normal context, then the value "Gregorian" MUST be assumed.

Definition:

```
<!ELEMENT calscale (#PCDATA)>
<!-- allowed PCDATA value is "Gregorian" -->
```

#### 7.24. TZ:observance XML element

Name: observance

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Provides data for a single observance period for a  
timezone.

Description: In an expanded timezone, the observance element  
specifies a single timezone observance.

Definition:

```
<!ELEMENT observance (name, local-name*,
                       onset, utc-offset-from, utc-offset-to)>
```

#### 7.25. TZ:name XML element

Name: name

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Name for the observance.

Description: This element specifies which timezone observance is  
being referred to. Typically this will be either "Standard" or  
"Daylight".

Definition:

```
<!ELEMENT name (#PCDATA)>
<!-- Typically one of either "Standard" or "Daylight" -->
```

#### 7.26. TZ:onset XML element

Name: onset

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: Local time onset of the observance.

Description: The onset element defines the local time at which the observance takes effect. The form is the same as an XML date-time with timezone information disallowed.

Definition:

```
<!ELEMENT onset (#PCDATA)>
<!-- A local DATE-TIME value -->
```

#### 7.27. TZ:utc-offset-from XML element

Name: utc-offset-from

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: UTC offset before the start of the observance.

Description: The utc-offset-from element defines the UTC offset in hours and minutes before the start of this observance. The value is a string of the form: ('+' | '-') hh ':' mm (':' ss)

Definition:

```
<!ELEMENT utc-offset-from (#PCDATA)>
<!-- Positive or negative hours, minutes and optional seconds -->
```

#### 7.28. TZ:utc-offset-to XML element

Name: utc-offset-to

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: UTC offset after the start of the observance.

Description: The utc-offset-to element defines the UTC offset in hours and minutes at and after the start of this observance. The value is a string of the form: ('+' | '-') hh ':' mm (':' ss)

Definition:

```
<!ELEMENT utc-offset-to (#PCDATA)>
<!-- Positive or negative hours, minutes and optional seconds -->
```

## 7.29. TZ:error element

Name: error

Namespace: urn:ietf:params:xml:ns:timezone-service

Purpose: To convey a descriptive error message to the client.

Description: Section 4.2.1

Definition:

```
<!ELEMENT error ANY>
```

## 8. XML Schema

Following is the XML schema for the timezone service responses.

```
<?xml version="1.0" encoding="UTF-8"?>
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:tns="urn:ietf:params:xml:ns:timezone-service"
  xmlns:xcal="urn:ietf:params:xml:ns:icalendar-2.0"
  targetNamespace="urn:ietf:params:xml:ns:timezone-service"
  elementFormDefault="qualified">
  <!-- =====
  Timezones service XML schema
  ===== -->

  <import schemaLocation="../../../xml.xsd"
    namespace="http://www.w3.org/XML/1998/namespace" />

  <import schemaLocation="../../../icalendar/iCalendar.xsd"
    namespace="urn:ietf:params:xml:ns:icalendar-2.0" />

  <!-- *****
  basic types
  ***** -->

  <simpleType name="CalScaleType">
    <annotation>
      <documentation xml:lang="en">
        The calendar system defines how rules, dates and times are to be
        interpreted. Currently only the value "Gregorian" is supported,
        referring to the Gregorian calendar scale. If this element is
        not present in its normal context, then the value "Gregorian"
        MUST be assumed.
      </documentation>
    </annotation>
  </simpleType>

