



WS-Calendar Minimal PIM-Conformant Schema Version 1.0

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Additional artifacts:

This prose specification is one component of a Work Product that also includes:

- XML schema: <http://docs.oasis-open.org/ws-calendar/ws-calendar-min/v1.0/csprd01/schema/ws-calendar-min-v1.0.xsd>

Related work:

This specification is related to:

- *WS-Calendar Platform Independent Model (PIM) Version 1.0*. Edited by W.T. Cox and Toby Considine. Latest version: <http://docs.oasis-open.org/ws-calendar/ws-calendar-pim/v1.0/ws-calendar-pim-v1.0.html>
- *WS-Calendar Version 1.0*. Edited by Toby Considine and Mike Douglass. Latest version: <http://docs.oasis-open.org/ws-calendar/ws-calendar/v1.0/ws-calendar-1.0-spec.html>

Declared XML namespaces:

- <http://docs.oasis-open.org/ws-calendar/ns/min-xcal/2015/12>

Abstract:

The WS-Calendar MIN is a WS-Calendar conformant schema optimized for use in machine-to-machine (M2M) schedule negotiations.

iCalendar (RFC5545) and its peer specification XCAL (also in WS-Calendar 1.0) is a well-known and long used means to convey schedule-related information. iCalendar makes extensive use of extension and recursion. The WS-Calendar Platform Independent Model (PIM) constrains iCalendar and defines a simpler information model which shares iCalendar semantics and can be used to create as the common basis for any number of Platform Specific Models (PSMs).

Because an information model is abstract, it can apply to many transmission and serialization schemas. The PIM itself does not include a transmission and serialization schemas. Through transitive conformance such PSMs themselves conform to WS-Calendar.

The Minimal PIM-Conformant (MIN) schema defines an XML Schema that conforms with the PIM. MIN can be used by itself or as a seed-schema for other specifications.

Status:

This document was last revised or approved by the OASIS Web Services Calendar (WS-Calendar) TC on the above date. The level of approval is also listed above. Check the "Latest version" location noted above for possible later revisions of this document. Any other numbered Versions and other technical work produced by the Technical Committee (TC) are listed at https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=ws-calendar#technical.

TC members should send comments on this specification to the TC's email list. Others should send comments to the TC's public comment list, after subscribing to it by following the instructions at the "[Send A Comment](#)" button on the TC's web page at <https://www.oasis-open.org/committees/ws-calendar/>.

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1 Introduction

[All text is normative unless otherwise labeled]

This specification addresses the need for a tightly conformable seed specification for use of **[WS-Calendar]**-compatible in rapid-processing and light-weight environments. This specifications conforms with the WS-Calendar Platform Independent Model **[WS-Calendar PIM]** and thereby transitively conforms with **[WS-Calendar]**.

iCalendar (RFC5545) and its peer specification XCAL (also in WS-Calendar 1.0) is a well-known and long used means to convey schedule-related information. iCalendar makes extensive use of extension and recursion. The WS-Calendar Platform Independent Model (PIM) constrains iCalendar and defines a simpler information model which shares iCalendar semantics and can be used to create as the common basis for any number of Platform Specific Models (PSMs).

A key concern for the original **[WS-Calendar]** was direct compatibility with xCal, the XML Format for iCalendar defined in **[RFC6321]**. While this format is flexible, it can offer too much optionality to be easily analyzed. To this end, the TC developed a Platform Independent Model **[WS-Calendar PIM]** which supports all the functions and messages from **[WS-Calendar]**, while defining only specific extensions and limiting recursion. This approach redefined WS-Calendar as what Model Driven Architecture calls a Platform Specific Model (PSM) which conforms to **[WS-Calendar PIM]**

[WS-Calendar PIM] is a general specification and makes no assumptions about how its information model is used. **[WS-Calendar PIM]** has specific rules which define Inheritance as a means to reduce the conveyance of repetitive information. As this specification anticipates schedule communications to specific business interactions, these inheritance rules are extended to embrace rules of interaction and rules of process that further reduce the information that must be expressed within each interval.

The **[WS-Calendar PIM]** itself does not include a transmission and serialization schemas, i.e. it is an information model that does not define a normative structure for the information conveyed. Because an information model is abstract, it can apply to many transmission and serialization schemas.

High speed transaction processing requires more predictable means to convey structured information concerning time-based events, states, and transactions. Even valid and conformant conveyances of **[WS-Calendar]** information may fail to meet the requirements for basic interoperability requirements **[WSI-Basic]**.

