N-Squared Software N2IVR
VoiceXML Protocol Conformance Statement

Version 2024-06

1 Document Information

1.1 Scope and Purpose

This document describes the VoiceXML specification as supported by the N-Squared N2IVR VoiceXML interpreter. In short, the N2IVR VoiceXML interpreter supports audio playback (without TTS) with DTMF prompt collection (without voice grammar support).

The N2SIP components are packaged and installed as “N2SIP”. This document should be read in conjunction with the respective Technical Guide [R-1] or [R-2] as applicable.

This document assumes a working knowledge of the relevant VoiceXML and other telephony concepts, including standard SRP interactions between a soft-switch and a SIP-connected resource platform, i.e. an SRP (or Intelligent Peripheral), SIP IVR, or SIP Application Server.

1.2 Definitions, Acronyms, and Abbreviations

Term	Meaning
AMR[-NB]	Adaptive Multi-Rate Narrow Band
AMR-WB	Adaptive Mulit-Rate Wide Band
AVP	Audio Video Profile
B2BUA	Back-to-Back User Agent
BER	Basic Encoding Rules
DTMF	Dual Tone Multi-Frequency
ETSI	European Telecommunications Standards Institute
IETF	Internet Engineering Task Force
INAP	Intelligent Networking Application Part
IP	Intelligent Peripheral
MIME	Multipurpose Internet Mail Extensions
N2	N-Squared
N2SIP	The N-Squared SIP framework on which N2IVR is implemented.
N2SVCD	The N-Squared run-time service framework on which N2IVR is implemented.
PCMA	Pulse Code Modulation a-law
PCMU	Pulse Code Modulation µ-law
PGP	Pretty Good Privacy
RFC	Request For Comments
RTCP	RTP Control Protocol
RTP	Real-time Transport Protocol
SCP	Service Control Point
SCTP	Stream Control Transmission Protocol
SDP	Session Description Protocol
SIP	Session Initiation Protocol
S/MIME	Secure/Multipurpose Internet Mail Extensions
SRF	Specialized Resource Function
SRP	Specialized Resource Platform

Term	Meaning
SRTP	Secure RTP
TCP	Transmission Control Protocol
TLS	Transport Layer Security
UDP	User Datagram Protocol
URL	Uniform Resource Locator
VXML	VoiceXML
XML	eXtensible Markup Language

1.3 References

The following documents are referenced within this document:

Ref.	Document
[R-1]	N2SIP Technical Guide https://www.nsquared.co.nz/product/n2sip.html
[R-2]	N2SVCD Technical Guide https://www.nsquared.co.nz/product/n2sip.html
[R-10]	Voice Extensible Markup Language (VoiceXML) Version 1.0 https://www.w3.org/TR/2000/NOTE-voicexml-20000505/
[R-11]	Voice Extensible Markup Language (VoiceXML) Version 2.0 https://www.w3.org/TR/voicexml20/
[R-12]	Voice Extensible Markup Language (VoiceXML) Version 2.1 https://www.w3.org/TR/voicexml21/
[R-13]	Voice Extensible Markup Language (VoiceXML) Version 3.0 http://www.w3.org/TR/voicexml30/
[R-14]	RFC 5552 SIP Interface to VoiceXML Media Services https://datatracker.ietf.org/doc/html/rfc5552

1.4 Ownership and Usage

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2 Contents

3 VoiceXML Compliance

3.1 VoiceXML Overview

A N2IVR solution communicates with a core network soft-switch to set-up and teardown SIP audio sessions, as well as for transferring audio (and out-of-band information such as DTMF telephony events) over RTP. The core network soft-switch will trunk these audio sessions to other network elements over circuit-switched, SIP/RTP, radio network or other channels, although this is not generally visible to the N2IVR solution.

When configured with the VoiceXML interpreter service, the N2IVR solution will communicate with a VoiceXML HTTP server to retrieve initial and subsequent VoiceXML documents to control the audio path interaction with the caller.

VoiceXML compliance for the N2IVR is based on VoiceXML 2.0 & 2.1. N2IVR is not compliant with VoiceXML 3.0 and does not enable specific support for VoiceXML 1.0.

