SML
Internet-Draft
Intended status: Standards Track
Expires: 8 January 2026

H.-J. Happel
audriga GmbH

7 July 2025

Structured vacation notices
draft-ietf-sml-structured-vacation-notices-01

Abstract

This document describes a machine-readable format for conveying unavailibility information in email messages. This includes "vacation notices" of persons but also different forms of unavailibility for emails sent by programs.

Structured vacation notices are supposed to be used in conjunction with conventional, human-readable vacation notices in most cases. They are based on the forthcoming "structured email" specification defined in [I-D.ietf-sml-structured-email-03] and related drafts.

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 https://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 8 January 2026.

Copyright Notice

Table of Contents

1. Introduction 3
2. Conventions Used in This Document 4
3. Scope 4
3.1. Subjects of Unavailabily 4
3.2. Time periods 4
3.2.1. Temporary 5
3.2.2. Permanent 5
4. Data model 6
4.1. Absence 6
4.2. Replacements 6
4.3. Mailbox status information 7
4.4. Note 7
5. Use cases 7
5.1. Absentee 7
5.1.1. Outgoing vacation notice 7
5.1.2. Outgoing preemptive vaction notice 8
5.2. Communication partner 8
5.2.1. Incoming vacation notice 8
5.2.2. Incoming preemptive vacation notice 9
5.2.3. Message composition 9
6. Implementation guidance 9
6.1. Sending 9
6.1.1. Leave structured vacation notices optional 9
6.1.2. Provide alternative representations 9
6.2. Processing 9
6.2.1. Igore past time ranges 9
6.2.2. Prefer latest vacation time range 10
6.2.3. Strip when forwarding 10
7. Implementation status 10
7.1. Structured Vacation Notice plugin for Roundcube Webmail 10
8. Security considerations 10
9. Privacy considerations 11
10. IANA Considerations 11
11. Appendix (Examples) 11
11.1. Example 1: Minimum viable structured vacation notice . . 11
11.2. Example 2: Basic structured vacation notice 11
11.3. Example 3: Basic structured vacation notice with AvailabilityPattern 12
11.4. Example 4: Structured vacation notice with AvailabilityPattern only 12

11.5. Example 5: Structured vacation notice with replacements 12
11.6. Example 6: Structured vacation notice for service with replacements 13
11.7. Example 7: Permanant unavailability 14
11.8. Example 8: Permanant unavailability after future date . 14
11.9. Example 9: Mailbox has moved 15
11.10. Example 10: Minimum noreply address 15
11.11. Example 11: Noreply address with phone contact 15
12. Appendix (vCard properties) 16
13. Appendix (Related use cases) 16
13.1. New contact data 17
13.2. Bounces 17
14. Informative References 17
Author's Address 19

1. Introduction

A "vacation notice" (also known as "out-of-office notice" [RFC3834][RFC5598] or "-reply") is a short text message which is automatically sent in response to incoming mail, if the recipient is absent or otherwise unable to answer immediately. Its content is written by the absentee in advance and usually informs about the unavailibility and possible alternative contacts for urgent inquiries.

The email system will return this content as an automatic repliy to incoming email messages, based on conditions set by the absentee. The most commonly used condition is the time period, during which incoming messages should be automatically answered with a vacation notice.

Vacation notices have not been standardized as such. A partial, implicit specification is contained in [RFC5230], which specifies an extension to the Sieve email filtering language. The user interface of MUAs provides further formalization of the user input for a vacation notice. While all this happens on the side of the absentee, vacation notices received by communication paterns just appear as a regular, human-readable email message.

The goal of this specification is to allow absentees to include a machine-readable version of the vacation notice, so that their communication partners can be assisted by software when dealing with vacation notices.

While this specification may be used stand-alone, is aims to be compliant to the "structured email" specification ([I-D.ietf-sml-structured-email-03]) and its trust and security recommendations ([I-D.happel-structured-email-trust-04]).

2. Conventions Used in This Document

The term "message" refers to "electronic mail messages" or "emails" as specified in [RFC5322].

The term "Message User Agent" (MUA) denotes an email client application as per [RFC5598]. Based on the role of the communication partners, one can further distiguish into "Recipient MUA" (rMUA) and "Author MUA" (aMUA).