This specification defines a normative structure for conveying time series of information that is conformant with **[WS-Calendar PIM]**. It is the intent of the TC meet the requirements of **[WSI-Basic]**. The Minimal PIM-Conformant **[MIN]** schecification defines an XML Schema that conforms just with the PIM. **[MIN]** can be used by itself or as a seed-schema for other specifications,

1.1 Terminology

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in [\[RFC2119\]](#).

1.2 Normative References

- [ISO8601]** ISO (International Organization for Standardization). *Representations of dates and times, third edition*, December 2004, (ISO 8601:2004)
- [RFC2119]** Bradner, S., “Key words for use in RFCs to Indicate Requirement Levels”, BCP 14, RFC 2119, March 1997. <http://www.ietf.org/rfc/rfc2119.txt>.
- [RFC5545]** B. Desruisseaux *Internet Calendaring and Scheduling Core Object Specification (iCalendar)*, <http://www.ietf.org/rfc/rfc5545.txt>, IETF RFC5545, proposed standard, September 2009
- [RFC6321]** C. Daboo, M Douglass, S Lees *xCal: The XML format for iCalendar*, <http://tools.ietf.org/html/rfc6321>, IETF Proposed Standard, August 2011.

- 48 [vAvailability] C. Daboo, M. Douglas: **Calendar Availability**, [https://tools.ietf.org/html/draft-](https://tools.ietf.org/html/draft-ietf-calext-availability-01)
 49 [ietf-calext-availability-01](https://tools.ietf.org/html/draft-ietf-calext-availability-01) Internet Draft, November 2015.
- 50 [WS-Calendar PIM] *WS-Calendar Platform Independent Model (PIM) Version 1.0*. Edited by William
 51 Cox and Toby Considine. 21 August 2015. OASIS Committee Specification 02.
 52 [http://docs.oasis-open.org/ws-calendar/ws-calendar-pim/v1.0/cs02/ws-calendar-](http://docs.oasis-open.org/ws-calendar/ws-calendar-pim/v1.0/cs02/ws-calendar-pim-v1.0-cs02.html)
 53 [pim-v1.0-cs02.html](http://docs.oasis-open.org/ws-calendar/ws-calendar-pim/v1.0/cs02/ws-calendar-pim-v1.0-cs02.html). Latest version: [http://docs.oasis-open.org/ws-calendar/ws-](http://docs.oasis-open.org/ws-calendar/ws-calendar-pim/v1.0/ws-calendar-pim-v1.0.html)
 54 [calendar-pim/v1.0/ws-calendar-pim-v1.0.html](http://docs.oasis-open.org/ws-calendar/ws-calendar-pim/v1.0/ws-calendar-pim-v1.0.html)
- 55 [XML NAMES] T Bray, D Hollander, A Layman, R Tobin, HS Thompson “Namespaces in
 56 XML 1.0 (Third Edition)” <http://www.w3.org/TR/xml-names/> W3C
 57 Recommendation, December 2009
- 58 [XML SCHEMA] PV Biron, A Malhotra, XML Schema Part 2: Datatypes Second Edition,
 59 <http://www.w3.org/TR/xmlschema-2/> October 2004.

60 1.3 Non-Normative References

- 61 [SOA-RM] SOA-RM OASIS Standard, *OASIS Reference Model for Service Oriented*
 62 *Architecture 1.0*, October 2006 [http://docs.oasis-open.org/soa-rm/v1.0/soa-](http://docs.oasis-open.org/soa-rm/v1.0/soa-rm.pdf)
 63 [rm.pdf](http://docs.oasis-open.org/soa-rm/v1.0/soa-rm.pdf)
- 64 [WSI-BASIC] R Chumbley, J Durand, G Pilz, T Rutt , *Basic Profile Version 2.0*,
 65 <http://ws-i.org/profiles/BasicProfile-2.0-2010-11-09.html>,
 66 The Web Services-Interoperability Organization, November 2010
- 67 [WS-Calendar] WS-Calendar OASIS Committee Specification, WS-Calendar Version 1.0, July
 68 2011, [http://docs.oasis-open.org/ws-calendar/ws-calendar-spec/v1.0/cs01/ws-](http://docs.oasis-open.org/ws-calendar/ws-calendar-spec/v1.0/cs01/ws-calendar-spec-v1.0-cs01.pdf)
 69 [calendar-spec-v1.0-cs01.pdf](http://docs.oasis-open.org/ws-calendar/ws-calendar-spec/v1.0/cs01/ws-calendar-spec-v1.0-cs01.pdf)
- 70 [xCal] C. Daboo, M Douglass, S Lees xCal: The XML format for iCalendar,
 71 <http://tools.ietf.org/html/rfc6321> , IETF Proposed Standard, April 2011.

