

Event Publishing Extensions to iCalendar

Working Draft Standard

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Abstract

This specification updates [IETF RFC 5545](#) by introducing a number of new iCalendar properties and components which are of particular use for event publishers and in social networking.

This specification also defines a new STRUCTURED-DATA property for iCalendar [IETF RFC 5545](#) to allow for data that is directly pertinent to an event or task to be included with the calendar data.

Introduction

The currently existing iCalendar standard [IETF RFC 5545](#) lacks useful methods for referencing additional, external information relating to calendar components. Additionally there is no standard way to provide rich text descriptions or meta-data associated with the event.

Current practice is to embed this information as links in the description or to add non-standard properties as defined in [IETF RFC 5545, Section 3.8.8.2](#).

This document updates [IETF RFC 5545](#) to define a number of properties and components referencing such external information that can provide additional information about an iCalendar component. The intent is to allow interchange of such information between applications or systems (e.g., between clients, between client and server, and between servers). Formats such as vCard [IETF RFC 2426](#) are likely to be most useful to the receivers of such events as they may be used in other applications — such as address books.

Event Publishing Extensions to iCalendar

1. Scope

2. Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IETF RFC 2119, BRADNER, S. *Key words for use in RFCs to Indicate Requirement Levels*. 1997. RFC Publisher. <https://www.rfc-editor.org/info/rfc2119>.

IETF RFC 2426, DAWSON, F., T. HOWES and Internet Engineering Task Force. *vCard MIME Directory Profile*. 1998. RFC Publisher. <https://www.rfc-editor.org/info/rfc2426>.

IETF RFC 3986, BERNERS-LEE, T., R. FIELDING and L. MASINTER. *Uniform Resource Identifier (URI): Generic Syntax*. 2005. RFC Publisher. <https://www.rfc-editor.org/info/rfc3986>.

IETF RFC 4589, SCHULZRINNE, H., H. TSCHOFENIG and Internet Engineering Task Force. *Location Types Registry*. 2006. RFC Publisher. <https://www.rfc-editor.org/info/rfc4589>.

IETF RFC 5545, Internet Engineering Task Force (committee). *Internet Calendaring and Scheduling Core Object Specification (iCalendar)*. 2009. RFC Publisher. <https://www.rfc-editor.org/info/rfc5545>.

IETF RFC 5546, Internet Engineering Task Force (committee). *iCalendar Transport-Independent Interoperability Protocol (iTIP)*. 2009. RFC Publisher. <https://www.rfc-editor.org/info/rfc5546>.

IETF RFC 7986, DABOO, C. and Internet Engineering Task Force. *New Properties for iCalendar*. 2016. RFC Publisher. <https://www.rfc-editor.org/info/rfc7986>.

IETF RFC 8126, COTTON, M., B. LEIBA and T. NARTEN. *Guidelines for Writing an IANA Considerations Section in RFCs*. 2017. RFC Publisher. <https://www.rfc-editor.org/info/rfc8126>.

IETF RFC 8174, LEIBA, B. *Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words*. 2017. RFC Publisher. <https://www.rfc-editor.org/info/rfc8174>.

IETF RFC 8259, Internet Engineering Task Force (committee). *The JavaScript Object Notation (JSON) Data Interchange Format*. 2017. RFC Publisher. <https://www.rfc-editor.org/info/rfc8259>.

W3C REC-html51-20171003, World Wide Web Consortium (committee). *HTML 5.1 2nd Edition*. 2017. World Wide Web Consortium. <https://www.w3.org/TR/2017/REC-html51-20171003/>.

W3C REC-xml-20081126, World Wide Web Consortium (committee). *Extensible Markup Language (XML) 1.0 (Fifth Edition)*. 2008. World Wide Web Consortium. <https://www.w3.org/TR/2008/REC-xml-20081126/>.

3. Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.

Event

When the (perhaps with a capitalised 'E') word 'event' is used we are referring to gatherings, formal or informal. For example a sports event, a party or a concert.

3.2.

Social Calendaring

Historically, calendar data and scheduling has been heavily biased towards meetings in a corporate environment. Some of the features defined in this document are to support a more

informal, i.e. social, model. For example, we may want to record who is participating in a public event.

4. Conventions

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 [IETF RFC 2119](#) [IETF RFC 8174](#) when, and only when, they appear in all capitals, as shown here.

5. Components and properties

Previous extensions to the calendaring standards have been largely restricted to the addition of properties or parameters. This is partly because iCalendar libraries had trouble handling components nested deeper than those defined in [IETF RFC 5545](#).

In a break with this ‘tradition’ this specification defines a number of components rather than properties. This is a better match for the way [W3C REC-xml-20081126](#) and JSON [IETF RFC 8259](#) handle such structures and allows richer definitions.

It also allows for the addition of extra properties inside the components and resolves some of the problems of trying to add detailed information as a parameter.

6. Typed References

The properties and components defined here can all reference external meta-data which may be used by applications to provide further information to users. By providing type information, clients and servers are able to discover interesting references and make use of them, perhaps for indexing or the presenting of additional related information for the user.

As always, clients should exercise caution in following references to external data.

The [IETF RFC 5545](#) LOCATION property provides only an unstructured single text value for specifying the location where an event (or task) will occur. This is inadequate for use cases where structured location information (e.g. address, region, country, postal code) is required or preferred, and limits widespread adoption of iCalendar in those settings.