3.2 VoiceXML Versions

The W3C publishes four main revisions of the VoiceXML specification. N2IVR supports features the following revisions:

VoiceXML Revision	Overall Support
1.0	Unsupported
2.0	Supported
2.1	Supported
3.0	Unsupported

3.3 VoiceXML Element Support

3.3.1 VoiceXML 2.0

N2IVR support for VoiceXML 2.0 elements is summarised in the following table:

Element	Support	Notes
<assign>	Supported	Section 4.1 ASSIGN
<audio>	Supported	Section 4.2 AUDIO
<block>	Supported	Section 4.3 BLOCK
<catch>	Supported	Section 4.4 CATCH
<choice>	Supported	Section 4.5 CHOICE
<clear>	Supported	Section 4.6 CLEAR
<disconnect>	Supported	Section 4.7 DISCONNECT
<else>	Supported	Section 4.8 ELSE
<elseif>	Supported	Section 4.9 ELSEIF
<enumerate>	Unsupported	The <enumerate> element is unsupported. An

Element	Support	Notes
		error.unsupported.enumerate event is thrown when one is encountered.
<error>	Supported	Section 4.10 ERROR
<exit>	Supported	Section 4.11 EXIT
<field>	Supported	Section 4.12 FIELD
<filled>	Supported	Section 4.13 FILLED
<form>	Supported	Section 4.14 FORM
<goto>	Supported	Section 4.15 GOTO
<grammar>	Unsupported	The <grammar> tag is unsupported. If encountered during interpreter execution an error.unsupported.grammar event is thrown by the VoiceXML interpreter.
<help>	Supported	Section 4.16 HELP
<if>	Supported	Section 4.17 IF
<initial>	Supported	The <initial> tag is unsupported. If encountered during interpreter execution an error.unsupported.initial event is thrown by the VoiceXML interpreter.
<link>	Unsupported	The <link> tag is unsupported. If encountered during interpreter execution an error.unsupported.link event is thrown by the VoiceXML interpreter.
<log>	Supported	Section 4.18 LOG
<menu>	Supported	Section 4.19 MENU
<meta>	Ignored	<meta> tags and their content are ignored by the N2IVR VoiceXML interpreter.
<metadata>	Ignored	<metadata> tags and their content are ignored by the N2IVR VoiceXML interpreter.
<noinput>	Supported	Section 4.22 NOINPUT
<nomatch>	Supported	Section 4.23 NOMATCH
<object>	Unsupported	The <object> tag is unsupported. If encountered during interpreter execution an error.unsupported.object error is thrown by the VoiceXML interpreter.
<option>	Supported	Section 4.24 OPTION
<param>	Unsupported	Unsupported as containing elements (<object> and <subdialog>) are unsupported in this release.
<prompt>	Limited Support	Section 4.25 PROMPT The <prompt> tag is supported, with significant restrictions on the possible content of this tag. See Section 3.3.2 for details on the SSML element support.
<property>	Supported	Section 4.26 PROPERTY
<record>	Unsupported	The <record> tag is unsupported. If encountered during interpreter execution an error.unsupported.record event is thrown by the VoiceXML interpreter.

Element	Support	Notes
<reprompt>	Supported	Section 4.27 REPROMPT
<return>	Unsupported	The <return> tag is unsupported. If encountered during interpreter execution an error.unsupported.return event is thrown by the VoiceXML interpreter.
<script>	Unsupported	The <script> tag is unsupported. If encountered during interpreter execution an error.unsupported.script event is thrown by the VoiceXML interpreter.
<subdialog>	Unsupported	The <subdialog> tag is unsupported. If encountered during interpreter execution an error.unsupported.subdialog event is thrown by the VoiceXML interpreter.
<submit>	Supported	Section 4.28 SUBMIT
<throw>	Supported	Section 4.30 THROW
<transfer>	Supported	Section 4.29 TRANSFER
<value>	Unsupported	The <value> element is unsupported. The use of <value> will throw an error.unsupported.value event when encountered at runtime by the VoiceXML interpreter.
<var>	Supported	Section 4.31 VAR
<vxml>	Supported	Section 4.32 VXML

3.3.2 Speech Synthesis Markup Language (SSML) Elements

The N2IVR supports SSML elements as noted in the following table. General information on SSML element processing is covered in Section 3.8.