72 1.4 Namespace

73 The XML namespace [XML-ns] URI that MUST be used by implementations of this specification is:

74 `http://docs.oasis-open.org/ws-calendar/ns/min-xcal/2015/12`

75 Dereferencing the above URI will produce the HTML document that describes this namespace.

76 Table 1 lists the XML namespaces that are used in this specification. The choice of any namespace prefix
 77 is arbitrary and not semantically significant.

78 *Table 1-1: Namespaces Used in this Specification*

Prefix	Namespace
xs	http://www.w3.org/2001/XMLSchema
min	http://docs.oasis-open.org/ws-calendar/ns/min-xcal/2015/12

79 The normative schemas for WS-Calendar MIN can be found linked from the namespace document that is
 80 located at the namespace URI specified above.

81 1.5 Naming Conventions

82 This specification follows some naming conventions for artifacts defined by the specification, as follows:

83 For the names of elements and the names of attributes within XSD files, the names follow the
 84 lowerCamelCase convention, with all names starting with a lower case letter. For example,

85 `<element name="componentType" type="ComponentType"/>`

86 For the names of types within XSD files, the names follow the UpperCamelCase convention with all
 87 names starting with a lower case letter prefixed by “type-“. For example,

88 `<complexType name="ComponentType">`

89 For the names of intents, the names follow the lowerCamelCase convention, with all names starting with
90 a lower case letter, EXCEPT for cases where the intent represents an established acronym, in which
91 case the entire name is in upper case.

92 **1.6 Editing Conventions**

93 For readability, element names in tables appear as separate words. The actual names are
94 lowerCamelCase, as specified above, and as they appear in the XML schemas.

95 All elements in the tables not marked as “optional” are mandatory.

96 Information in the “Specification” column of the tables is normative. Information appearing in the note
97 column is explanatory and non-normative.

98 All sections explicitly noted as examples are informational and are not to be considered normative.

99

2 Specification Based on WS-Calendar PIM

101 Without an understanding of certain terms and conventions based in **[WS-Calendar PIM]**, the reader may
102 have difficulty achieving complete understanding of their use in this standard. **[WS-Calendar PIM]**
103 defines a Platform Independent Model and re-defined **[WS-Calendar]** as a semantically richer and more
104 variable conformant Platform Specific Model (PSM).
105 Because this specification is A PSM conformant with **[WS-Calendar PIM]**, it transitively conforms to **[WS-**
106 **Calendar]**.
107 In particular, the reader understand the logic of time specification and the language of inheritance as
108 described in **[WS-Calendar PIM]**.

2.1 When: Start, End and Duration

109 Any interval can be fully defined by two out of these three elements: when it begins, how long it lasts, and
110 when it ends. With any two, you can compute the third.
111 This specification assigns predominance to how long it lasts, the Duration. This approach is commonly
112 used to request human scheduling, i.e., “Find a time when the three of us can meet for an hour.” Activities
113 are then normally scheduled by Start Time, again to reflect human usage: “We will meet for lunch at
114 Noon”.
115 An application or specification MAY choose to specify the Duration and the End of an event, if this is
116 simpler for its domain. Such a specification MUST make this expectation clear, as allowing a mix of Start
117 and End based requests makes programming and conformance more difficult. For simplicity, in this
118 document, all scheduling is described refining an Interval with a Duration and adding a Start.
119 A service request MAY specify both. For example, a Sequence may be advertised with no fixed duration,
120 and a service request MAY specify both the Duration and the Start.
121 The use of the Start and the End without a definition is discouraged because it reduces flexibility while
122 increasing required computation.
123 The complete normative discussion of these issues can be found in **[WS-Calendar PIM]**.
124

2.1.1 Semantics of Inheritance

125 **[WS-Calendar PIM]** enables parsimony and artifact reuse through defined rules of inheritance. At its
126 simplest, a Sequence can be relocated or replicated from one day to another, each time inheriting the
127 start date, without being re-crafted. Similarly a start time for a single interval can affect the start times of
128 the other Intervals in the Sequence. Depending upon Inheritance, an Interval may become Fully Bound,
129 i.e., defined sufficiently for execution.
130 The terms Inherit, Inheritance, and Bequeath are as defined within **[WS-Calendar PIM]**.
131

3 Core Components: Intervals, Sequences, and Gluons

The types in this section are each defined in [WS-Calendar PIM]. As the PIM is an information model rather than a message format, they are restated here and in the associated schema.