Using the VLOCATION component, rich information about multiple locations can be communicated in a STRUCTURED-DATA property, for example, address, region, country, postal code as well as other information such as parking availability, nearby restaurants and the venue. Servers and clients can retrieve the objects when storing the event and use them to index by geographic location.

When a calendar client receives a calendar component it can search the set of locations looking for those of particular interest. The LOCATION-TYPE property and STRUCTURED-DATA FMTTYPE parameter, if supplied, can be used to help the selection.

The PARTICIPANT component is designed to handle common use cases in event publication. It is generally important to provide information about the organizers of such events. Sponsors wish to be referenced in a prominent manner. In social calendaring it is often important to identify the active participants in the event, for example a school sports team, and the inactive participants, for example the parents.

The PARTICIPANT component can be used to provide useful extra data about an attendee. For example a location inside the PARTICIPANT gives the actual location of a remote attendee. (But see the note about privacy.)

Alternatively the PARTICIPANT component can be used to provide a reference - perhaps the address for mailing lists.

6.1. Use Cases

The main motivation for these changes has been event publication but there are opportunities for use elsewhere. The following use cases will describe some possible scenarios.

6.1.1. Piano Concert Performance

In putting together a concert there are many participants: piano tuner, performer, stage hands etc. In addition there are sponsors and various contacts to be provided. There will also be a number of related locations. A number of events can be created, all of which relate to the performance in different ways.

There may be an iTIP [IETF RFC 5546](#) meeting request for the piano tuner who will arrive before the performance. Other members of staff may also receive meeting requests.

An event can also be created for publication which will have a PARTICIPANT component for the pianist providing a reference to vCard [IETF RFC 2426](#) information about the performer. This event would also hold information about parking, local subway stations and the venue itself. In addition, there may be sponsorship information for sponsors of the event and perhaps paid sponsorship properties essentially advertising local establishments.

6.1.2. Itineraries

These additions also provide opportunities for the travel industry. When booking a flight the PARTICIPANT component can be used to provide references to businesses at the airports and to car hire businesses at the destination.

The embedded location information can guide the traveler at the airport or to their final destination. The contact information can provide detailed information about the booking agent, the airlines, car hire companies and the hotel.

6.1.3. Reserving facilities

For a meeting, the size of a room and the equipment needed depends to some extent on the number of attendees actually in the room.

A meeting may have many attendees none of which are co-located. The current ATTENDEE property does not allow for the addition of such meta-data. The PARTICIPANT component allows attendees to specify their location.

7. Modifications to Calendar Components

The following changes to the syntax defined in [IETF RFC 5545](#) are made here. New elements are defined in subsequent sections.

```
; Addition of PARTICIPANT, VLOCATION and VRESOURCE
; as valid components
eventc      = "BEGIN" ":" "VEVENT" CRLF
              eventprop *alarmc *participantc *locationc *resourcec
              "END" ":" "VEVENT" CRLF

; Addition of properties STYLED-DESCRIPTION and STRUCTURED-DATA
eventprop   =/ *styleddescription
              *sdataprop
```

```

; Addition of PARTICIPANT, VLOCATION and VRESOURCE
; as valid components
todoc      = "BEGIN" ":" "VTODO" CRLF
            todoprop *alarmc *participantc *locationc *resourcec
            "END" ":" "VTODO" CRLF

; Addition of properties STYLED-DESCRIPTION, STRUCTURED-DATA
todoprop =/ *styleddescription
          *sdataprop

; Addition of PARTICIPANT, VLOCATION and VRESOURCE
; as valid components
journalc   = "BEGIN" ":" "VJOURNAL" CRLF
            jourprop *participantc *locationc *resourcec
            "END" ":" "VJOURNAL" CRLF

; Addition of properties STYLED-DESCRIPTION, STRUCTURED-DATA
jourprop =/ *styleddescription
          *sdataprop

; Addition of PARTICIPANT, VLOCATION and VRESOURCE
; as valid components
freebusyc  = "BEGIN" ":" "VFREEBUSY" CRLF
            fbprop *participantc *locationc *resourcec
            "END" ":" "VFREEBUSY" CRLF

; Addition of property STYLED-DESCRIPTION
fbprop     =/ *styleddescription

```

8. New Property Parameters

8.1. Order

Parameter name	ORDER
Purpose	To define ordering for the associated property.
Format Definition	This parameter is defined by the following notation: <pre> orderparam = "ORDER" "=" integer ; Must be greater than or equal to 1 </pre>
Description	The ORDER parameter is OPTIONAL and is used to indicate the relative ordering of the corresponding instance of a property. Its value MUST be an integer greater than or equal to 1 that specifies the order with 1 being the first in the ordering. When the parameter is absent, the default MUST be to interpret the property instance as being ordered last, that is, the property will appear after any other instances of the same property with any value of ORDER. When any ORDER parameters have the same value all the associated properties appear as a group within which there is no defined order. Note that the value of this parameter is to be interpreted only in relation to values assigned to other corresponding instances of the same property in the same entity.

This parameter MUST NOT be applied to a property that does not allow multiple instances.

Example uses The ORDER may be applied to the PARTICIPANT-TYPE property to indicate the relative importance of the participant, for example as a sponsor or a performer. For example, ORDER=1 could define the principal performer or soloist.

8.2. Schema

Parameter SCHEMA

Name

Purpose To specify the schema used for the content of a "STRUCTURED-DATA" property value.