Element	Support	Notes
<audio>	Supported	Section 4.2 AUDIO.
<break>	Ignored	
<desc>	Ignored	
<emphasis>	Ignored	Unsupported where <emphasis> includes text content to be synthesised.
<lexicon>	Ignored	
<mark>	Ignored	
<meta>	Ignored	
<metadata>	Ignored	
<p>	Ignored	Unsupported where <p> includes text content to be synthesised.
<phoneme>	Unsupported	The <phoneme> tag is unsupported. If encountered during interpreter execution an error.unsupported.phoneme event is thrown by the VoiceXML interpreter.
<prosody>	Ignored	Unsupported where <prosody> includes text content to be synthesised.
<say-as>	Unsupported	The <say-as> tag is unsupported. If encountered during interpreter execution an error.unsupported.say-as event is thrown by the VoiceXML interpreter.
<s>	Ignored	Unsupported where <s> includes text content to be synthesised.

Element	Support	Notes
<sub>	Unsupported	The <sub> tag is unsupported. If encountered during interpreter execution an error.unsupported.sub event is thrown by the VoiceXML interpreter.
<voice>	Ignored	Unsupported where <voice> includes text content to be synthesised.

3.3.3 VoiceXML 2.1

N2IVR support for VoiceXML 2.1 features is summarised in the following table:

Element	Support	Notes
<data>	Unsupported	Unsupported. An error.unsupported.data event is thrown if encountered.
<transfer>	Supported	The type attribute added in VoiceXML 2.1 to the <transfer> element is supported. The consultation form of transfer is also supported.
<disconnect>	Supported	The namelist attribute added in VoiceXML 2.1 to the <disconnect> element is supported.

3.4 VoiceXML Properties

VoiceXML properties are set by the <properties> element. The following properties are supported and may be set by documents processed by the VoiceXML interpreter.

While all properties may be set, many properties are inherently ignored by the N-Squared VoiceXML interpreter when used by the N2SIP SRP.

3.4.1 Generic Speech Recognizer Properties

Property	Support	Notes
confidencelevel	Ignored	All generic speech recogniser properties are ignored by the interpreter. The N2SIP SRP does not support speech recognition.
sensitivity	Ignored	
speedvsaccuracy	Ignored	
completetimeout	Ignored	
incompletetimeout	Ignored	
maxspeechtimeout	Ignored	

3.4.2 Generic DTMF Recognizer Properties

Property	Support	Notes
interdigittimeout	Supported	The N2IVR supports inter-digit timeouts at a granularity of seconds only. The default is set to 4 seconds.
termtimeout	Ignored	The termtimeout is not used by the N2IVR.
termchar	Supported	The termchar can be set to 0-9, * or #. It may also be set to the empty string to disable the terminating char.

3.4.3 Prompt and Collect Properties

Property	Support	Notes
bargein	Supported	The bargein property is honored, and when a <prompt> does not defined the bargein value, the value of this property will be used.
bargeintype	Ignored	The N2IVR supports only DTMF barge-in. This property is ignored.
timeout	Supported	The N2IVR supports first-digit timeouts at a granularity of seconds only. The default is set to 8 seconds.

