

Serialising Extended Data About Times and Events
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Date and Time on the Internet: Timestamps with additional information
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Abstract

This document defines an extension to the timestamp format defined in RFC3339 for representing additional information including a time zone.

Status of This Memo

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

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1. Introduction

Dates and times are used in a very diverse set of internet applications, all the way from server-side logging to calendaring and scheduling.

Each distinct instant in time can be represented in a descriptive text format using a timestamp, and [ISO8601] standardizes a widely-adopted timestamp format, which forms the basis of [RFC3339]. However, this format only allows timestamps to contain very little additional relevant information, which means that, beyond that, any contextual information related to a given timestamp needs to be either handled separately or attached to it in a non-standard manner.

This is already a pressing issue for applications that handle each instant with an associated time zone name, to take into account things like DST transitions. Most of these applications attach the timezone to the timestamp in a non-standard format, at least one of which is fairly well-adopted [JAVAZDT]. Furthermore, applications might want to attach even more information to the timestamp, including but not limited to the calendar system it needs to be represented in.

This document defines an extension syntax for timestamps as specified in [RFC3339] that has the following properties:

- * The extension suffix is completely optional, making existing [RFC3339] timestamps compatible with this format.

- * The format is compatible with the pre-existing popular syntax for attaching time zone names to timestamps ([JAVAZDT]).
- * The format provides a generalized way to attach any additional information to the timestamp.

2. Definitions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

UTC: Coordinated Universal Time, as maintained since 1988 by the Bureau International des Poids et Mesures (BIPM) in conjunction with leap seconds as announced by the International Earth Rotation and Reference Frames Service [IERS]. From 1972 through 1987 UTC was maintained entirely by Bureau International de l'Heure (BIH). Before 1972 UTC was not generally recognized and civil time was determined by individual jurisdictions using different techniques for attempting to follow Universal Time based on measuring the rotation of the earth.

UTC is often mistakenly referred to as GMT, an earlier time scale UTC was designed to be a useful successor for.

ABNF: Augmented Backus-Naur Form, a format used to represent permissible strings in a protocol or language, as defined in [RFC5234]. The rules defined in Appendix B of [RFC5234] are imported implicitly.

Internet Date/Time Format: The date/time format defined in section 3 of this document.

Timestamp: This term is used in this document to refer to an unambiguous representation of some instant in time.

Z: A suffix which, when applied to a time, denotes a UTC offset of 00:00; often spoken "Zulu" from the ICAO phonetic alphabet representation of the letter "Z".

Time Zone: A time zone that is included in the Time Zone Database (often called tz or zoneinfo) maintained by IANA.

CLDR: Common locale data repository [CLDR], a project of the Unicode Consortium to provide locale data to applications.

For more information about time scales, see Appendix E of [RFC1305], Section 3 of [ISO8601], and the appropriate ITU documents [ITU-R-TF.460-6].

3. Extended Date/Time format

This section discusses desirable qualities of formats for the timestamp extension suffix and defines such a format that extends [RFC3339] for use in Internet protocols.

3.1. Informative

The format should allow implementations to specify additional important information in addition to the bare timestamp. This is done by defining `_tags_`, each with a `_key_` and a `_value_` separated by an equals sign, and allowing implementations to include an informative `_suffix_` at the end with as many tags as required. The value of a tag can be a hyphen delimited list of multiple values.

In case a key is repeated or conflicted, implementations MUST give precedence to whichever value is positioned first.

3.2. Namespaced

Since tags can include all sorts of additional information, different standards bodies/organizations need a way to identify which part adheres to their standards. For this, all information needs to be namespaced. Each key is therefore divided into two hyphen-separated sections: the namespace and the key. For example, the calendar as defined by the Unicode consortium could be included as `u-ca=<value>`.

All single-character namespaces are reserved for [BCP47] extensions recorded in the BCP47 extensions registry. For these namespaces:

- * Case differences are ignored.
- * The namespace is restricted to single alphanum, corresponding to extension singletons ('x' can be used for a private use extension).
- * In addition, for CLDR extensions:
 - There must be a namespace-key and it is restricted to 2 alphanum characters.
 - A suffix-value is limited to 3*8alphanum.