Format This parameter is defined by the following notation:

Definition

schemaparam = "SCHEMA" "=" DQUOTE uri DQUOTE

Description This property parameter SHOULD be specified on "STRUCTURED-DATA" properties. When present it provides identifying information about the nature of the content of the corresponding "STRUCTURED-DATA" property value. This can be used to supplement the media type information provided by the "FMTP" parameter on the corresponding property.

Example STRUCTURED-DATA;FMTP=application/ld+json;
 SCHEMA="https://schema.org/FlightReservation";
 ENCODING=BASE64;VALUE=BINARY:ICAgIDxzY3JpcHQgdHlwZT0iYXBwb
 GljYXRpb24vbGQranNvbiI+CiAgICB7CiAgICAgICJAY29udGV4dCI6ICJodHR
 wOi8vc2NoZW1hLm9yZyIsCiAgICAgICJAdHlwZSI
 6ICJGblnaHRSZXNlcnZhdGlvbiIsCiAgICAgICJyZXNlcnZhdGlvbkklIjogI
 lJYSjM0UCIsCiAgICAgICJyZXNlcnZhdGlvblN0
 YXR1cyI6ICJodHRwOi8vc2NoZW1hLm9yZy9SZXNlcnZhdGlvbkNvbWZpcm1lZC
 IsCiAgICAgICJwYXNzZW5nZXJQcm1vcml0eVN0
 YXR1cyI6ICJGYXN0IFRyYWNrIiwKICAgICAgInBhc3NlbnRlcnVlbnNlcnVtYmV
 yIjogIkFCQzEyMyIsCiAgICAgICJzZW50eVNjcm1vcml0eVNjcm1vcml0eVNjcm1
 vbm9uZyI6ICJUU0EgUHJlQ2h1Y2siLAogICAgICAgICAidW5kZXJ0YW
 1lIjogewogICAgICAgICJAdHlwZSI6ICJQZXJzZ
 24iLAogICAgICAgICJuYW1lIjogIkV2YSBhcmVlbiIKICAgICAgfSwKICAgICA
 gInJlc2VydF0aW9uRm9yIjogewogICAgICAgIC
 JAdHlwZSI6ICJGblnaHR0dW1iZXIiOiAiVUEX
 MTAiLAogICAgICAgICJwcm92aWRlciI6IHsKIC
 AgICAgICAgICJAdHlwZSI6ICJBaXJsaW5lIiwKICAgICAgICAgICJuYW1lIjog
 IkNvbnRpbmVudGFsIiwKICAgICAgICAgICJpYX
 RhQ29kZSI6ICJDTyIsCiAgICAgICAgICAgICAiYm9hcmRpbmdQb2xpY3kiOiAiA
 HR0cDovL3NjaG9tYS5vcml0eVNjcm1vcml0eVNjcm1vcml0eVNjcm1vcml0eVN
 9saWN5IogICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgIC
 ICJAdHlwZSI6ICJBaXJsaW5lIiwKICAgICAgICAgICAgICAgICAgICAgICAgIC
 gICJuYW1lIjogIlVuaXRlZCI6ICAgICAgICAgICAgICAgICAgICAgICAgICAgIC
 iAgICAgICAgfSwKICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAg
 lQWlycG9ydCI6IHsKICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgIC
 AgICAgICAgICJuYW1lIjogIlNhbiBGcmFuY2IzY28
 gQWlycG9ydCI6ICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAg
 H0sCiAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgIC
 iMjAxNy0wMy0wNFQyMDoxNTowMC0wODowMCIsCiAgICAgICAgICAgICAgICAg
 XJwb3J0IjogewogICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAg
 gIkFpcnBvcnQiLAogICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgICAgIC
 EludGVybW9uZyYwWgQWlycG9ydCI6ICAgICAgICAgICAgICAgICAgICAgICAgIC

gICAgICAiaWF0YUNvZGUiOiAiSkZLIgogICAgICAgIH0sCiAgICAgICAgImFyc
 m12YWxUaW11IjogIjIwMTctMDMtMDVUMDY6MzA
 6MDAtMDU6MDAiCiAgICAgIH0KICAgIH0KICAgIDwvc2NyaXB0Pg==

8.3. Derived

Parameter Name	DERIVED
Purpose	To specify that the value of the associated property is derived from some other property value or values.
Format Definition	This parameter is defined by the following notation: <pre>derivedparam = "DERIVED" "=" ("TRUE" / "FALSE") ; Default is FALSE</pre>
Description	This property parameter MAY be specified on any property when the value is derived from some other property or properties. When present with a value of TRUE clients MUST NOT update the property. As an example, if a STYLED-DESCRIPTION property is present with FMTTYPE="application/rtf" then there may be an additional STYLED-DESCRIPTION property with FMTTYPE="text/html" and DERIVED=TRUE and a value created from the rtf value.
Example	STYLED-DESCRIPTION;FMTTYPE=text/html; DERIVED=TRUE:<html>...</html>

9. New Properties

This specification makes use of the NAME property which is defined in [IETF RFC 7986](#).

9.1. Location Type

Property name	LOCATION-TYPE
Purpose	To specify the type(s) of a location.
Value type	The value type for this property is TEXT. The allowable values are defined below.
Description	This property MAY be specified in VLOCATION components and provides a way to differentiate multiple locations. For example, it allows event producers to provide location information for the venue and the parking.
Format Definition	This property is defined by the following notation: <pre>loctype = "LOCATION-TYPE" loctypeparam ":" text *("," text) CRLF loctypeparam = *(";" other-param)</pre> Multiple values may be used if the location has multiple purposes, for example a hotel and a restaurant.