```

```
</annotation>
<restriction base="string"/>
</simpleType>

<simpleType name="DtstampType">
  <annotation>
    <documentation xml:lang="en">
      Provides the UTC date and time when a substantive change was
      made to the timezone data.
    </documentation>
  </annotation>
  <restriction base="tns:UTCDateTimeType"/>
</simpleType>

<simpleType name="LastmodifiedType">
  <annotation>
    <documentation xml:lang="en">
      Provides the UTC date and time that the timezone data was last
      modified.
    </documentation>
  </annotation>
  <restriction base="tns:UTCDateTimeType"/>
</simpleType>

<complexType name="LocalNameType">
  <annotation>
    <documentation xml:lang="en">
      Defines one or more localized names that are used when a
      timezone identifier needs to be presented to a user.
      The xml:lang attribute is used to indicate the language
      associated with each value.
      If multiple names are provided for the same locale the preferred
      name can be flagged with the pref attribute.
    </documentation>
  </annotation>
  <simpleContent>
    <extension base="string">
      <attribute ref="xml:lang" />
      <attribute name="pref" type="boolean" default="false" />
    </extension>
  </simpleContent>
</complexType>

<simpleType name="OnsetType">
  <annotation>
    <documentation xml:lang="en">
      The onset element defines the local time at which the
      observance takes effect.
    </documentation>
  </annotation>
```

```
    </documentation>
  </annotation>
  <restriction base="dateTime">
    <pattern value="\d{4}\-\d{2}\-\d{2}T\d{2}:\d{2}:\d{2}(\.\d*)?" />
  </restriction>
</simpleType>

<simpleType name="TzidType">
  <annotation>
    <documentation xml:lang="en">
      The text value is the identifier of the timezone being
      referred to.
    </documentation>
  </annotation>
  <restriction base="string" />
</simpleType>

<simpleType name="UtcOffsetType">
  <annotation>
    <documentation xml:lang="en">
      This type specifies the UTC offset in hours, minutes and
      optional seconds.
    </documentation>
  </annotation>
  <restriction base="string">
    <pattern value="(\-|\+)?\d{2}:\d{2}(:\d{2})?" />
  </restriction>
</simpleType>

<complexType name="AliasType">
  <annotation>
    <documentation xml:lang="en">
      Defines alternative identifiers that can be used for the
      timezone. This feature allows mapping of old identifiers
      onto new.
    </documentation>
  </annotation>
  <simpleContent>
    <extension base="string" />
  </simpleContent>
</complexType>

<complexType name="InactiveType">
  <annotation>
    <documentation xml:lang="en">
      The inactive empty element flags timezones that are
      no longer active.
    </documentation>
  </annotation>
```

```

    </annotation>
</complexType>

<complexType name="BaseResultType" abstract="true" />

<simpleType name="UTCDateTimeType">
  <restriction base="dateTime">
    <pattern
      value="(\-|\+)?\d{4}-\d{2}-\d{2}T\d{2}:\d{2}:\d{2}(\.\d*)Z"/>
    </restriction>
  </simpleType>

<!-- *****
                        error response
***** -->

<complexType name="ErrorResponse" mixed="true" >
  <annotation>
    <documentation xml:lang="en">
      Useful messages SHOULD be returned as an error element.
    </documentation>
  </annotation>
  <sequence>
    <any minOccurs="0"/>
  </sequence>
</complexType>

<element name="error" type="tns:ErrorResponse" />

<!-- *****
                        capabilities response
***** -->

<complexType name="CapabilitiesInfoType">
  <annotation>
    <documentation xml:lang="en">
      The element used as the container for information about the
      servers source of data and contacts.
    </documentation>
  </annotation>
  <sequence>
    <choice>
      <element name="source" type="string" />
      <element name="primary-source" type="string" />
    </choice>
    <element name="contact" type="string"
      minOccurs="0" maxOccurs="unbounded" />
  </sequence>

```



```
</complexType>

<complexType name="CapabilitiesAcceptParameterType">
  <annotation>
    <documentation xml:lang="en">
      This defines the name, type and characteristics of an operation
      parameter.
    </documentation>
  </annotation>
  <sequence>
    <element name="name" type="string" />
    <element name="required" type="boolean" />
    <element name="multi" type="boolean" />
    <element name="value" type="string" />
    <element name="description" type="string" />
  </sequence>
</complexType>

<complexType name="CapabilitiesOperationType">
  <annotation>
    <documentation xml:lang="en">
      The element used as the container for information defining an
      operation and its parameters.
    </documentation>
  </annotation>
  <sequence>
    <element name="action" type="string" />
    <element name="description" type="string" />
    <element name="accept-parameter"
      type="tns:CapabilitiesAcceptParameterType"
      maxOccurs="unbounded" />
  </sequence>
</complexType>

<complexType name="CapabilitiesType">
  <annotation>
    <documentation xml:lang="en">
      The root (top-level) element used as the container for
      capabilities information.
    </documentation>
  </annotation>
  <complexContent mixed="false">
    <extension base="tns:BaseResultType">
      <sequence>
        <element name="info"
          type="tns:CapabilitiesInfoType" />

        <element name="operation">
```

```
        type="tns:CapabilitiesOperationType"
        maxOccurs="unbounded" />
    </sequence>
</extension>
</complexContent>
</complexType>

<element name="capabilities" type="tns:CapabilitiesType" />

<!-- *****
                list response
        ***** -->

<complexType name="SummaryType">
  <annotation>
    <documentation xml:lang="en">
      This defines the element that provides summary information for a
      timezone in the timezones list.
    </documentation>
  </annotation>
  <sequence >
    <element name="tzid" type="tns:TzidType" minOccurs="1" />
    <element name="last-modified" type="tns:LastmodifiedType" />
    <element name="inactive" type="tns:InactiveType" minOccurs="0" />
    <element name="local-name" type="tns:LocalNameType"
      minOccurs="0" maxOccurs="unbounded" />
    <element name="alias" type="tns:AliasType"
      minOccurs="0" maxOccurs="unbounded" />
  </sequence>
</complexType>

<complexType name="TimezoneListType">
  <annotation>
    <documentation xml:lang="en">
      This defines the root (top-level) element used as the container
      for a timezone listing.
    </documentation>
  </annotation>
  <complexContent mixed="false">
    <extension base="tns:BaseResultType">
      <sequence >
        <element name="dtstamp"
          type="tns:DtstampType" minOccurs="1" />
        <element name="summary"
          type="tns:SummaryType"
          maxOccurs="unbounded" />
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