3.3. Multi-character Namespaces

Multi-character namespaces can be registered specifically for use in this format, see Section 4. The registration policy requires the development of an RFC, which SHALL define the name, purpose, processes, and procedures for maintaining the tags using the namespace registered.

(This subsection uses BCP 14 language to describe the requirements on the information interchanged indirectly by providing requirements on the RFC registering a namespace and the principles of its evolution.)

The maintaining or registering authority, including name, contact email, discussion list email, and URL location of the registry, MUST be indicated clearly in the RFC. The RFC MUST specify each of the following (directly or included by reference):

- * The specification MUST reference the specific version or revision of this document that governs its creation and MUST reference this section of this document.
- * The specification and all keys defined by the specification MUST follow the ABNF and other rules for the formation of keys as defined in this document. In particular, it MUST specify that case is not significant and that keys MUST NOT exceed eight characters in length.
- * The specification MUST specify a canonical representation.
- * The specification of valid keys MUST be available over the Internet and at no cost.
- * The specification MUST be in the public domain or available via a royalty-free license acceptable to the IETF and specified in the RFC.
- * The specification MUST be versioned, and each version of the specification MUST be numbered, dated, and stable.
- * The specification MUST be stable. That is, namespace keys, once defined by a specification, MUST NOT be retracted or change in meaning in any substantial way.
- * The specification MUST include, in a separate section, the registration form reproduced in this section (below) to be used in registering the namespace upon publication as an RFC.

- * IANA MUST be informed of changes to the contact information and URL for the specification.

IANA will maintain a registry of allocated multi-character namespaces. This registry MUST use the record-jar format described by the ABNF in [BCP47]. Upon publication of a namespace as an RFC, the maintaining authority defined in the RFC MUST forward this registration form to <mailto:iesg@ietf.org>, who MUST forward the request to <mailto:iana@iana.org>. The maintaining authority of the namespace MUST maintain the accuracy of the record by sending an updated full copy of the record to <mailto:iana@iana.org> with the subject line "TIMESTAMP FORMAT NAMESPACE UPDATE" whenever content changes. Only the 'Comments', 'Contact_Email', 'Mailing_List', and 'URL' fields MAY be modified in these updates.

Failure to maintain this record, maintain the corresponding registry, or meet other conditions imposed by this section of this document MAY be appealed to the IESG [RFC2028] under the same rules as other IETF decisions (see [RFC2026]) and MAY result in the authority to maintain the extension being withdrawn or reassigned by the IESG.

```
%%
Identifier:
Description:
Comments:
Added:
RFC:
Authority:
Contact_Email:
Mailing_List:
URL:
%%
```

Figure 1: Registration record for a multi-character namespace

'Identifier' contains the multi-character sequence assigned to the namespace. The Internet-Draft submitted to define the namespace SHOULD specify which sequence to use, although the IESG MAY change the assignment when approving the RFC.

'Description' contains the name and description of the namespace.

'Comments' is an OPTIONAL field and MAY contain a broader description of the namespace.

'Added' contains the date the namespace's RFC was published in the "date-full" format specified in Figure 2. For example: 2004-06-28 represents June 28, 2004, in the Gregorian calendar.

'RFC' contains the RFC number assigned to the namespace.

'Authority' contains the name of the maintaining authority for the namespace.

'Contact_Email' contains the email address used to contact the maintaining authority.

'Mailing_List' contains the URL or subscription email address of the mailing list used by the maintaining authority.

'URL' contains the URL of the registry for this namespace.

The determination of whether an Internet-Draft meets the above conditions and the decision to grant or withhold such authority rests solely with the IESG and is subject to the normal review and appeals process associated with the RFC process.