Values for this parameter are taken from the values defined in [IETF RFC 4589, Section 3](#). New location types SHOULD be registered in the manner laid down in section 5 of that specification.

9.2. Participant Type

Property name	PARTICIPANT-TYPE
Purpose	To specify the type of participant.
Value type	The value type for this property is TEXT. The allowable values are defined below.
Property Parameters	Non-standard parameters can be specified on this property.
Conformance	This property MUST be specified once within a PARTICIPANT component.
Description	This property defines the type of participation in events or tasks. Participants can be individuals or organizations, for example a soccer team, the spectators, or the musicians.
Format Definition	This property is defined by the following notation: <pre> participanttype = "PARTICIPANT-TYPE" partvalueparam ":" partvalue CRLF partvalue = ("ACTIVE" / "INACTIVE" / "SPONSOR" / "CONTACT" / "BOOKING-CONTACT" / "EMERGENCY-CONTACT" / "PUBLICITY-CONTACT" / "PLANNER-CONTACT" / "PERFORMER" / "SPEAKER" / iana-token) ; Other IANA-registered ; values partvalueparam = *(";" other-param) </pre>
Example	PARTICIPANT-TYPE:SPEAKER

The registered values for the PARTICIPANT-TYPE property have the meanings described here:

ACTIVE	A participant taking an active role — for example a team member.
INACTIVE	A participant taking an inactive role — for example an audience member.
SPONSOR	A sponsor of the event. The ORDER parameter may be used with this participant type to define the relative order of multiple sponsors.
CONTACT	Contact information for the event. The ORDER parameter may be used with this participant type to define the relative order of multiple contacts.
BOOKING-CONTACT	Contact information for reservations or payment

EMERGENCY-CONTACT	Contact in case of emergency
PUBLICITY-CONTACT	Contact for publicity
PLANNER-CONTACT	Contact for the event planner or organizer
PERFORMER	A performer — for example the soloist or the accompanist. The ORDER parameter may be used with this participant type to define the relative order of multiple performers. For example, ORDER=1 could define the principal performer or soloist.
SPEAKER	Speaker at an event

9.3. Resource Type

Property name	RESOURCE-TYPE
Purpose	To specify the type of resource.
Value type	The value type for this property is TEXT. The allowable values are defined below.
Format Definition	This property is defined by the following notation: <pre> restypeprop = "RESOURCE-TYPE" restypeparam ":" restypevalue CRLF restypevalue = ("ROOM" / "PROJECTOR" / "REMOTE-CONFERENCE-AUDIO" / "REMOTE-CONFERENCE-VIDEO" / iana-token) ; Other IANA-registered ; values restypeparam = *(";" other-param) </pre>
Description	This property MAY be specified in VRESOURCE components and provides a way to differentiate multiple resources.

The registered values are described below. New resource types SHOULD be registered in the manner laid down in this specification.

ROOM	A room for the event/meeting.
PROJECTOR	Projection equipment.
REMOTE-CONFERENCE-AUDIO	Audio remote conferencing facilities.
REMOTE-CONFERENCE-VIDEO	Video remote conferencing facilities.

9.4. Calendar Address

Property name	CALENDAR-ADDRESS
Purpose	To specify the calendar address for a participant.
Value type	CAL-ADDRESS

Property Parameters	IANA-registered, or non-standard property parameters can be specified on this property.
Conformance	This property MAY be specified once within a PARTICIPANT component.
Description	This property provides a calendar user address for the participant. If there is an ATTENDEE property with the same value then the participant is schedulable.
Format Definition	This property is defined by the following notation: <pre>calendaraddress = "CALENDAR-ADDRESS" caladdressparam ":" cal-address CRLF caladdressparam = *(";" other-param)</pre>

9.5. Styled-Description

Property name	STYLED-DESCRIPTION
Purpose	This property provides for one or more rich-text descriptions to replace that provided by the DESCRIPTION property.
Value type	There is no default value type for this property. The value type can be set to URI or TEXT. Other text-based value types can be used when defined in the future. Clients MUST ignore any properties with value types they do not understand.
Property Parameters	IANA-registered, non-standard, id, alternate text representation, format type, derived and language property parameters can be specified on this property.
Conformance	The property can be specified multiple times in the "VEVENT", "VTODO", "VJOURNAL", "VFREEBUSY", "PARTICIPANT", or "VALARM" calendar components. If it does appear more than once there MUST be exactly one instance of the property with no DERIVED parameter or DERIVED=FALSE. All others MUST have DERIVED=TRUE. Additionally, if there is one or more STYLED-DESCRIPTION property then the DESCRIPTION property should be either absent or have the parameter DERIVED=TRUE.
Description	This property supports rich-text descriptions, for example HTML. Event publishers typically wish to provide more and better formatted information about the event. This property is used in the "VEVENT" and "VTODO" to capture lengthy textual descriptions associated with the activity. This property is used in the "VJOURNAL" calendar component to capture one or more textual journal entries. This property is used in the "VALARM" calendar component to capture the display text for a DISPLAY category of alarm, and to capture the body text for an EMAIL category of alarm. In the PARTICIPANT component it provides a detailed description of the participant. VALUE=TEXT is used to provide rich-text inline as the property value.

VALUE=URI is used to provide a link to rich-text content which is expected to be displayed inline as part of the event.

In either case the DESCRIPTION property should be absent or contain a plain text rendering of the styled text.