```

    </complexContent>
</complexType>

<element name="timezone-list" type="tns:TimezoneListType" />

<!-- *****
                expand response
                ***** -->

<complexType name="ObservanceType">
  <annotation>
    <documentation xml:lang="en">
      In an expanded timezone, the observance element specifies a
      single timezone observance.

      The utc-offset-from element defines the UTC offset in hours
      and minutes before the start of this observance.

      The utc-offset-to element defines the UTC offset in hours and
      minutes at and after the start of this observance.
    </documentation>
  </annotation>
  <sequence>
    <element name="name" type="string" />
    <element name="local-name" type="tns:LocalNameType"
      maxOccurs="unbounded" />
    <element name="onset" type="tns:OnsetType" minOccurs="1" />
    <element name="utc-offset-from"
      type="tns:UtcOffsetType" minOccurs="1" />
    <element name="utc-offset-to" type="tns:UtcOffsetType"
      minOccurs="1" />
  </sequence>
</complexType>

<complexType name="TzdataType">
  <annotation>
    <documentation xml:lang="en">
      This element specifies expanded timezone data for the range
      specified in a request.
    </documentation>
  </annotation>
  <sequence>
    <element name="tzid" type="tns:TzidType" minOccurs="1" />
    <element name="calscale" type="tns:CalscaleType" />
    <element name="observance" type="tns:ObservanceType"
      maxOccurs="unbounded" />
  </sequence>
</complexType>

```

```
<complexType name="TimezonesType">
  <annotation>
    <documentation xml:lang="en">
      This defines the root (top-level) element used as the container
      for expanded timezone data.
    </documentation>
  </annotation>
  <complexContent mixed="false">
    <extension base="tns:BaseResultType">
      <sequence >
        <element name="dtstamp"
          type="tns:DtstampType" minOccurs="1" />
        <element name="tzdata" type="tns:TzdataType"
          maxOccurs="unbounded" />
      </sequence>
    </extension>
  </complexContent>
</complexType>