3.1 Intervals

The Interval is the core artifact of calendar and schedule. It conveys when something happens and for how long.

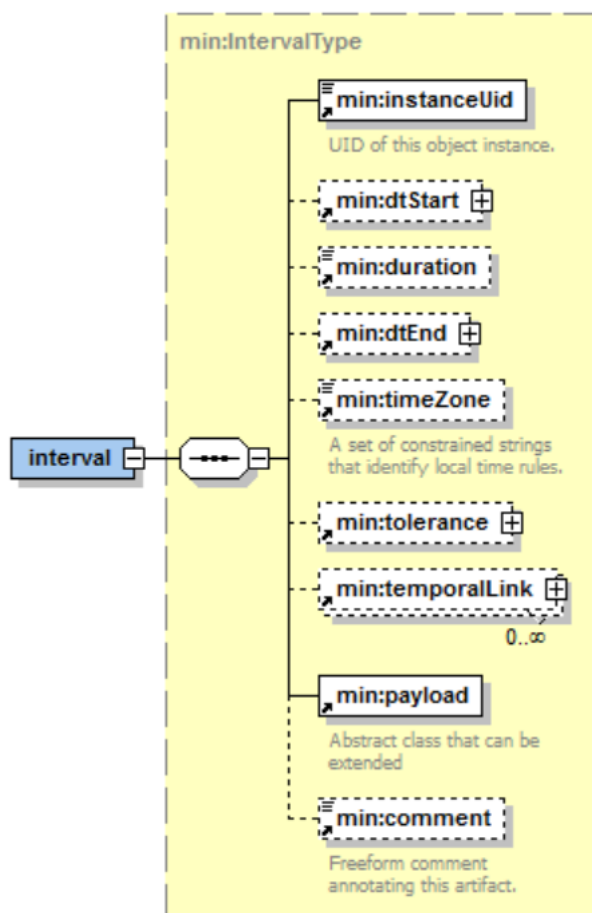


Figure 3-1 The Interval

Everything is calendar related except for the payload. The payload is an abstract type to be extended by specifications using this specification. Specifications incorporating this specification Shall define how inheritance applies to the Payload

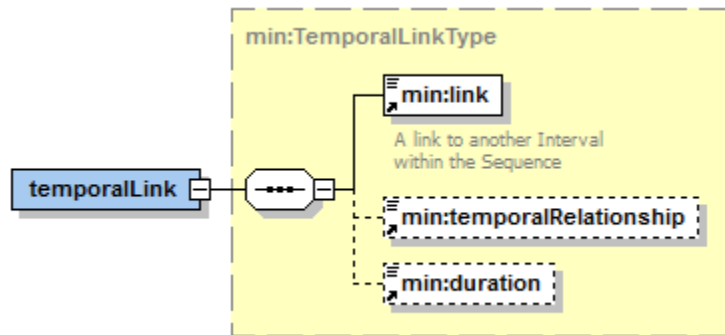
3.2 Temporal Links and Sequences

Temporal Links convey the relations between Intervals in a Sequence. Each Interval can be considered as a distinct activity for a period of time. A Sequence is a set of such activities. These activities may follow one after another. There may be mandatory gaps, as in paint drying

149 for at least six hours before the next step. It may be a requirement that two Intervals finish at the same
 150 time.
 151 If a Sequence describes a ramp-time of activities prior to the Inherited dtStart, then the ramp activities
 152 must complete prior to the start time. Similarly, a system MAY need to ramp down at the end of a
 153 requested Duration of activity.
 154 There is a special case of Sequence in which all Intervals proceed linearly without pause, and all Intervals
 155 share a common Duration. A Sequence of this Type is referred to as a Partition.

156 3.2.1 Temporal Links

157 Temporal Links are so named because they convey how Intervals are related in Time. A Temporal Link
 158 consists of a reference to an Interval, a type of Temporal Relationship, and the Duration of the
 159 Relationship.