Applications MAY attempt to guess the media type of the resource via inspection of its content if and only if the media type of the resource is not given by the "FMTTYPE" parameter. If the media type remains unknown, calendar applications SHOULD treat it as type "text/html" and process the content as defined in [W3C REC-html51-20171003](#).

Multiple STYLED-DESCRIPTION properties may be used to provide different formats or different language variants. However all but one MUST have DERIVED=TRUE.

Format Definition

This property is defined by the following notation:

```
styleddescription = "STYLED-DESCRIPTION" styleddescparam ":"
                    styleddescval CRLF
```

```
styleddescparam   = *(
                    ; The following is REQUIRED,
                    ; but MUST NOT occur more than once.
                    ;
                    (";" "VALUE" "=" ("URI" / "TEXT")) /
                    ;
                    ; The following are OPTIONAL,
                    ; but MUST NOT occur more than once.
                    ;
                    (";" altrepparam) / (";" languageparam) /
                    (";" fmttypeparam) / (";" derivedparam) /
                    ;
                    ; the following is OPTIONAL
                    ; and MAY occur more than once
                    ;
                    (";" other-param)
                    )
```

```
styleddescval     = ( uri / text )
                    ;Value MUST match value type
```

Example

The following is an example of this property. It points to an html description.

```
STYLED-DESCRIPTION;VALUE=URI:http://example.org/desc001.html
```

9.6. Structured-Data

Property Name	STRUCTURED-DATA
Purpose	This property specifies ancillary data associated with the calendar component.
Value Type	There is no default value type for this property. The value type can be set to TEXT, BINARY or URI
Property Parameters	IANA-registered, non-standard, inline encoding and value data type property parameters can be specified on this property. The format type

and schema parameters can be specified on this property and MUST be present for text or inline binary encoded content information.

Conformance This property can be specified multiple times in an iCalendar object. Typically it would be used in "VEVENT", "VTODO" or "VJOURNAL" calendar components.

Description The existing properties in iCalendar cover key elements of events and tasks such as start time, end time, location, summary, etc. However, different types of events often have other specific "fields" that it is useful to include in the calendar data. For example, an event representing an airline flight could include the airline, flight number, departure and arrival airport codes, check-in and gate-closing times etc. As another example, a sporting event might contain information about the type of sport, the home and away teams, the league the teams are in, information about nearby parking, etc.

This property is used to specify ancillary data in some structured format either directly (inline) as a "TEXT" or "BINARY" value or as a link via a "URI" value.

Rather than define new iCalendar properties for the variety of event types that might occur, it would be better to leverage existing schemas for such data. For example, schemas available at <https://schema.org> include different event types. By using standard schemas, interoperability can be improved between calendar clients and non-calendaring systems that wish to generate or process the data.

This property allows the direct inclusion of ancillary data whose schema is defined elsewhere. This property also includes parameters to clearly identify the type of the schema being used so that clients can quickly and easily spot what is relevant within the calendar data and present that to users or process it within the calendaring system.

iCalendar does support an "ATTACH" property which can be used to include documents or links to documents within the calendar data. However, that property does not allow data to be included as a "TEXT" value (a feature that "STRUCTURED-DATA" does allow), plus attachments are often treated as "opaque" data to be processed by some other system rather than the calendar client. Thus the existing "ATTACH" property is not sufficient to cover the specific needs of inclusion of schema data. Extending the "ATTACH" property to support a new value type would likely cause interoperability problems. Additionally some implementations manage attachments by stripping them out and replacing with a link to the resource. Thus a new property to support inclusion of schema data is warranted.

Format Definition This property is defined by the following notation:

```
sdataprop      = "STRUCTURED-DATA" sdataparam
                  (
                    ";" "VALUE" "=" "TEXT"
                    ":" text
                  ) /
                  (
                    ";" "ENCODING" "=" "BASE64"
                    ";" "VALUE" "=" "BINARY"
                    ":" binary
                  ) /
                  (
```

```

        ";" "VALUE" "=" "URI"
        ":" uri
    )
    CRLF

sdataparam = *(
    ;
    ; The following is OPTIONAL for a URI value,
    ; REQUIRED for a TEXT or BINARY value,
    ; and MUST NOT occur more than once.
    ;
    (";" fmttypeparam) /
    (";" schemaparam) /
    ;
    ; The following is OPTIONAL,
    ; and MAY occur more than once.
    ;
    (";" other-param)
    ;
)

```

Example The following is an example of this property:

```

STRUCTURED-DATA;FMTTYPE=application/ld+json;
SCHEMA="https://schema.org/SportsEvent";
VALUE=TEXT:{\n
  "@context": "http://schema.org"\,\n
  "@type": "SportsEvent"\,\n
  "homeTeam": "Pittsburgh Pirates"\,\n
  "awayTeam": "San Francisco Giants"\n
}\n

```

10. New Components

10.1. Participant

Component name	PARTICIPANT
Purpose	This component provides information about a participant in an event or task.
Conformance	This component can be specified multiple times in a “VEVENT”, “VTODO”, “VJOURNAL” or “VFREEBUSY” calendar component.
Description	This component provides information about a participant in a calendar component. A participant may be an attendee in a scheduling sense and the ATTENDEE property may be specified in addition. Participants can be individuals or organizations, for example a soccer team, the spectators or the musicians. STRUCTURED-DATA properties if present may refer to definitions of the participant — such as a vCard. The CALENDAR-ADDRESS property if present will provide a cal-address. If an ATTENDEE property has the same value the participant is considered schedulable. The PARTICIPANT component can be used to contain additional meta-data related to the attendee.