3.4.4 Fetching Properties

Property	Support	Notes
documentmaxstale	Supported	See Section 3.7 HTTP Requests May be empty
documentmaxage	Supported	See Section 3.7 HTTP Requests May be empty
documentfetchhint	Supported	The value of this property must be either “safe” or “prefetch”. All document fetching is performed in safe mode. The “prefetch” hint is ignored.
grammarmaxstale	Ignored	Grammar fetch properties are ignored by the interpreter. The N2SIP SRP does not support generated audio.
grammarmaxage	Ignored	
grammarfetchhint	Ignored	
scriptmaxstale	Ignored	Script fetch properties are ignored by the interpreter. The N2SIP SRP does not support the <script> tag.
scriptmaxage	Ignored	
scriptfetchhint	Ignored	
objectmaxstale	Ignored	Object fetch properties are ignored by the interpreter. The N2SIP SRP does not support the <object> tag.
objectmaxage	Ignored	
objectfetchhint	Ignored	
audiomaxstale	Ignored	Audio playback by the N2IVR reads audio from the local disk and not from a URI (e.g. over HTTP). Audio fetch is effectively instantaneous. These audio fetch properties are ignored.
audiomaxage	Ignored	
audiofetchhint	Ignored	
fetchaudio	Unsupported	Audio playback during the fetch of VoiceXML documents is unsupported in the current released version of N2IVR.
fetchaudiodelay	Unsupported	
fetchaudiominimum	Unsupported	
fetchtimeout	Ignored	The architecture of the N2IVR relies on HTTP requests being made through a separate service (a REST client service) to the VoiceXML interpreter. The REST client service determines the timeout independently of the VoiceXML interpreter. The value of the fetchtimeout property is ignored.

3.4.5 Miscellaneous Properties

Property	Support	Notes
inputmodes	Ignored	The N2SIP SRP only supports “dtmf” input modes. The value of this property is ignored.
universals	Ignored	The N2SIP SRP does not support grammars. The default value “none” is used internally. The value of this property is ignored.
maxnbest	Ignored	Determines the maximum number of items in the application.lastresult$ array. The lastresult$ array is only ever length 1.

3.4.6 N2IVR Specific Properties

The following properties are N2IVR specific and do not have a corresponding VoiceXML 2.0 property definition.

Property	Support	Notes
lang	Supported	The language determined by interpreter context configuration, or mapped from the <vxml> lang attribute, is presented as the lang property on the interpreter. The lang property can be set using <property> to an explicit value. <prompt> elements may define a specific language to use for audio of the prompt. The <prompt> xml:lang attribute does not set the lang property.

3.5 Interpreter Variables

3.5.1 Dialog Variables

The following document (application) level variables are supported:

Variable	Support	Notes
lastresult$	Supported	The lastresult$ array is supported. The last interaction result can be accessed at lastresult$[0]. The values of this array indexed table are the same as the next four direct-access variables.
lastresult$.confidence	Supported	Always set to 1
lastresult$.utterance	Supported	Set to the digits collected from the caller via DTMF.
lastresult$.inputmode	Supported	Always set to dtmf
lastresult$.interpretation	Supported	Set to the digits input via DTMF when the input type is digits, otherwise the Boolean or integer value (as appropriate) based on type of input.

3.5.2 Document and Application Variables

Dialog level shadow variables for named fields are supported. E.g. a field named pin will have pin$.utterance and pin$.value populated.

3.5.3 Session Variables

The N2IVR VoiceXML Interpreter Context is implemented to align with RFC 5552 (See [R-14]). Session variable values are derived as per the RFC where supported.

For further information on the listed session variables, See Section 2.4 of RFC 5552.

The following session variables are available to all VoiceXML scripts:

Session Variable	Support	Notes
connection.local.uri	Supported	The local URI is determined from the SIP To: header of the incoming SIP INVITE.
connection.remote.uri	Supported	The remote URI is determined from the SIP From: header of the incoming SIP INVITE.
telephone.dnis	Supported	Set to the value of connection.local.uri
telephone.ani	Supported	Set to the value of connection.remote.uri
connection.originator	Not Supported	
connection.protocol.name	Supported	Always set to: sip
connection.protocol.version	Supported	Always set to: 2.0
connection.redirect	Not Supported	
connection.protocol.sip.requesturi	Not Supported	
connection.protocol.sip.media	Not Supported	
connection.protocol.sip.headers	Partially Supported	A subset of SIP INVITE headers will be made available through this session variable prefix. To make a header available, the SIP common configuration block <invite_headers> must be configured with the headers to make available. All headers must be accessed through the dot notation rather than a["b"] notation.
connection.protocol.sip.headers.call_id	Supported	The SIP Call ID is available as call_id, rather than call-id.
connection.aai	Partially Supported	The value of this field is not derived from the inbound SIP Request-URI as defined by RFC 5552. The value of this field is set to a fixed value specified by configuration. The default value of this field is: N2IVR VoiceXML Interpreter

Additional session variables can be defined in configuration. Refer to [R-1] for the configuration of global static session variables.