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.

3. Scope

3.1. Subjects of Unavailabily

The unavailability of a particular mailbox owner (i.e., person) is the most common case for a vacation notice. In practice, vacation notices and similar messages are also often used on generic _role acocunts_ ([RFC2142]) to indicate the unavailability of a certain service ("Our restaurant is closed till the end of August").

3.2. Time periods

Many systems allow to specify a time range, during which a vacation notice should be sent. Notably, this time range must not exactly match the actual absence time, even though this is probably the most common case in practice.

When realized using the Sieve vacation extension ([RFC5230]), time periods are typically defined in conjuction with a currentdate test ([RFC5260]).

We distinguish temporary and permantenty availability for considering the time periods of unavailability denoted by a structured vacation notice.

3.2.1. Temporary

Temporary unavailabily for a certain time range is the most common case for vacation notices, typically specifying a start and an end date. Some systems also allow for an open-ended time period, leaving start or end date empty.

The specification of fixed workdays for a person or of service days for an organization is currently not supported by most systems.

3.2.2. Permanent

Permanent unavailability can be seen as a special case of unavailability, in which a person or service will be no more available in the future. This is mentioned as part of the "Change of address" case in [RFC3834] and can already be modeled in some systems by leaving both, start and end date, empty.

Even though the corresponding mailbox will eventually cease to exist at some point, it is not uncommon that affected persons or services return a "permanent unavailability" message during a phase-out period.

3.2.2.1. Mailbox move

A mailbox move is a special form of permanent unavailability. While the original mailbox will become permantently unavailable at some point, there exists a new mailbox replacing the former one (also mentioned in the "Change of address" case in [RFC3834]).

Reasons for this might be a name change in the local part (e.g., due to marriage) or a name change in the domain part (e.g., a company merge or renaming).

3.2.2.2. Noreply

A "noreply" message is an internet naming convention, indicating that a sending mailbox is not attended and replies to that mailbox will likely be discarded. This fact is typically conveyed by the name of the email address ("noreply@example.com") and sometimes explained in the email body. It is typically used on machine-generated, transactional emails.

Noreply messages can be considered as a form of unavailability and hence fit into this draft. "Replacement" information as described in the data model of this specification can be used to point receipients to other communication channels such as a phone hotline.

4. Data model

The minimum data for a vacation notice is the actual notice content as specified by the absentee. It might be as short as "I am currently out of office".

This document specifies an RDF class UnavailabilityInformation which is described in the following sections.

4.1. Absence

start and end are optional date fields in the format YYYY-MM-DDThh:mm:ssZ following ISO 8601 ([iso8601]). Since both dates are fixed in time, they do not require timezone information for interpretation. Hence, the date MUST only be formatted in UTC.

availabilityPattern is a text String with similar semantics as the Schema.org openingHours property ([openingHours]).
availabilityTimezone is a text String with an identifier from the IANA Time Zone Database ([tzdb]). If an availabilityPattern is set, the availabilityTimezone property MUST be set as well.

Both start/end and availabilityPattern might be used in parallel. In this case, the start/end dates override the availabilityPattern in case of conflict.

A permanent absence can be signaled explicily using mailbox status information as explained below.

4.2. Replacements

Vacation notice content may also contain information about if a message is automatically forwarded to a replacement person (isForwarded), or details about replacement persons to contact for urgent inquiries (replacement).

When considering organizational users or role accounts, a replacement can also be another organization ("While our doctor’s office is closed, refer to Dr. Doe in case of emergencies"). Values of the replacement property are of type Replacement, which:

* MAY contain a description to add context for distinguishing multiple replacement options
* MAY contain an availabilityPattern and availabilityTimezone
* and MUST contain instances of either Schema.Org Person ([person]) or Organization ([organization]) or any of its subclasses.

4.3. Mailbox status information

For a clear distinction of cases of temporary and permanent unavailability, senders MAY specify an unavailabilityType property in UnavailabilityInformation.

unavailabilityType is text field, allowing for the following values:

* temporary (temporary absence/classic vacation notice; implicit default value)
* permanent (infinite absence / mailbox is not used anymore)
* moved (mailbox name has changed)
* noreply (mailbox is send only)

For any value which is not temporary, potentially conflicting information from the end date MUST be ignored. The start date however MUST be considered if set.