Format
Definition

This component is defined by the following notation:

```

participantc = "BEGIN" ":" "PARTICIPANT" CRLF
               partprop *locationc *resourcec
               "END" ":" "PARTICIPANT" CRLF

partprop      = *(
               ;
               ; The following are REQUIRED,
               ; but MUST NOT occur more than once.
               ;
               participanttype / uid /
               ;
               ; The following are OPTIONAL,
               ; but MUST NOT occur more than once.
               ;
               calendaraddress / created / description /
dtstamp /
               geo / last-mod / priority / seq /
               status / summary / url /
               ;
               ; The following are OPTIONAL,
               ; and MAY occur more than once.
               ;
               attach / categories / comment /
               contact / location / rstatus / related /
               resources / strucloc / strucres /
styledescription /
               sdataprop / iana-prop
               ;
               )

```

Note When the PRIORITY is supplied it defines the ordering of PARTICIPANT components with the same value for the PARTICIPANT-TYPE property.

Privacy Issues When a LOCATION is supplied it provides information about the location of a participant at a given time or times. This may represent an unacceptable privacy risk for some participants. User agents MUST NOT broadcast this information without the express permission of the participants whose location would be exposed.

Example The following is an example of this component. It contains a STRUCTURED-DATA property which points to a vCard providing information about the event participant.

```

BEGIN:PARTICIPANT
UID: em9lQGZvb2GFtcGx1LmNvbQ
PARTICIPANT-TYPE:PERFORMER
STRUCTURED-DATA;VALUE=URI:
  http://dir.example.com/vcard/aviolinist.vcf
END:PARTICIPANT

```

Example The following is an example for the primary contact.

```

BEGIN:PARTICIPANT
UID: em9lQGZvb2GFtcGx1LmNvbQ
STRUCTURED-DATA;VALUE=URI:
  http://dir.example.com/vcard/contacts/contact1.vcf
PARTICIPANT-TYPE:CONTACT
DESCRIPTION:A contact

```

END:PARTICIPANT

Example The following is an example for a participant with contact and location.

```

BEGIN:PARTICIPANT
UID: em9lQGZvb2GFtcGx1LmNdrt
STRUCTURED-DATA;VALUE=URI;
  http://dir.example.com/vcard/contacts/my-card.vcf
PARTICIPANT-TYPE:SPEAKER
DESCRIPTION:A participant
BEGIN:VLOCATION
UID:123456-abcdef-98765432
NAME:My home location
STRUCTURED-DATA;VALUE=URI;
  http://dir.example.com/addresses/my-home.vcf
END:VLOCATION
END:PARTICIPANT

```

10.1.1. Schedulable Participant

A PARTICIPANT component may represent someone or something that needs to be scheduled as defined for ATTENDEE in [IETF RFC 5545](#) and [IETF RFC 5546](#). The PARTICIPANT component may also represent someone or something that is NOT to receive scheduling messages.

For backwards compatibility with existing clients and servers when used to schedule events and tasks the ATTENDEE property MUST be used to specify the scheduling parameters as defined for that property.

For other, future uses the CALENDAR-ADDRESS property MUST be used to specify those parameters.

A PARTICIPANT component is defined to be schedulable if:

- It contains a CALENDAR-ADDRESS property
- That property value is the same as the value for an ATTENDEE property.

If both of these conditions apply then the participant defined by the value of the URL property will take part in scheduling operations as defined in [IETF RFC 5546](#).

An appropriate use for the PARTICIPANT component in scheduling would be to store SEQUENCE and DTSTAMP properties associated with replies from each ATTENDEE. A LOCATION property within the PARTICIPANT component might allow better selection of meeting times when participants are in different timezones.

10.2. Location

Component name	VLOCATION
Purpose	This component provides rich information about the location of an event using the structured data property or optionally a plain text typed value.
Conformance	This component can be specified multiple times in a "VEVENT", "VTODO", "VJOURNAL", "VFREEBUSY" or "PARTICIPANT" calendar component.
Description	There may be a number of locations associated with an event. This component provides detailed information about a location.

When used in a component the value of this property provides information about the event venue or of related services such as parking, dining, stations etc.

STRUCTURED-DATA properties if present may refer to representations of the location — such as a vCard.

**Format
Definition**

This component is defined by the following notation:

```
locationnc      = "BEGIN" ":" "VLOCATION" CRLF
                  locprop
                  "END" ":" "VLOCATION" CRLF

locprop         = *(
                  ;
                  ; The following are REQUIRED,
                  ; but MUST NOT occur more than once.
                  ;
                  uid /
                  ;
                  ; The following are OPTIONAL,
                  ; but MUST NOT occur more than once.
                  ;
                  description / geo / loctype / name /
                  ;
                  ; The following are OPTIONAL,
                  ; and MAY occur more than once.
                  ;
                  sdataprop / iana-prop
```

The NAME property is defined in [IETF RFC 7986](#).