3.4. Syntax Extensions to RFC 3339

The following rules extend the ABNF syntax defined in [RFC3339] in order to allow the inclusion of an optional suffix: the extended date/time format is described by the rule date-time-ext.

```

time-zone-initial = ALPHA / "." / "_"
time-zone-char   = time-zone-initial / DIGIT / "-" / "+"
time-zone-part   = time-zone-initial *13(time-zone-char)
                  ; but not "." or ".."
time-zone-name   = time-zone-part *("/" time-zone-part)
time-zone        = "[" time-zone-name "]"

namespace        = 1*alphanum
namespace-key    = 1*alphanum
suffix-key       = namespace ["-" namespace-key]

suffix-value     = 1*alphanum
suffix-values    = suffix-value *("-" suffix-value)
suffix-tag       = "[" suffix-key "=" suffix-values "]"
suffix           = [time-zone] *suffix-tag

date-time-ext    = date-time suffix

alphanum         = ALPHA / DIGIT

```

Figure 2: ABNF grammar of extensions to RFC 3339

3.5. Examples

Here are some examples of Internet extended date/time format.

```
1996-12-19T16:39:57-08:00
```

Figure 3: RFC 3339 date-time with timezone offset

Figure 3 represents 39 minutes and 57 seconds after the 16th hour of December 19th, 1996 with an offset of -08:00 from UTC. Note that this is the same instant in time as 1996-12-20T00:39:57Z, expressed in UTC.

```
1996-12-19T16:39:57-08:00[America/Los_Angeles]
```

Figure 4: Adding a timezone name

Figure 4 represents the exact same instant as the previous example but additionally specifies the human time zone associated with it ("Pacific Time") for time-zone-aware implementations to take into account.

```
1996-12-19T16:39:57-08:00[America/Los_Angeles][u-ca=hebrew]
```

Figure 5: Projecting to the Hebrew calendar

Figure 5 represents the exact same instant but it informs calendar-aware implementations that they should project it to the Hebrew calendar.

```
1996-12-19T16:39:57-08:00[x-foo=bar][x-baz=bat]
```

Figure 6: Adding tags in private use namespaces

Figure 6, based on Figure 3, utilizes the private use namespace to declare two additional pieces of information in the suffix that can be interpreted by any compatible implementations and ignored otherwise.

4. IANA Considerations

Multi-character namespaces are assigned by IANA using the "IETF Review" policy defined by [RFC8126]; the IETF review process needs to be based on the requirements laid out in Section 3.3.

5. Security Considerations

TBD

6. References

6.1. Normative References

- [BCP47] Phillips, A. and M. Davis, "Matching of Language Tags", BCP 47, RFC 4647, September 2006.
- Phillips, A., Ed. and M. Davis, Ed., "Tags for Identifying Languages", BCP 47, RFC 5646, September 2009.
- <<https://www.rfc-editor.org/info/bcp47>>
- [RFC2026] Bradner, S., "The Internet Standards Process -- Revision 3", BCP 9, RFC 2026, DOI 10.17487/RFC2026, October 1996, <<https://www.rfc-editor.org/info/rfc2026>>.
- [RFC2028] Hovey, R. and S. Bradner, "The Organizations Involved in the IETF Standards Process", BCP 11, RFC 2028, DOI 10.17487/RFC2028, October 1996, <<https://www.rfc-editor.org/info/rfc2028>>.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
- [RFC3339] Klyne, G. and C. Newman, "Date and Time on the Internet: Timestamps", RFC 3339, DOI 10.17487/RFC3339, July 2002, <<https://www.rfc-editor.org/info/rfc3339>>.
- [RFC5234] Crocker, D., Ed. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", STD 68, RFC 5234, DOI 10.17487/RFC5234, January 2008, <<https://www.rfc-editor.org/info/rfc5234>>.
- [RFC8126] Cotton, M., Leiba, B., and T. Narten, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 8126, DOI 10.17487/RFC8126, June 2017, <<https://www.rfc-editor.org/info/rfc8126>>.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.