3.6 EMCA Script Compliance

The VoiceXML specification assumes that an ECMAScript interpreter underpins the execution of logic as defined by a VoiceXML document.

In the N2IVR service, the scripting language Lua is used and ECMAScript support is restricted to a subset of EMCA expressions that can be translated from ECMAScript to Lua by the N2IVR.

The following features of ECMAScript expressions are available:

EMCA Script Feature	Support	Notes
Boolean true and false	Supported	
null and undefined keywords	Supported	
Positive and negative numbers	Supported	Numbers as high as ECMAScript's Number.MAX_VALUE and Number.MAX_SAFE_INTEGER are supported.
Strings and string concatenation	Supported	UTF-8 ECMAScript strings translated to Lua strings directly.
Number math symbols +, -, *, / and %	Supported	
Prefix operators !, -, + and ~	Supported	When the + and - prefix operators are used, the Lua tonumber() function is used to coerce the value to a number.
Operators <, >, ==, !=, ===, !===, >= and <=	Supported	!== and === are converted to Lua ~= and == operators.
Boolean operators &&, ||	Supported	
Bitwise operators ^, |, &, <<, >>, and >>>	Unsupported	
Ternary operator	Supported	
Array definitions	Unsupported	Array definition via constructs such as [1,2,3] are unsupported.
Array access	Supported	Array access (e.g. to access lastresult$[0]) is supported.
Method calls	Supported	Method calls are supported in general, however only a limited number of methods can be called. See below for the list of method calls supported.
Function definitions	Unsupported	Function definitions (including anonymous functions) are unsupported.
Variable access	Partially Supported	Variable access is supported through "dot" notation. E.g. connection.protocol.name is supported to access the name in the "protocol" object. Object access through the [] operator syntax, e.g. connection['protocol']['name'] is unsupported.

The following list of functions may be called within ECMAScript embedded in expressions in VoiceXML documents:

Function	Support	Notes
encodeURIComponent(string)	Supported	Encodes a string such that it may be embedded in a URL as a query value, or path section – e.g. as part of a <goto> or <submit>.

3.7 HTTP Requests

3.7.1 HTTP Headers

The N2IVR VoiceXML interpreter context will make requests to the VoiceXML server determined by configuration matching the incoming SIP request. When a HTTP request is made to a VoiceXML server for the initial VoiceXML session document, the following headers are included:

Header	Example	Purpose
X-N2IVR-CALL-ID	segEIFXe3z	The value of this header will match the session ID of the SIP session that has initiated this VoiceXML session
User-Agent	n2svcd::RestClientApp	The User-Agent header identifies the type of UA making the HTTP request. This is a fixed string set to n2svcd::RestClientApp

3.7.2 Cookies

HTTP Requests made in response to a <submit> or <goto> element include Cookie headers in requests if any are set by the VoiceXML server in previous HTTP responses.

3.7.3 Caching

The N2IVR VoiceXML solution performs no HTTP caching of VoiceXML documents received from remote servers. If caching occurs at all, caching will occur off-platform, e.g. by a 3RD party HTTP proxy.

With reference to [R-10] Section 6.1.2 (Caching), no caching is performed by the N2IVR.

With reference to [R-10] Section 6.1.3 (Prefetching), no prefetching is performed by the N2IVR. All HTTP requests are performed at the time the request response is required by the VoiceXML interpreter.

Where a VoiceXML action (such as a <submit>) includes an action which supports attributes such as maxstale or maxage, these attributes are used to determine the value of the Cache-Control HTTP header in HTTP requests made by the VoiceXML interpreter.

The N2IVR VoiceXML interpreter determines the appropriate value of maxage and maxstale to use based on the specifications scoping rules as defined in [R-10].

3.8 SSML Element Conformance

N2IVR conformance to the VoiceXML <prompt> element is determined by its conformance to the SSML elements that may appear within <prompt> for VoiceXML.