4.4. Note

The note property is a text String which allows for an optional free-form message in addition to the structured data.

For discussion, see also:
https://github.com/hhappel/draft-happel-sml-structured-vacation-notices/issues/1

5. Use cases

For the use cases, we distinguish the absentee, willing to answer incoming messages with a vacation notice, and communication partner(s), which are sending messages to the absentee during or around the time of her absence.

5.1. Absentee

The absentee might want to send vacation notices in two difference scenarios. Besides the common, dedicated vacation notice autoreplies, machine-readable vacation notices might also be added to regular email messages sent to communication partners ("preemptive vacation notice").

5.1.1. Outgoing vacation notice

For adding a structured vacation notice in a common vacation notice message, a JSON-LD snippet using the UnavailabilityInformation type defined in the previous section needs to be embedded in the text/html representation of the vacation notice email (TODO sync with [I-D.ietf-sml-structured-email-03]).

In systems using the Sieve vacation extension ([RFC5230]), text/html body parts are supported when using the parameter to include MIME content (:mime).

If the user interface already allows to set date ranges, the structured vacation notice data may be added or prefilled automatically, without extra user effort.

5.1.2. Outgoing preemptive vaction notice

Structured vacation notices can support a second use case, in which information can be preemptively added to regular outgoing email messages by the absentee.

This may be helpful in three scenarios, if an absentee sends a message:

* _during_ her absence, to proactively inform communication partners
* _before_ her absence, so that communication partners can preemptively learn about an upcoming absence and take according actions
* _after_ her absence, communication partners could learn that the absentee is available again (in particular, if no initial absence end date was given, or if the absence ended earlier than planned)

<a/>

For discussion, see also:
https://github.com/hhappel/draft-happel-sml-structured-vacation-notices/issues/2

5.2. Communication partner

Structured vacation notices may be processed by the communication partner (resp. her MUA) in different ways.

5.2.1. Incoming vacation notice

If an incoming vacation notice contains structured vacation notice data, the MUA of the communication partner MAY extract and store this data.

Since the MUA can make sense of the structured vacation notice, it MAY also employ various forms of user assistance at its own discretion, such as:

* Highlighting the absence in a special way
* Allowing the user to take certain actions (e.g., set a reminder, store to calendar, or forward the message to a replacement person)

5.2.2. Incoming preemptive vacation notice

As described before, the absentee may decide to add structured vacation notices in regular messages sent before, during, or after her absence.

When receiving such messages, the MUA of the communication partner MAY extract and store the structured vacation notice and MAY display the absence information.

5.2.3. Message composition

If a communication partner wants to send a message to a person, for which a structured vacation notice has been received earlier, the MUA MAY inform its user about this upcoming or ongoing absence.

6. Implementation guidance

The following points should be considered when implementing (structured) vacation notices from a sender and recipient-side processing perspective.

6.1. Sending

6.1.1. Leave structured vacation notices optional

Adding structured data to a vacation notice should be left as a choice to the user. A MUA SHOULD not add structured data to vacation notices without explicit consent or action of the user.

6.1.2. Provide alternative representations

Vacation notices containing structured data which are sent to human readers MUST contain a human readable alternative version of the vacation notice using text/plain and/or text/html multipart/alternative body parts.

Vacation notices sent between mailboxes that are known to be processed by programs only may just contain a structured vacation notice as their main message body part.

6.2. Processing

6.2.1. Igore past time ranges

A MUA MUST ignore structured vacation notices with time ranges in the past.

6.2.2. Prefer latest vacation time range

If multiple structured vacation notices exist for a user, prefer the one from the most recently received message.

6.2.3. Strip when forwarding

In the case of preemptive structured vacation notices, strip the structured data from the message when it is forwarded to a third party by the user.