<element name="timezones" type="tns:TimezonesType" />
</schema>
```

## 9. Security Considerations

Timezone data is critical in determining local or UTC time for devices and in calendaring and scheduling operations. As such, it is vital that a reliable source of timezone data is used. Servers providing a timezone service MUST support HTTP over Transport Layer Security (TLS) (as defined by [RFC2818]) with a valid certificate. Clients and servers making use of a timezone service SHOULD use HTTP over TLS and verify the authenticity of the service being used before accepting and using any timezone data from that source.

Clients that support transport layer security as defined by [RFC2818] SHOULD try the "\_timezones" service first before trying the "\_timezone" service. Clients MUST follow the certificate verification process specified in [RFC6125].

A malicious attacker with access to the DNS server data, or 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.

Timezone servers SHOULD protect themselves against errant or malicious clients by throttling high request rates or frequent requests for large amounts of data. Clients can avoid being throttled by using the polling capabilities outlined in Section 4.1.3

## 10. IANA Considerations

This document uses one new URN to identify a new XML namespace for the response data used in this specification, and defines a new registry of "actions" for the timezone service protocol, and defines a "well-known" URI using the registration procedure and template from Section 5.1 of [RFC5785], and creates two new SRV service label aliases.

### 10.1. XML namespace

Registration request for the timezone service namespace:

URI: urn:ietf:params:xml:ns:timezone-service

Registrant Contact: iesg@ietf.org.

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

### 10.2. Service Operations Registration

This section defines the process to register new or modified timezone service operations with IANA.

#### 10.2.1. Service Operations Registration Procedure

The IETF will create a mailing list, `timezone-service@ietf.org`, which can be used for public discussion of timezone service operations proposals prior to registration. Use of the mailing list is strongly encouraged. The IESG will appoint a designated expert who will monitor the `timezone-service@ietf.org` mailing list and review registrations.

Registration of new timezone service operations MUST be reviewed by the designated expert and published in an RFC. A Standard Tracks RFC is REQUIRED for the registration of new timezone service operations. A Standard Tracks RFC is also REQUIRED for changes to operations previously documented in a Standard Tracks RFC.

The registration procedure begins when a completed registration template, defined in the sections below, is sent to `timezone-service@ietf.org` and `iana@iana.org`. The designated expert

is expected to tell IANA and the submitter of the registration within two weeks whether the registration is approved, approved with minor changes, or rejected with cause. When a registration is rejected with cause, it can be re-submitted if the concerns listed in the cause are addressed. Decisions made by the designated expert can be appealed to the IESG Applications Area Director, then to the IESG. They follow the normal appeals procedure for IESG decisions.

#### 10.2.2. Registration Template for Operations

An operation is defined by completing the following template.

**Name:** The name of the operation. This is also the value of the "action" parameter used in timezone service requests.

**Description:** A general description of the operation, its purpose, etc.

**Parameters:** A list of allowed request parameters, indicating whether they are "REQUIRED" or "OPTIONAL" and whether they can occur only once or multiple times.

**Response** The nature of the response to the HTTP request, e.g., what format the response data is in.

#### 10.2.3. Registration Template for Operation Parameters

An operation parameter is defined by completing the following template.

**Name:** The name of the parameter.

**Description:** A general description of the parameter, its purpose, etc.

**Value:** The format of the parameter value, or an indication that the parameter has no value.

### 10.3. Initial Timezone Service Registries

The IANA is requested to create and maintain the following registries for timezone service operations with pointers to appropriate reference documents.

#### 10.3.1. Operations Registry

The following table is to be used to initialize the operations registry.

Operation Name	Status	Reference
capabilities	Current	RFCXXXX, Section 6.1
list	Current	RFCXXXX, Section 6.2
get	Current	RFCXXXX, Section 6.3
expand	Current	RFCXXXX, Section 6.4

### 10.3.2. Operation Parameters Registry

The following table is to be used to initialize the parameters registry.

Parameter	Status	Reference
action	Current	RFCXXXX, Section 5.1
changedsince	Current	RFCXXXX, Section 5.3
end	Current	RFCXXXX, Section 5.5
format	Current	RFCXXXX, Section 5.2
lang	Current	RFCXXXX, Section 5.6
returnall	Current	RFCXXXX, Section 5.7
start	Current	RFCXXXX, Section 5.4
tzid	Current	RFCXXXX, Section 5.8

### 10.4. timezone Well-Known URI Registration

URI suffix: timezone