160
 161 *Figure 3-2: The Temporal Link*

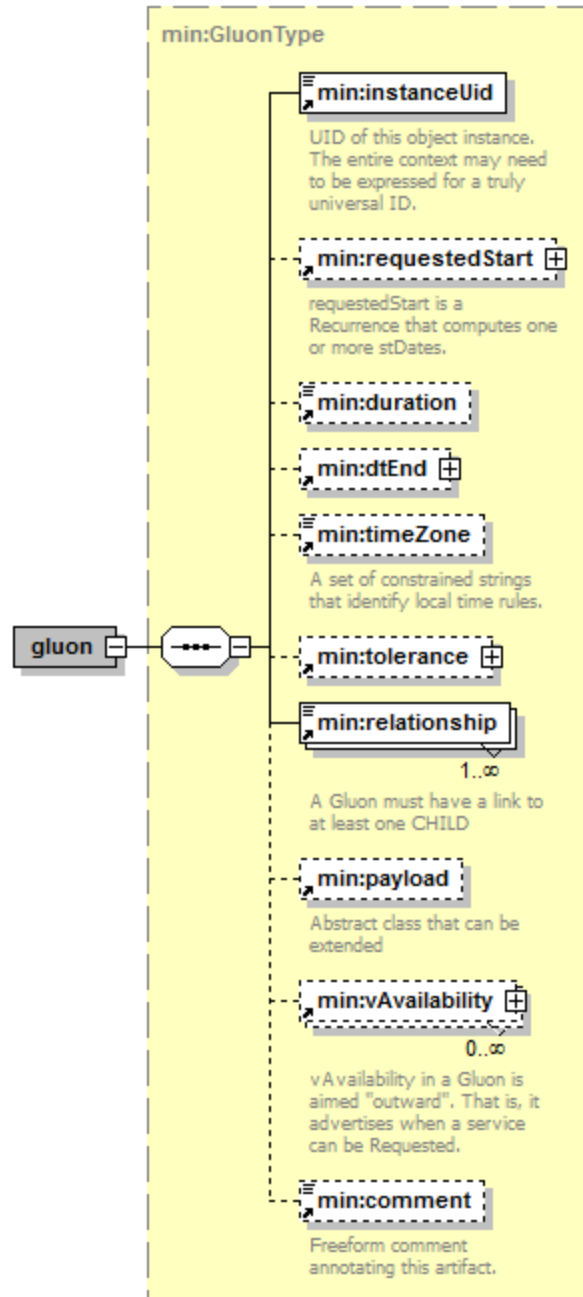
162 As defined in the PIM, there are four types of Temporal Relationship. Temporal Relationships combine
 163 with the Duration to describe a sequence; a Sequence is a set of temporally linked Intervals. A missing or
 164 empty Duration is considered a zero length Duration.
 165 If a specification that claims conformance this specification permits a missing Temporal Relationship, then
 166 that specification MUST state which Temporal Relationship is implied. A conforming specification MAY
 167 disallow a missing Temporal Relationship.

168 3.2.2 Sequences

169 Sequences are collections of Intervals connected by Temporal Relationships. There is no Sequence
 170 structure per-se. A Sequence is referenced by referencing the InstanceUID of one Interval in the
 171 Sequence. That Interval is referred to as the Designated Interval. The Designated Interval has special
 172 rules for Inheritance. For example, when a Gluon Bequeaths a dtStart to a Sequence, is it the Designated
 173 Interval that starts at that time.
 174 Inheritance within a Sequence is specified in [WS-Calendar PIM].

175 3.3 The Gluon

176 The Gluon links a Sequence to a service interaction. The Gluon can be considered a degenerate Interval
 177 that cannot itself be executed. It does, however provide missing information to fully bind each Interval in
 178 the Sequence.
 179 Another perspective describes the Gluon as the service entry point for an activity defined by a Sequence.
 180 Sequence execution is launched by providing a dtStart though a Gluon. A service request acting as a
 181 Gluon bequeaths missing information that is inherited by the entry point Gluon to bind the Sequence.
 182 The Gluon Type is shown in *Figure 3-3: The Gluon*.



183

184 *Figure 3-3: The Gluon*

185 Notice that the Gluon is nearly identical to the Interval. A Requested Start replaces the dtStart. Requested
 186 Start is of type Recurrence. Recurrence describes how to compute a collection of dtStarts. Recurrence is
 187 discussed in below in Section 4.