6.2. Informative References

- [CLDR] "Unicode CLDR Project", <<https://cldr.unicode.org>>.
- [IERS] "International Earth Rotation Service Bulletins", <<https://www.iers.org/IERS/EN/Publications/Bulletins/bulletins.html>>.
- [ISO8601] International Organization for Standardization, "Data elements and interchange formats Information interchange Representation of dates and times", ISO 8601:1988, June 1988, <<https://www.iso.org/standard/15903.html>>.
- [ITU-R-TF.460-6] "ITU-R TF.460-6. Standard-frequency and time-signal emissions", February 2002, <<https://www.itu.int/rec/R-REC-TF.460/en>>.
- [JAVAZDT] "Java SE 8, java.time.format, DateTimeFormatter: ISO_ZONED_DATE_TIME", <https://docs.oracle.com/javase/8/docs/api/java/time/format/DateTimeFormatter.html#ISO_ZONED_DATE_TIME>.
- [RFC1305] Mills, D., "Network Time Protocol (Version 3) Specification, Implementation and Analysis", RFC 1305, DOI 10.17487/RFC1305, March 1992, <<https://www.rfc-editor.org/info/rfc1305>>.

Appendix A. Acknowledgements

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draft-ietf-sedate-datetime-extended-04

Abstract

This document defines an extension to the timestamp format defined in RFC3339 for representing additional information including a time zone.

About This Document

This note is to be removed before publishing as an RFC.

Status information for this document may be found at <https://datatracker.ietf.org/doc/draft-ietf-sedate-datetime-extended/>.

Discussion of this document takes place on the Serialising Extended Data About Times and Events (SEDATE) Working Group mailing list (<mailto:sedate@ietf.org>), which is archived at <https://mailarchive.ietf.org/arch/browse/sedate/>.

Source for this draft and an issue tracker can be found at <https://github.com/ietf-wg-sedate/draft-ietf-sedate-datetime-extended>.

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1. Introduction

Dates and times are used in a very diverse set of internet applications, all the way from server-side logging to calendaring and scheduling.

Each distinct instant in time can be represented in a descriptive text format using a timestamp, and [ISO8601:1988] standardizes a widely-adopted timestamp format, which forms the basis of [RFC3339]. However, this format only allows timestamps to contain very little additional relevant information, which means that, beyond that, any contextual information related to a given timestamp needs to be either handled separately or attached to it in a non-standard manner.

This is already a pressing issue for applications that handle each instant with an associated time zone name, to take into account events such as daylight saving time transitions. Most of these applications attach the time zone to the timestamp in a non-standard format, at least one of which is fairly well-adopted [JAVAZDT]. Furthermore, applications might want to attach even more information to the timestamp, including but not limited to the calendar system in which it should be represented.

1.1. Scope

This document defines an extension syntax for timestamps as specified in [RFC3339] that has the following properties:

- * The extension suffix is completely optional, making existing [RFC3339] timestamps compatible with this format.
- * The format is compatible with the pre-existing popular syntax for attaching time zone names to timestamps ([JAVAZDT]).
- * The format provides a generalized way to attach any additional information to the timestamp.

This document does not address extensions to the format where the semantic result is no longer a fixed timestamp that is referenced to a (past or future) UTC time. For instance, it does not address:

- * Future time given as a local time in some specified time zone, where changes to the definition of that time zone (e.g., a political decision to enact or rescind daylight saving time) affect the instant in time corresponding with the timestamp.
- * "Floating time", i.e., a local time without information describing the UTC offset or time zone in which it should be interpreted.
- * The use of time scales different from UTC, such as TAI.

However, additional information augmenting a fixed timestamp may be sufficient to detect an inconsistency between intention and the actual information in the timestamp, e.g., between the UTC offset and time zone name in the timestamp. For instance, such an inconsistency might arise because of:

- * Political decisions as discussed above, or
- * errors in the applications producing and consuming such a timestamp.

While the information available is not generally sufficient to resolve the inconsistency, it may be used to initiate some out of band processing to obtain sufficient information for such a resolution.

In order to address some of the requirements implied here, future related specifications might define syntax and semantics of strings similar to [RFC3339]. Note that the extension syntax defined in the present document is designed in such a way that it can be useful for such specifications as well.