Change controller: IETF.

Specification document(s): This RFC.

Related information:

### 10.5. Service Name Registrations

This document registers two new service names as per [RFC6335]. Both are defined within this document.

#### 10.5.1. timezone Service Name Registration

Service Name: `timezone`

Transport Protocol(s): `TCP`

Assignee: IESG <iesg@ietf.org>

Contact: IETF Chair <chair@ietf.org>

Description: `Timezone Service Protocol - non-TLS`

Reference: `[draft-douglass-timezone-service]`

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

#### 10.5.2. `timezones` Service Name Registration

Service Name: `timezones`

Transport Protocol(s): `TCP`

Assignee: IESG <iesg@ietf.org>

Contact: IETF Chair <chair@ietf.org>

Description: `Timezone Service Protocol - over TLS`

Reference: `[draft-douglass-timezone-service]`

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

### 11. Acknowledgements

The authors would like to thank the members of the Calendaring and Scheduling Consortium's Timezone Technical Committee and the following individuals for contributing their ideas and support: John Haug, Ciny Joy, Bryan Keller, Andrew McMillan, Arnaud Quillaud, Jose Edvaldo Saraiva.

The authors would also like to thank the Calendaring and Scheduling Consortium for advice with this specification.

### 12. Normative References

`[I-D.cheshire-dnsext-dns-sd]`



Cheshire, S. and M. Krochmal, "DNS-Based Service Discovery", draft-cheshire-dnsext-dns-sd-11 (work in progress), December 2011.

- [RFC2046] Freed, N. and N. Borenstein, "Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types", RFC 2046, November 1996.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
- [RFC2616] Fielding, R., Gettys, J., Mogul, J., Frystyk, H., Masinter, L., Leach, P., and T. Berners-Lee, "Hypertext Transfer Protocol -- HTTP/1.1", RFC 2616, June 1999.
- [RFC2782] Gulbrandsen, A., Vixie, P., and L. Esibov, "A DNS RR for specifying the location of services (DNS SRV)", RFC 2782, February 2000.
- [RFC2818] Rescorla, E., "HTTP Over TLS", RFC 2818, May 2000.
- [RFC5246] Dierks, T. and E. Rescorla, "The Transport Layer Security (TLS) Protocol Version 1.2", RFC 5246, August 2008.
- [RFC5545] Desruisseaux, B., "Internet Calendaring and Scheduling Core Object Specification (iCalendar)", RFC 5545, September 2009.
- [RFC5646] Phillips, A. and M. Davis, "Tags for Identifying Languages", BCP 47, RFC 5646, September 2009.
- [RFC5785] Nottingham, M. and E. Hammer-Lahav, "Defining Well-Known Uniform Resource Identifiers (URIs)", RFC 5785, April 2010.
- [RFC6125] Saint-Andre, P. and J. Hodges, "Representation and Verification of Domain-Based Application Service Identity within Internet Public Key Infrastructure Using X.509 (PKIX) Certificates in the Context of Transport Layer Security (TLS)", RFC 6125, March 2011.
- [RFC6321] Daboo, C., Douglass, M., and S. Lees, "xCal: The XML Format for iCalendar", RFC 6321, August 2011.
- [RFC6335] Cotton, M., Eggert, L., Touch, J., Westerlund, M., and S. Cheshire, "Internet Assigned Numbers Authority (IANA) Procedures for the Management of the Service Name and Transport Protocol Port Number Registry", BCP 165,

RFC 6335, August 2011.

[RFC6557] Lear, E. and P. Eggert, "Procedures for Maintaining the Time Zone Database", BCP 175, RFC 6557, February 2012.

[W3C.REC-xml-20081126]

Sperberg-McQueen, C., Yergeau, F., Paoli, J., Bray, T., and E. Maler, "Extensible Markup Language (XML) 1.0 (Fifth Edition)", World Wide Web Consortium Recommendation REC-xml-20081126, November 2008, <<http://www.w3.org/TR/2008/REC-xml-20081126>>.

#### Appendix A. Changes for version 05

- o Replaced reference to draft RFC with RFC6557 and RFC6125
- o New XML namespace contact.
- o Templates for service name.
- o Various typos fixed.
- o More acknowledgements.

#### Appendix B. Changes for version 04

- o Replaced reference to RFC4646 with reference to RFC5646
- o New wording on polling.

#### Appendix C. Changes for version 03

- o Replaced erroneous reference to ISO3036 with reference to RFC4646
- o Update reference to iCalendar in XML (RFC6321)
- o More description of ids/aliases/names
- o Add substitute-alias parameter for action=get
- o Allow tzid on list
- o Added name request parameter

- o Added find action

#### Appendix D. Changes for version 02

- o Missed definitions of the inactive element
- o Restrict UtcOffsetFromType, UtcOffsetToType to a pattern - allow seconds.
- o Use restricted XML dateTime as base for onset
- o Use restricted XML dateTime for lastmodified and dtstamp
- o Note that 0 and 1 are valid values for an XML boolean.
- o Set pref to a default value of false
- o Server will now set tzid of aliased timezones to the alias name
- o Remove returnaliases option
- o Aliases should not have lang attribute - removed
- o Add text on status codes and an error element
- o Added capabilities info element containing source | primary-source and contacts.

#### Authors' Addresses

Michael Douglass  
Rensselaer Polytechnic Institute  
110 8th Street  
Troy, NY 12180  
USA

Email: [douglm@rpi.edu](mailto:douglm@rpi.edu)  
URI: <http://www.rpi.edu/>

Cyrus Daboo  
Apple Inc.  
1 Infinite Loop  
Cupertino, CA 95014  
USA

Email: [cyrus@daboo.name](mailto:cyrus@daboo.name)  
URI: <http://www.apple.com/>