188 The significant difference between Gluon and Interval are as follows:

- 189 1) The Gluon has no Temporal Links. It cannot be part of a Sequence, so it maintains no Temporal
 190 Relations with other Components.
- 191 2) A Gluon must have at least one Relationship, and it can have many. The Relationship connects a
 192 Gluon to a Sequence, to establish Inheritance. A Relationship MAY connect a Gluon to another
 193 Gluon, establishing a Lineage that eventually binds a Sequence.

- 194 3) A Gluon may convey multiple dtStarts. This collection is computed in RequestedStart, which is of
195 type Recurrence. A recurrence is a structure to convey or compute a collection of starting dates
196 and times. These act as if there were multiple Gluons, each conveying a single dtStart.
197 4) vAvaialbility. VAvailability is an outward looking element that conveys information about potential
198 schedules for the underlying Sequence.

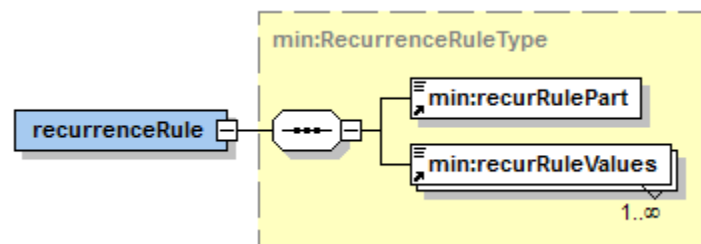
199 4 Service Advertising and Request: Recurrence and 200 Availability

201 Up until this section, dates and times were specific. This section introduces Recurrence and types that
202 enable patterns of dates and schedules to be computed. When a specific term is not defined within this
203 specification, it is as defined in **[WS-Calendar PIM]**.

204 There may be good reasons for a specification that claims conformance with this specification to forbid e
205 Recurrence. Requiring each service invocation to require its own message that acts as a Gluon MAY
206 simplify the system. A conforming specification MUST state of the use of these components is forbidden.

207 4.1 Recurrence Rules

208 Recurrence Rules are used in both Recurrence and in Availability to compute patterns of schedules and
209 dates. Each Rule consists of a Rule Part, which names a type of Rule, and Rule Values, constrained lists
210 which operate within the Rule Part.

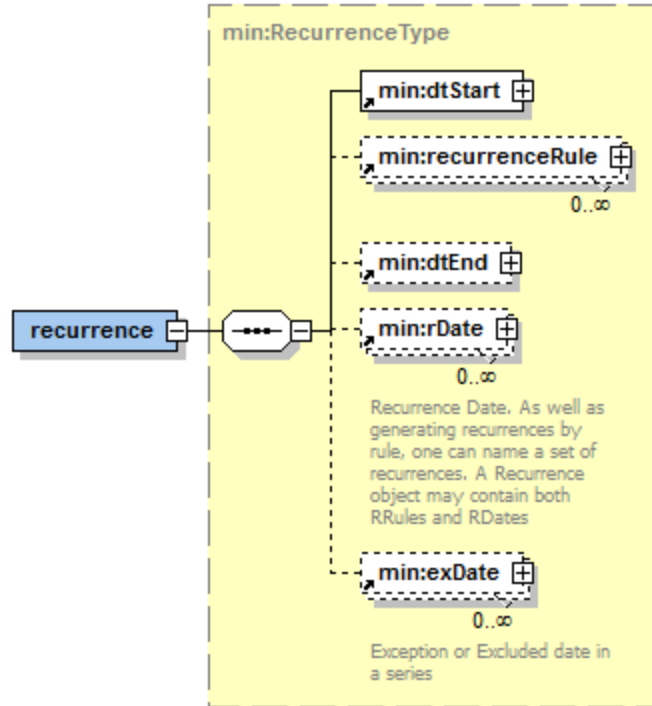


211
212 *Figure 4-1: The Recurrence Rule*

213 Representative recurRuleParts indicate that a Rule is hourly, or at a fixed frequency, or on certain days of
214 the month. Rule Values are constrained depending on the RulePart, to indicate days of the week, every
215 three hours, and so on. Recurrence Rules are normatively described in **[RFC5545]** section 3.3.10. Many
216 web-sites and open source libraries discuss these rules; no efforts will be made in this specification to re-
217 state these rules.