1.2. Definitions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

UTC: Coordinated Universal Time, as maintained since 1988 by the Bureau International des Poids et Mesures (BIPM) in conjunction with leap seconds as announced by the International Earth Rotation and Reference Frames Service [IERS]. From 1972 through 1987, UTC was maintained entirely by Bureau International de l'Heure (BIH). Before 1972, UTC was not generally recognized and civil time was determined by individual jurisdictions using different techniques for attempting to follow Universal Time based on measuring the rotation of the earth.

UTC is often mistakenly referred to as GMT, an earlier time scale UTC was designed to be a useful successor for.

ABNF: Augmented Backus-Naur Form, a format used to represent permissible strings in a protocol or language, as defined in [RFC5234]. The rules defined in Appendix B of [RFC5234] are imported implicitly.

Internet Date/Time Format: The date/time format defined in section 3 of this document.

Timestamp: An unambiguous representation of some instant in time.

UTC Offset: Difference between a given local time and UTC, usually given in negative or positive hours and minutes. For example, local time in New York in the wintertime is 5 hours behind UTC, so its UTC offset is "-05:00".

Z: A suffix which, when applied to a time, denotes a UTC offset of 00:00; often spoken "Zulu" from the ICAO phonetic alphabet representation of the letter "Z". (Definition from Section 2 of [RFC3339].)

Time Zone: A set of rules representing the relationship of local time to UTC for a particular place or region. Mathematically, a time zone can be thought of as a function that maps timestamps to UTC offsets. Time zones can deterministically convert a timestamp to local time. They can also be used in the reverse direction to convert local time to a timestamp, with the caveat that some local times may have zero or multiple possible timestamps due to nearby Daylight Saving Time changes or other changes to the UTC offset of that time zone. Unlike the UTC offset of a timestamp which makes no claims about the UTC offset of other related timestamps (and which is therefore unsuitable for performing local-time operations such as "one day later"), a time zone also defines how to derive new timestamps based on differences in local time. For example, to calculate "one day later than this timestamp in San Francisco", a time zone is required because the UTC offset of local time in San Francisco can change from one day to the next.

IANA Time Zone: A named time zone that is included in the Time Zone Database (often called tz or zoneinfo) maintained by IANA [TZDB][BCP175]. Most IANA time zones are named for the largest city in a particular region that shares the same time zone rules, e.g. Europe/Paris or Asia/Tokyo [TZDB-NAMING]. Special IANA time zones such as Etc/GMT+10 can be used to represent timestamps outside country boundaries, e.g. a buoy in the middle of the Pacific Ocean (note that the Etc/GMT+10 time zone has a constant UTC Offset of -10:00 [sic!]).

Note that the rules defined for a named IANA time zone can change over time. The use of a named IANA time zone implies that the intent is for the rules that are current at the time of interpretation to apply, i.e., the additional information conveyed by using that time zone name is to change with the changed rules as recorded in the IANA time zone database.

Offset Time Zone: A time zone defined by a specific UTC offset, e.g. +08:45 and serialized using as its name the same numeric UTC offset format used in an RFC 3339 timestamp. Although serialization with offset time zones is supported in this document for backwards compatibility with `java.time.ZonedDateTime` [JAVAZDT], use of offset time zones is strongly discouraged. In particular, programs MUST NOT copy the UTC offset from a timestamp into an offset time zone in order to satisfy another program which requires a time zone annotation in its input. Doing this will improperly assert that the UTC offset of timestamps in that location will never change, which can result in incorrect calculations in programs that add, subtract, or otherwise derive new timestamps from the one provided. For example, `2020-01-01T00:00+01:00[Europe/Paris]` will let programs add six months to the timestamp while adjusting for Summer Time (Daylight Saving Time). But the same calculation applied to `2020-01-01T00:00+01:00[+01:00]` will produce an incorrect result that will be off by one hour in the timezone Europe/Paris.

CLDR: Common locale data repository [CLDR], a project of the Unicode Consortium to provide locale data to applications.