Example The following is an example of this component. It points to a venue.

```
BEGIN:VLOCATION
UID:123456-abcdef-98765432
NAME:The venue
STRUCTURED-DATA;VALUE=URI:
  http://dir.example.com/venues/big-hall.vcf
END:VLOCATION
```

10.3. Resource

Component name	VRESOURCE
Purpose	This component provides a typed reference to external information about a resource or optionally a plain text typed value. Typically a resource is anything that might be required or used by a calendar entity and possibly has a directory entry.
Conformance	This component can be specified multiple times in a “VEVENT”, “VTODO”, “VJOURNAL”, “VFREEBUSY” or “PARTICIPANT” calendar component.
Description	When used in a component this component provides information about resources used for the event such as rooms, projectors, conferencing capabilities. The RESOURCE-TYPE value registry provides a place in which resource types may be registered.

STRUCTURED-DATA properties if present may refer to representations of the resource — such as a vCard.

**Format
Definition**

This component is defined by the following notation:

```
resourcec      = "BEGIN" ":" "VRESOURCE" CRLF
                resprop
                "END" ":" "VRESOURCE" CRLF

resprop        = *(
                ;
                ; The following are REQUIRED,
                ; but MUST NOT occur more than once.
                ;
                uid /
                ;
                ; The following are OPTIONAL,
                ; but MUST NOT occur more than once.
                ;
                description / geo / name / restype /
                ;
                ; The following are OPTIONAL,
                ; and MAY occur more than once.
                ;
                sdataprop / iana-prop
```

The NAME property is defined in [IETF RFC 7986](#)

Example The following is an example of this component. It refers to a projector.

```
BEGIN:VRESOURCE
UID:456789-abcdef-98765432
NAME:The projector
RESOURCE-TYPE:projector
STRUCTURED-DATA;VALUE=URI:http://dir.example.com/projectors/3d.
vcf
END:VRESOURCE
```

11. Extended examples

The following are some examples of the use of the properties defined in this specification. They include additional properties defined in [IETF RFC 7986](#) which includes IMAGE.

11.1. Example 1

The following is an example of a VEVENT describing a concert. It includes location information for the venue itself as well as references to parking and restaurants.

```
BEGIN:VEVENT
CREATED:20200215T145739Z
DESCRIPTION: Piano Sonata No 3\n
Piano Sonata No 30
DTSTAMP:20200215T145739Z
DTSTART;TZID=America/New_York:20200315T150000Z
DTEND;TZID=America/New_York:20200315T163000Z
LAST-MODIFIED:20200216T145739Z
SUMMARY:Beethoven Piano Sonatas
UID:123456
IMAGE;VALUE=URI;DISPLAY=BADGE;FMTTYPE=image/png:h
```

```

  ttp://example.com/images/concert.png
BEGIN:PARTICIPANT
PARTICIPANT-TYPE:SPONSOR
UID:dG9tQGZvb2Jhci5x1LmNvbQ
STRUCTURED-DATA;VALUE=URI:http://example.com/sponsor.vcf
END:PARTICIPANT
BEGIN:PARTICIPANT
PARTICIPANT-TYPE:PERFORMER:
UID:em9lQGZvb2GFtcGx1LmNvbQ
STRUCTURED-DATA;VALUE=URI:http://www.example.com/people/johndoe.vcf
END:PARTICIPANT
BEGIN:VLOCATION
UID:123456-abcdef-98765432
NAME:The venue
STRUCTURED-DATA;VALUE=URI:http://dir.example.com/venues/big-hall.vcf
END:VLOCATION
BEGIN:VLOCATION
UID:123456-abcdef-87654321
NAME:Parking for the venue
STRUCTURED-DATA;VALUE=URI:http://dir.example.com/venues/parking.vcf
END:VLOCATION
END:VEVENT

```

11.2. Example 2

The following is an example of a VEVENT describing a meeting. One of the attendees is a remote participant.

```

BEGIN:VEVENT
CREATED:20200215T145739Z
DTSTAMP:20200215T145739Z
DTSTART;TZID=America/New_York:20200315T150000Z
DTEND;TZID=America/New_York:20200315T163000Z
LAST-MODIFIED:20200216T145739Z
SUMMARY:Conference planning
UID:123456
ORGANIZER:mailto:a@example.com
ATTENDEE;PARTSTAT=ACCEPTED;CN=A:mailto:a@example.com
ATTENDEE;RSVP=TRUE;CN=B:mailto:b@example.com
BEGIN:PARTICIPANT
PARTICIPANT-TYPE:ACTIVE:
UID:v39lQGZvb2GFtcGx1LmNvbQ
STRUCTURED-DATA;VALUE=URI:http://www.example.com/people/b.vcf
LOCATION:At home
END:PARTICIPANT
END:VEVENT

```

12. Security Considerations

This specification extends [IETF RFC 5545](#) and makes further use of possibly linked data. While calendar data is not unique in this regard it is worth reminding implementors of some of the dangers and safeguards.

12.1. URIs

See [IETF RFC 3986](#) for a discussion of the security considerations relating to URIs. Because of the issues discussed there and below, clients SHOULD NOT follow URIs and fetch content automatically, and should only do so at the explicit request of the user.

Fetching remote resources carries inherent risks. Connections must only be allowed on well known ports, using allowed protocols (generally just HTTP/HTTPS on their default ports). The URL must be resolved externally and not allowed to access internal resources. Connecting to an external source reveals IP (and therefore generally location) information.

A maliciously constructed iCalendar object may contain a very large number of URIs. In the case of published calendars with a large number of subscribers, such objects could be widely distributed. Implementations should be careful to limit the automatic fetching of linked resources to reduce the risk of this being an amplification vector for a denial-of-service attack.