7. Implementation status

< RFC Editor: before publication please remove this section and the reference to [RFC7942] >

This section records the status of known implementations of the protocol defined by this specification at the time of posting of this Internet-Draft, and is based on a proposal described in [RFC7942]. The description of implementations in this section is intended to assist the IETF in its decision processes in progressing drafts to RFCs. Please note that the listing of any individual implementation here does not imply endorsement by the IETF. Furthermore, no effort has been spent to verify the information presented here that was supplied by IETF contributors. This is not intended as, and must not be construed to be, a catalog of available implementations or their features. Readers are advised to note that other implementations may exist.

According to [RFC7942], "this will allow reviewers and working groups to assign due consideration to documents that have the benefit of running code, which may serve as evidence of valuable experimentation and feedback that have made the implemented protocols more mature. It is up to the individual working groups to use this information as they see fit".

7.1. Structured Vacation Notice plugin for Roundcube Webmail

This draft is implemented in an open source plugin for the Roundcube Webmail system [RC-SVN], partly based on the Roundcube managesieve plugin.

8. Security considerations

In particular when using structured vacation notices in conjunction with the Sieve filtering language, the security considerations of the corresponding RFCs should be taken into account:

* Sieve base specification [RFC5228]
* Sieve Vacation extension [RFC5230]
* [I-D.happel-sml-structured-email-trust-00]

9. Privacy considerations

Vacation notices expose certain potentially sensitive information to third parties, such as absence times, absence reasons and organizational details (such as replacement staff and their contact information).

For this reason, absentees are typically free to decide how much information they expose in the written text of their vacation notice.

Accordingly, software systems SHOULD leave absentees the same level of freedom when adding structured vacation notices and, e.g., not enforce the inclusion of certain information or even do so implicitly.

Information exposure might also be limited by restricting the usage of structured vacation notices to certain communication partners (e.g., using address book information [RFC6134] as discussed in [RFC6133]).

10. IANA Considerations

This document has no IANA actions at this time.

11. Appendix (Examples)

The following snippet shows a potential extension to the [SchemaOrg] vocabulary in [JSONLD] format.

Note that this is a preliminary specification only. Do not use examples in practice.

11.1. Example 1: Minimum viable structured vacation notice

```
{
        "@context": "https://sml.draft.iana.org",
        "@type": "UnavailabilityInformation",
}
```

11.2. Example 2: Basic structured vacation notice

```
{
        "@context": "https://sml.draft.iana.org",
        "@type": "UnavailabilityInformation",
        "start": "2025-06-22T00:00",
        "end": "2025-08-22T00:00",
        "note": "I am currently on vacation."
}
```

11.3. Example 3: Basic structured vacation notice with AvailabilityPattern

```
{
        "@context": "https://sml.draft.iana.org",
        "@type": "UnavailabilityInformation",
        "start": "2025-06-22T00:00",
        "end": "2025-08-22T00:00",
        "availabilityPattern": "Mo,Tu 12:00-15:00",
        "availabilityTimezone": "Europe/London",
        "note": "I am currently on vacation."
}
```

11.4. Example 4: Structured vacation notice with AvailabilityPattern only

```
{
        "@context": "https://sml.draft.iana.org",
        "@type": "UnavailabilityInformation",
        "availabilityPattern": "Mo,Tu 12:00-15:00",
        "availabilityTimezone": "Europe/London",
        "note": "I am in office Mondays and Tuesday afternoon."
}
```

11.5. Example 5: Structured vacation notice with replacements

```
{
        "@context": "https://sml.draft.iana.org",
        "@type": "UnavailabilityInformation",
        "unavailabilityType": "temporary",
        "start": "2025-06-22T00:00",
        "end": "2025-08-22T00:00",
        "isForwarded": false,
        "replacement": [
            {
                "@type": "Replacement",
                "description": "Project A",
                        "replacedBy": {
                                "@type": "http://schema.org/Person",
                                "name": "John Doe",
                                "email": "john@doe.com",
                                "phone": "+1234567890"
                        }
            },
            {
                "@type": "Replacement",
                "description": "Project B",
                        "availabilityPattern": "Mo,Tu 12:00-15:00",
                        "availabilityTimezone": "Europe/London",
                        "replacedBy": {
                                "@type": "http://schema.org/Person",
                                "name": "Jane Doe",
                                "email": "jane@doe.com",
                                "phone": "+9876543210"
                        }
            }
        ],
        "note": "I am currently on vacation."
}
```