For more information about time scales, see Appendix E of [RFC1305], Section 3 of [ISO8601:1988], and the appropriate ITU documents [ITU-R-TF.460-6].

2. Extended Date/Time format

This section discusses desirable qualities of formats for the timestamp extension suffix and defines such a format that extends [RFC3339] for use in Internet protocols.

2.1. Informative

The format is intended to allow implementations to specify additional important information in addition to the bare timestamp.

This is done by defining `_tags_`, each with a `_key_` and a `_value_` separated by an equals sign. The value of a tag can be one or more items delimited by hyphen/minus signs.

Applications can build an informative timestamp `_suffix_` using any number of these tags.

Keys are case-sensitive. Values are case-sensitive unless otherwise specified.

When a suffix contains a repeated key or otherwise conflicting tags, implementations MUST give precedence to whichever value is positioned first.

```
// I'd rather place a MUST NOT for this case, first. This definitely
// needs to be expanded into some general text about error handling.
//
// -- --- cabo
```

2.2. Registered

Actual suffix tag keys are registered by supplying the information specified in this section. This information is modeled after that specified for the media type registry [RFC6838]; if in doubt, the provisions of this registry should be applied analogously.

Key Identifier: The key.

Registration status: "Provisional" or "Permanent"

Description: A very brief description of the key.

Change controller: Who is in control of evolving the specification governing values for this key. This information can include email addresses of contact points and discussion lists, and references to relevant web pages (URLs).

Reference: A reference. For permanent tag keys, this includes a full specification. For provisional tag keys, there is an expectation that some information is available even if that does not amount to a full specification; in this case, the registrant is expected to improve this information over time.

Key names that start with an underscore are intended for experiments in controlled environments and cannot be registered; such keys MUST NOT be used for interchange and MUST be rejected by implementations not specifically configured to take part in such an experiment. See [BCP178] for a discussion about the danger of experimental keys leaking out to general production and why that MUST be prevented.

3. Syntax Extensions to RFC 3339

3.1. ABNF

The following rules extend the ABNF syntax defined in [RFC3339] in order to allow the inclusion of an optional suffix.

The extended date/time format is described by the rule date-time-ext. date-time and time-numoffset are imported from Section 5.6 of [RFC3339], ALPHA and DIGIT from Appendix B.1 of [RFC5234].

```

time-zone-initial = ALPHA / "." / "_"
time-zone-char   = time-zone-initial / DIGIT / "-" / "+"
time-zone-part   = time-zone-initial *13(time-zone-char)
                  ; but not "." or ".."
time-zone-name   = time-zone-part *("/" time-zone-part)
time-zone        = "[" time-zone-name / time-numoffset "]"

key-initial      = ALPHA / "_"
key-char         = key-initial / DIGIT / "-"
suffix-key       = key-initial *key-char

suffix-value     = 1*alphanum
suffix-values    = suffix-value *("-" suffix-value)
suffix-tag       = "[" suffix-key "=" suffix-values "]"
suffix           = [time-zone] *suffix-tag

date-time-ext    = date-time suffix

alphanum         = ALPHA / DIGIT

```

Figure 1: ABNF grammar of extensions to RFC 3339

Note that a time-zone is syntactically similar to a suffix-tag, but does not include an equals sign. This special case is only available for time zone tags.

3.2. Examples

Here are some examples of Internet extended date/time format.

```
1996-12-19T16:39:57-08:00
```

Figure 2: RFC 3339 date-time with time zone offset

Figure 2 represents 39 minutes and 57 seconds after the 16th hour of December 19th, 1996 with an offset of -08:00 from UTC. Note that this is the same instant in time as 1996-12-20T00:39:57Z, expressed in UTC.

```
1996-12-19T16:39:57-08:00[America/Los_Angeles]
```

Figure 3: Adding a time zone name

Figure 3 represents the exact same instant as the previous example but additionally specifies the human time zone associated with it ("Pacific Time") for time-zone-aware implementations to take into account.

```
1996-12-19T16:39:57-08:00[America/Los_Angeles][u-ca=hebrew]
```

Figure 4: Projecting to the Hebrew calendar

Figure 4 represents the exact same instant, but it informs calendar-aware implementations that they should project it to the Hebrew calendar.

```
1996-12-19T16:39:57-08:00[_foo=bar][_baz=bat]
```

Figure 5: Adding experimental tags

Figure 5, based on Figure 2, utilizes keys identified as experimental by a leading underscore to declare two additional pieces of information in the suffix; these can be interpreted by implementations that take part in the controlled experiment making use of these tag keys.