All content of the <prompt> element will be processed without generating an error during the VoiceXML parsing and transpile steps executed by the N2IVR. During execution of a VoiceXML document, if execution encounters a request for voice synthesis the appropriate error.unsupported event is thrown.

Note that in some cases the element itself does not cause an error, only text content within the element will. For example, <emphasis/> will not generate an error, but <emphasis>hello</emphasis> will.

The <audio> element is documented separately. See Section 4.2.

3.9 Grammars

While the N2IVR does not support the <grammar> tag (whether with DTMF or speech grammar definitions), support for builtin grammars defined by the type attribute of the <field> element are supported.

The following builtin grammars are supported:

Builtin Grammar	Support	Notes
boolean	Supported	The boolean grammar is supported with parameters "y" and "n". The default values accepted are 1 (true) and 2 (false) Truth and false can be altered using optional parameters: • y if specified determines the digit to be used for true • n if specified determines the digit to be used for false If y and n are configured to the same digit, the interpreter will return true when that digit is pressed.
digits	Supported	The digits grammar is supported with optional parameters: • length if specified, the exact length of the DTMF string of digits to accept. • minlength if specified, the minimum length of the DTMF string of digits to accept. • maxlength if specified, the maximum length of the DTMF string of digits to accept. By default, the digits grammar will accept digit input between 1 and 99 digits long.
date	Unsupported	
currency	Unsupported	
number	Unsupported	
phone	Unsupported	
time	Unsupported	

3.10 DTMF Collection

The VoiceXML Interpreter Context uses the underlying SIP & RTP engines for audio playback and DTMF detection & collection.

The N2IVR DTMF collection algorithms (inherited from the N2SIP framework) do not buffer DTMF input by the user. DTMF input is only gathered from the moment DTMF collection is enabled. This is:

1. From the moment the audio file(s) begin playing, when bargein is true for the relevant <prompt> queued.
2. From the moment the audio files(s) end playing, when bargein is false for the relevant <prompt> queued.

When multiple <prompt>s are queued, with different bargein values, the bargein value is honored for each set of sequential prompts with the same value. If bargein is true, and the user enters one or more DTMF digits, all subsequent queued prompts (including any with bargein set to false) are not played.

3.11 Audio File Selection

The N2IVR VoiceXML interpreter supports audio file playback from local files only. The audio file to play can be referenced either by file or by message ID.

When using a message ID, the format of this attribute must be:

```
builtin://<messageid>
```

Where <messageid> is the unique message ID as predefined in the N2IVR audio configuration.

When using a file, the format of this attribute must be:

```
file://[/path/to/file/]<group>/<filename>.<suffix>
```

Where:

- [/path/to/file/] is an optional path on disk to the file. This is stripped from the file path and ignored. All audio files are selected based only on their group and filename, which must be explicitly listed in the N2IVR configuration.
- <group> is the audio file group. This determines whether the file is a variable part or not.
- <filename> is the filename of the audio file to play. This must match an audio file defined in the N2IVR configuration.
- <suffix> is the suffix of the audio file. It is ignored.

4 Detailed VoiceXML Element Conformation

This section provides detailed conformance information for each VoiceXML element, in alphabetical order. For SSML specific elements (e.g. <p>), see Section 3.8 SSML Element Conformance.

4.1 ASSIGN

N2IVR supports the <assign> element to assign new values to variables within VoiceXML document. The <assign> element is supported at all scopes allowed by the specification.

Element Attribute	Support	Notes
name	Supported	The name of the variable. Variable names are validated. Names that do not adhere to the VoiceXML 2.0 variable naming rules cause an error.semantic event to be thrown. Variable names may be scoped (e.g. with prefixes such as document.)
expr	Supported	Variable expressions are supported to the extent the interpreter supports general ECMAScript expressions. See Section 3.6 EMCA Script Compliance for more information on what script expressions are supported.

4.2 AUDIO

N2IVR supports the use of one or more <audio> elements within a <prompt> element to define the audio to play to the caller when the <prompt> is selected for playback.