11.6. Example 6: Structured vacation notice for service with replacements

```
{
        "@context": "https://sml.draft.iana.org",
        "@type": "UnavailabilityInformation",
        "unavailabilityType": "temporary",
        "start": "2025-06-22T00:00",
        "end": "2025-08-22T00:00",
        "isForwarded": false,
        "replacement": [
            {
                "@type": "Replacement",
                        "replacedBy": {
                                "@type": "http://schema.org/Physician",
                                "name": "Dr. Alice",
                                "email": "contact@alice.example.com",
                                "phone": "+1234567890"
                        }
            },
            {
                "@type": "Replacement",
                        "availabilityPattern": "Mo,Tu,We",
                        "replacedBy": {
                                "@type": "http://schema.org/Physician",
                                "name": "Dr. Bob",
                                "email": "contact@bob.example.com",
                                "phone": "+9876543210"
                        }
            }
        ],
        "note": "Our doctor’s office is closed for holidays."
}
```

11.7. Example 7: Permanant unavailability

```
{
        "@context": "https://sml.draft.iana.org",
        "@type": "UnavailabilityInformation",
        "unavailabilityType": "permanent",
        "note": "This address is not used anymore"
}
```

11.8. Example 8: Permanant unavailability after future date

```
{
        "@context": "https://sml.draft.iana.org",
        "@type": "UnavailabilityInformation",
        "unavailabilityType": "permanent",
        "start": "2025-08-31T00:00",
        "note": "This address is not used anymore after August 2025"
}
```

11.9. Example 9: Mailbox has moved

```
{
        "@context": "https://sml.draft.iana.org",
        "@type": "UnavailabilityInformation",
        "unavailabilityType": "moved",
        "isForwarded": false,
        "replacement":
            {
                "@type": "Replacement",
                        "replacedBy": {
                                "@type": "http://schema.org/Person",
                                "email": "john@doe.com",
                        }
            },
        "note": "May email has changed"
}
```

11.10. Example 10: Minimum noreply address

```
{
        "@context": "https://sml.draft.iana.org",
        "@type": "UnavailabilityInformation",
        "unavailabilityType": "noreply",
}
```

11.11. Example 11: Noreply address with phone contact

```
{
        "@context": "https://sml.draft.iana.org",
        "@type": "UnavailabilityInformation",
        "unavailabilityType": "noreply",
        "replacement":
            {
                "@type": "Replacement",
                        "replacedBy": {
                                "@type": "http://schema.org/Organization",
                                "name": "Customer support",
                                "phone": "+9876543210"
                        }
            }
}
```

12. Appendix (vCard properties)

The following vCard X-Properties are currently used by the [RC-SVN] implementation to store incoming structured vacation notice data of absentees in the address book of the communication partner. I.e., if an email message with a structured vacation notice is processed, the implementation will lookup the absentee in the communication partner’s address book and store the absence information, if an address book entry was found.

While this is mostly for internal data management in [RC-SVN], standardizing the vCard properties could be useful from a data portability perspective.

Most X-Properties directly map to the example OutOfOffice JSON-LD snippet above, X-OOF-UPDATED was added to store the receiving date of the email message which contained the structured vacation notice.

```
X-OOF-UPDATED:2023-10-01
X-OOF-START:2023-10-01
X-OOF-END:2023-11-01
X-OOF-IS-FORWARDED:false
X-OOF-REPLACEMENT:Jane Doe,Marketing,jane.doe@corp.com,+1234567-89
X-OOF-REPLACEMENT:John Doe,Development,john.doe@corp.com,+1234567-99
X-OOF-NOTE:I am out of office please reach my replacement instead
```

13. Appendix (Related use cases)

There are some use cases which are somehow related to "vacation notices", mostly by providing automated messages about a certain status of the recipient.

Those related use cases may be worth further consideration within the design space of this draft or may result in future related drafts.

For discussion, see also:
https://github.com/hhappel/draft-happel-sml-structured-vacation-notices/issues/3

13.1. New contact data

Beyond the email addresses, senders sometimes highlight updated information in the signature of a message, such as:

* Updated postal address
* Updated phone number

13.2. Bounces

Another category of automated email messages are Delivery Status Notifications (DSNs) ([RFC3464]). DSNs are messages sent by a receiving MTA to the original sender to convey meta information about the delivery. The most common case is to report isuses with an email received, a case also refered to as "NDR" (Non-Delivery Report) or "bounce message".