218 4.2 Recurrence

219 Recurrence is conveys a mechanism to compute a collection of starting date-times. At its simplest, it is a
220 dtStart, just as in the Interval. Recurrence Rules then describe how to compute additional starting dates
221 and times using the dtStart as a seed. rDates add additional starting dates to the collection. xDates then
222 block out dates, that is, remove specific date-times from the collection.



223
224 *Figure 4-2: Recurrence*

225 The Requested Start in the Gluon is of type Recurrence.

226 4.3 Availability and VAvailability

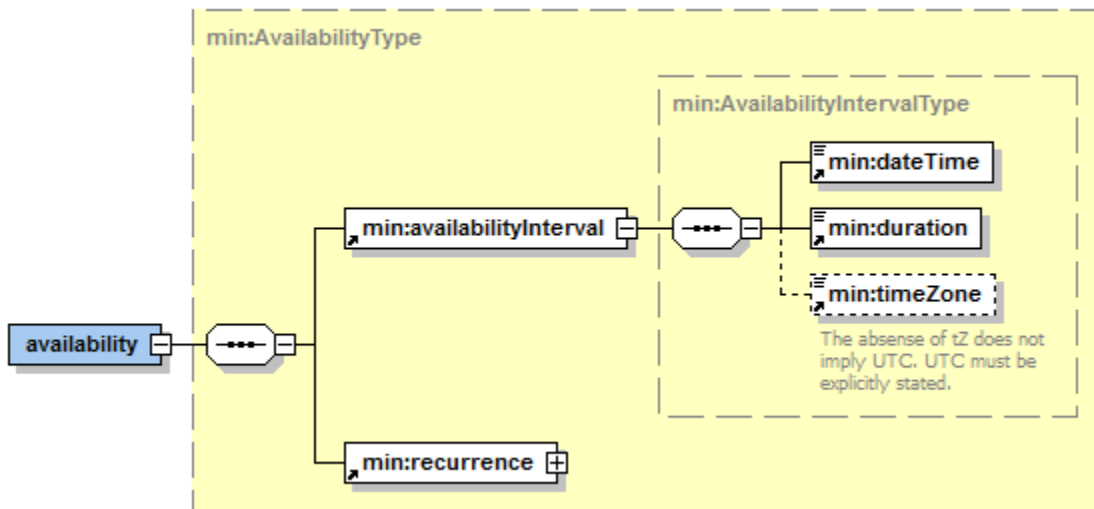
227 VAvailability is the sum of one or more patterns (Availability) that together express when a Service can be
228 invoked.

229 As a non-normative illustration, the well-known pattern of “During Business Hours” can be described as
230 the hours from 9:00 AM to 5:00 PM repeated weekly on Monday, Tuesday, Wednesday, Thursday, and
231 Friday. Alternately it might be the sum of two patterns, 8:00 AM until noon, Monday, Tuesday,
232 Wednesday, Thursday, and Friday and 1:00 until 5:00 on Monday, Tuesday, Wednesday, Thursday, and
233 Friday. An additional pattern of 9:00 AM until 1:00 PM might be added each Saturday. The smaller
234 patterns are named “Availability” and the top level summary is named VAvailability.

235 Note that a Gluon may have an array of Vavailability components. These components MAY be both
236 Available and Unavailable in the same set. There are specific rules for overlaying vAvailability
237 components which the practitioner should be aware of. These rules are described in **[vAvailability]**.

238 **4.3.1 Availability**

239 The Availability type uses the same computational rules as Recurrence and applies then to a seed
240 Interval, that is a Duration and dtStart. The DateTime and the Duration are known as the Availability
241 Interval.