4. IANA Considerations

IANA is requested to establish a registry called "Timestamp Suffix Tag Keys". Each entry in the registry shall consist of the information described in Section 2.2. Initial contents of the registry are specified in Section 2.2.
// We need to actually do this; see github issue #4.

The registration policy [RFC8126] is "Specification Required" for permanent entries, and "Expert Review" for provisional ones. In the second case, the expert is instructed to ascertain that a basic specification does exist, even if not complete or published yet.

5. Security Considerations

TBD

6. References

6.1. Normative References

[BCP175] Lear, E. and P. Eggert, "Procedures for Maintaining the Time Zone Database", BCP 175, RFC 6557, DOI 10.17487/RFC6557, February 2012, <<https://www.rfc-editor.org/info/rfc6557>>.

- [BCP178] Saint-Andre, P., Crocker, D., and M. Nottingham, "Deprecating the "X-" Prefix and Similar Constructs in Application Protocols", BCP 178, RFC 6648, DOI 10.17487/RFC6648, June 2012, <<https://www.rfc-editor.org/info/rfc6648>>.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
- [RFC3339] Klyne, G. and C. Newman, "Date and Time on the Internet: Timestamps", RFC 3339, DOI 10.17487/RFC3339, July 2002, <<https://www.rfc-editor.org/info/rfc3339>>.
- [RFC5234] Crocker, D., Ed. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", STD 68, RFC 5234, DOI 10.17487/RFC5234, January 2008, <<https://www.rfc-editor.org/info/rfc5234>>.
- [RFC6838] Freed, N., Klensin, J., and T. Hansen, "Media Type Specifications and Registration Procedures", BCP 13, RFC 6838, DOI 10.17487/RFC6838, January 2013, <<https://www.rfc-editor.org/info/rfc6838>>.
- [RFC8126] Cotton, M., Leiba, B., and T. Narten, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 8126, DOI 10.17487/RFC8126, June 2017, <<https://www.rfc-editor.org/info/rfc8126>>.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.

6.2. Informative References

- [CLDR] "Unicode CLDR Project", <<https://cldr.unicode.org>>.
- [IERS] "International Earth Rotation Service Bulletins", <<https://www.iers.org/iers/EN/Publications/Bulletins/bulletins.html>>.
- [ISO8601:1988] International Organization for Standardization, "Data elements and interchange formats Information interchange Representation of dates and times", ISO 8601:1988, June 1988, <<https://www.iso.org/standard/15903.html>>.

- [ITU-R-TF.460-6]
"ITU-R TF.460-6. Standard-frequency and time-signal emissions", February 2002,
<<https://www.itu.int/rec/R-REC-TF.460/en>>.
- [JAVAZDT] "Java SE 8, java.time.format, DateTimeFormatter: ISO_ZONED_DATE_TIME",
<https://docs.oracle.com/javase/8/docs/api/java/time/format/DateTimeFormatter.html#ISO_ZONED_DATE_TIME>.
- [RFC1305] Mills, D., "Network Time Protocol (Version 3) Specification, Implementation and Analysis", RFC 1305, DOI 10.17487/RFC1305, March 1992,
<<https://www.rfc-editor.org/info/rfc1305>>.
- [TZDB] "Sources for time zone and daylight saving time data",
<<https://data.iana.org/time-zones/tz-link.html>>.
- [TZDB-NAMING]
"Theory and pragmatics of the tz code and data",
<<https://data.iana.org/time-zones/theory.html>>.

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