Status codes to be used in DSNs are defined in [RFC3463]. Common include:

* 5.1.1 User unknown
* 4.2.2/5.2.2 Mailbox full
* 5.3.4 Message size
* 5.7.1 Security or policy-related issues

At least the first case could already be modeled according to this specification (see Example 7). As this specification indends to enabled MUAs to propose actions on issues encountered, one may consider to include further NDR cases.

Alternatively, implementation guidance might advice MUAs to parse certain DSN and offer similar user interactions as for Structured Vacation Notices.

14. Informative References

[JSONLD] W3C JSON-LD Working Group, "JSON-LD 1.1", <https://www.w3.org/TR/json-ld/>.

[RC-SVN] audriga GmbH, "Structured Vacation Notice plugin for Roundcube Webmail", <https://github.com/audriga/roundcube-structured-vacation-notice/>.

[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>.

[RFC2142] Crocker, D., "Mailbox Names for Common Services, Roles and Functions", RFC 2142, DOI 10.17487/RFC2142, May 1997, <https://www.rfc-editor.org/info/rfc2142>.

[RFC3834] Moore, K., "Recommendations for Automatic Responses to Electronic Mail", RFC 3834, DOI 10.17487/RFC3834, August 2004, <https://www.rfc-editor.org/info/rfc3834>.

[RFC5228] Guenther, P., Ed. and T. Showalter, Ed., "Sieve: An Email Filtering Language", RFC 5228, DOI 10.17487/RFC5228, January 2008, <https://www.rfc-editor.org/info/rfc5228>.

[RFC5230] Showalter, T. and N. Freed, Ed., "Sieve Email Filtering: Vacation Extension", RFC 5230, DOI 10.17487/RFC5230, January 2008, <https://www.rfc-editor.org/info/rfc5230>.

[RFC5260] Freed, N., "Sieve Email Filtering: Date and Index Extensions", RFC 5260, DOI 10.17487/RFC5260, July 2008, <https://www.rfc-editor.org/info/rfc5260>.

[RFC5322] Resnick, P., Ed., "Internet Message Format", RFC 5322, DOI 10.17487/RFC5322, October 2008, <https://www.rfc-editor.org/info/rfc5322>.

[RFC5598] Crocker, D., "Internet Mail Architecture", RFC 5598, DOI 10.17487/RFC5598, July 2009, <https://www.rfc-editor.org/info/rfc5598>.

[RFC6133] George, R., Leiba, B., and A. Melnikov, "Sieve Email Filtering: Use of Presence Information with Auto-Responder Functionality", RFC 6133, DOI 10.17487/RFC6133, July 2011, <https://www.rfc-editor.org/info/rfc6133>.

[RFC6134] Melnikov, A. and B. Leiba, "Sieve Extension: Externally Stored Lists", RFC 6134, DOI 10.17487/RFC6134, July 2011, <https://www.rfc-editor.org/info/rfc6134>.

[RFC7942] Sheffer, Y. and A. Farrel, "Improving Awareness of Running Code: The Implementation Status Section", BCP 205, RFC 7942, DOI 10.17487/RFC7942, July 2016, <https://www.rfc-editor.org/info/rfc7942>.

[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>.

[SchemaOrg] W3C Schema.org Community Group, "Schema.org", <https://schema.org/>.

[iso8601] ISO, "ISO 8601 Date and time format", <https://www.iso.org/iso-8601-date-and-time-format.html>.

[openingHours] W3C Schema.org Community Group, "Schema.org openingHours", <https://schema.org/openingHours>.

[organization] W3C Schema.org Community Group, "Schema.org Organization", <https://schema.org/Organization>.

[person] W3C Schema.org Community Group, "Schema.org Person", <https://schema.org/Person>.

[tzdb] IANA, "Time Zone Database", <https://www.iana.org/time-zones>.

Author’s Address

Hans-Joerg Happel
audriga GmbH
Email: happel@audriga.com
URI: https://www.audriga.com