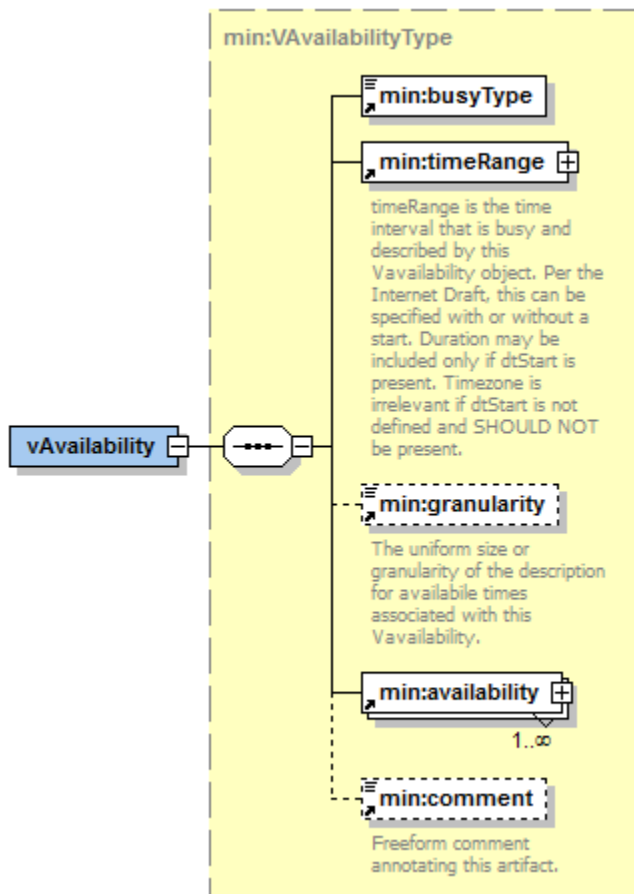


242
243 *Figure 4-3: Availability*

244 Availability applies the Recurrence Rules (RRules) defined in [RFC5545] to the availability interval.

245 **4.3.2 VAvailability**

246 VAvailability represents the sum of a collection of Availability types applied within the bounds of a defined
247 Time Range.



248
249 *Figure 4-4: VAvailability Type*

250 Note that Granularity, when applied to vAvailability has a special meaning. A three hour interval
251 advertised with a granularity of 15 minutes may only be invoked on the 15 minute interval. Foreexample,
252 the interval may be 9:00 until Noon, but the only dtStarts that may be requested are at 9:00, 9:15, 8:30,
253 9:25 and so on.

254 5 Conformance

255 5.1 Conformance to WS-Calendar MIN

256 Implementations and specifications claiming conformance to this specification SHALL implement all
257 inheritance and semantic rules as described in **[WS-Calendar-PIM]** and in particular its Section 5.

258 Conformance rules in PIM Section 6 are applied to implementations and specifications claiming
259 conformance to MIN.

260 Implementations and specifications claiming conformance to MIN SHALL implement the entire MIN
261 schema. Extensions are permitted, but MUST be documented in the conforming implementation's
262 conformance statement.

263 5.2 Detailed Conformance with the WS-Calendar-PIM

264 **[WS-Calendar-PIM]** requires that MIN and other conforming implementations and specification fully
265 support the defined rules in Section 5 "Conformance Rules for WS-Calendar PIM".

266

267 **[WS-Calendar-PIM]** Section 6.1 "Conformance for Specifications Claiming Conformance to WS-Calendar
268 PIM" details conformance rules for this specification.

Section of WS-Calendar-PIM	Notes
6.1	MIN requires conformance to the referenced rules.
6.2	Non-normative; the precision is addressed in [XSD] . Conforming applications should example PIM Section 6.2 and address those issues as deemed appropriate.
6.3	All conformance requirements in PIM Section 6.3 and its sub-sections meet the requirements of PIM 6.3.
6.4	These operational conformance requirements are applied to specifications and implementations claiming conformance to MIN in Section 5.1 above.
6.5	This non-normative section SHOULD be considered by conforming implementations and specifications

269

270 **Appendix A. Acknowledgments**

271 The following individuals have participated in the creation of this specification and are gratefully
272 acknowledged:

273 **Participants:**

274 David Thewlis, CalConnect

275 William Cox, Individual

276 Gershon Janssen, Individual

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280 Chris Bogen, US Department of Defense (DoD)

281

Appendix B. Revision History

Revision	Date	Editor	Changes Made
WD01	21 Jul 2015	Toby Considine	Initial Draft
WD02	22 Jul 2015	Toby Considine	Added section on Recurrence and Availability. Added recurrence to Gluons.
WD03	25 Oct 2015	Toby Considine	Removed re-statement of PIM, keeping definitions and graphics for simplified models for serialization.
WD04	10 Dec 2015	Toby Considine	Changed Relations and Temporal Relations to Relationships and Temporal Relationships. This avoids overloading "Relation" in the PIM.
WD05	14-Dec-2015	William T Cox	Added conformance. Minor edits
WD06	31-Dec-2015	Toby Considine	Migrated to official template as part of publishing for public review. Slight update of Abstract. Removed some spurious references to MPC. No substantive changes.