12.2. Malicious Content

For the “STRUCTURED-DATA” property, agents need to be aware that a client could attack underlying storage by sending extremely large values and could attack processing time by uploading a recurring event with a large number of overrides and then repeatedly adding, updating and deleting structured data.

Agents should set reasonable limits on storage size and number of instances and apply those constraints. Calendar protocols should ensure there is a way to report on such limits being exceeded.

Malicious content could be introduced into the calendar server by way of the “STRUCTURED-DATA” property and propagated to many end users via scheduling. Servers SHOULD check this property for malicious or inappropriate content. Upon detecting such content, servers SHOULD remove the property.

12.3. HTML Content

When processing HTML content, applications need to be aware of the many security and privacy issues, as described in the IANA considerations section of [W3C REC-html51-20171003](#).

13. Privacy Considerations

13.1. Tracking

Properties with a “URI” value type can expose their users to privacy leaks as any network access of the URI data can be tracked both by a network observer and by the entity hosting the remote resource. Clients SHOULD NOT automatically download data referenced by the URI without explicit instruction from users.

To help alleviate some of the concerns protocols and services could provide proxy services for downloading referenced data.

13.2. Revealing Locations

The addition of location information to the new participant component provides information about the location of participants at a given time. This information MUST NOT be distributed to other participants without those participant’s express permission. Note that there may be a number of participants who may be unaware of their inclusion in the data.

Agents processing and distributing calendar data must be aware that it has the property of providing information about a future time when a given individual may be at a particular location, which could enable targeted attacks against that individual.

The same may be true of other information contained in the participant component. In general, revealing only as much as is absolutely necessary should be the approach taken.

For example, there may be some privacy considerations relating to the ORDER parameter, as it provides an indication of the organizer's perception of the relative importance of other participants.

14. IANA Considerations

14.1. Additional iCalendar Registrations

14.1.1. Properties

This document defines the following new iCalendar properties to be added to the registry defined in [IETF RFC 5545, Section 8.2.3](#):

Table 1

Property	Status	Reference
CALENDAR-ADDRESS	Current	RFCXXXX, Clause 9.4
LOCATION-TYPE	Current	RFCXXXX, Clause 9.1
PARTICIPANT-TYPE	Current	RFCXXXX, Clause 9.2
RESOURCE-TYPE	Current	RFCXXXX, Clause 9.3
STRUCTURED-DATA	Current	RFCXXXX, Clause 9.6
STYLED-DESCRIPTION	Current	RFCXXXX, Clause 9.5

14.1.2. Parameters

This document defines the following new iCalendar property parameters to be added to the registry defined in [IETF RFC 5545, Section 8.2.4](#):

Table 2

Property Parameter	Status	Reference
ORDER	Current	RFCXXXX, Clause 8.1
SCHEMA	Current	RFCXXXX, Clause 8.2
DERIVED	Current	RFCXXXX, Clause 8.3

14.1.3. Components

This document defines the following new iCalendar components to be added to the registry defined in [IETF RFC 5545, Section 8.3.1](#):

Table 3

Component	Status	Reference
PARTICIPANT	Current	RFCXXXX, Clause 10.1
VLOCATION	Current	RFCXXXX, Clause 10.2
VRESOURCE	Current	RFCXXXX, Clause 10.3

14.2. New Registration Tables

This section defines new registration tables for PARTICIPANT-TYPE and RESOURCE-TYPE values. These tables are updated using the same approaches laid down in [IETF RFC 5545, Section 8.2.1](#).

This document creates new IANA registries for participant and resource types.

IANA will maintain these registries and, following the policies outlined in [IETF RFC 8126](#), new tokens are assigned after Expert Review. The Expert Reviewer will generally consult the IETF GeoPRIV working group mailing list or its designated successor. Updates or deletions of tokens from the registration follow the same procedures.

The expert review should be guided by a few common sense considerations. For example, tokens should not be specific to a country, region, organization, or company; they should be well-defined and widely recognized. The expert's support of IANA will include providing IANA with the new token(s) when the update is provided only in the form of a schema, and providing IANA with the new schema element(s) when the update is provided only in the form of a token.

To ensure widespread usability across protocols, tokens MUST follow the character set restrictions for XML Names [3].

Each registration must include the name of the token and a brief description similar to the ones offered herein for the initial registrations contained this document:

14.2.1. Participant Types

The following table has been used to initialize the participant types registry:

Table 4

Participant Type	Status	Reference
ACTIVE	Current	RFCXXXX, Clause 9.2
INACTIVE	Current	RFCXXXX, Clause 9.2
SPONSOR	Current	RFCXXXX, Clause 9.2
CONTACT	Current	RFCXXXX, Clause 9.2
BOOKING-CONTACT	Current	RFCXXXX, Clause 9.2
EMERGENCY-CONTACT	Current	RFCXXXX, Clause 9.2
PUBLICITY-CONTACT	Current	RFCXXXX, Clause 9.2
PLANNER-CONTACT	Current	RFCXXXX, Clause 9.2
PERFORMER	Current	RFCXXXX, Clause 9.2
SPEAKER	Current	RFCXXXX, Clause 9.2

14.2.2. Resource Types

The following table has been used to initialize the resource types registry:

Table 5

Resource Type	Status	Reference
PROJECTOR	Current	RFCXXXX, Clause 9.3
ROOM	Current	RFCXXXX, Clause 9.3
REMOTE-CONFERENCE-AUDIO	Current	RFCXXXX, Clause 9.3
REMOTE-CONFERENCE-VIDEO	Current	RFCXXXX, Clause 9.3

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