Element Attribute	Support	Notes
src	Supported	All audio is read from local disk. The src attribute (or the expr attribute when evaluated) determines the audio file to play. N2IVR stores all audio files for playback on local disk. See Section 3.11 Audio File Selection for more information on valid source formats.
fetchtimeout	Ignored	All audio is read from local disk. There is no meaningful delay in playback of selected audio within the N2IVR.
fetchhint	Ignored	
maxage	Ignored	
maxstale	Ignored	
expr	Supported	The expr attribute is supported to determine the value of the src attribute. See Section 3.6 EMCA Script Compliance for more information on the extent of the script expressions supported.

4.3 BLOCK

N2IVR supports the <block> form item to define executable content within a VoiceXML form.

Element Attribute	Support	Notes
name	Supported	The name of the block. If defined, the block's form variable will be defined as given by this attribute. If not defined, a deterministic internal name is generated for the block's form item variable and any associated shadow variables.
expr	Supported	If this ECMAScript expression evaluates to false at the moment the block may be executed, the block is not eligible for execution by the interpreter FIA. See Section 3.6 EMCA Script Compliance for further details on supported expressions.

4.4 CATCH

See also <error>, <help>, <noinput> and <nomatch>

N2IVR supports the <catch> element to define a handler for event(s) thrown.

The <catch> element in N2IVR is implemented as defined in the specification, namely the catch handler selected by the VoiceXML interpreter is selected from the defined handlers by determining the best match following the VoiceXML 2.0 algorithm.

Within the catch block the variables _event and _message are available.

Element Attribute	Support	Notes

event	Supported	A space-separated list of event prefixes this catch handler is to catch. Each event prefix given must conform to the regular expression:
		`/^[0-9a-zA-Z][0-9a-zA-Z.-]*$/`
		The event attribute if given must not be empty. To capture all events with the attribute, use:
		`event="."`

count	Supported	The minimum number of times that the matching event must have occurred in the current execution context before this catch block is possibly used. The default value for count is 1.
cond	Supported	An ECMAScript expression that must evaluate to a Boolean. This condition is run in the scope where the catch handler is being triggered. See Section 3.6 EMCA Script Compliance for more information on what script expressions are supported

4.5 CHOICE

N2IVR supports the use of the <choice> element in menus to either:

1. Transition from to an explicit form item within the current form.
2. Transition to another form (or restart the current form) within the current document.
3. Transition to another document (and optionally, an explicit form).
4. Generate an event within the scope of the enclosing <menu>.

When a transition to a new document is required, N2IVR will use a HTTP GET request to perform the request.

Element Attribute	Support	Notes
dtmf	Supported	The DTMF digits that will match this option. Whitespace in this attribute is removed.
accept	Ignored	As all menu entry is via DTMF, the accept attribute is ignored.
next	Supported	HTTP and HTTPS are supported in URIs
expr	Supported	An expression to evaluate to generate the next URI (rather than read the next attribute). See Section 3.6 EMCA Script Compliance for more information on the extend of support for EMCAScript expressions.
event	Supported	The string event (e.g. nomatch, or nz.nsquared.unimplemented) to generate if this option is chosen by the caller.
eventexpr	Supported	Once evaluated, the event to be generated when this option is chosen by the caller. See Section 3.6 EMCA Script Compliance for more information on the extend of support for EMCAScript expressions.
message	Supported	A fixed message to be used as the message in the <throw> action if one is generated by this choice.
messageexpr	Supported	An expression that will evaluate to the message to be used as the message in the <throw> action if one is generated by this choice. See Section 3.6 EMCA Script Compliance for more information on the extend of support for EMCAScript expressions.
fetchaudio	Unsupported	
fetchhint	Ignored	The fetchhint value may be specified but is ignored. All HTTP requests are submitted when executed by the interpreter.
fetchtimeout	Ignored	
maxage	Supported	See Section 3.7 HTTP Requests
maxstale	Supported	See Section 3.7 HTTP Requests

4.6 CLEAR

N2IVR supports the <clear> element to set declared variables and form item values to undefined.

Element Attribute	Support	Notes
namelist	Supported	The list of variables and form item variables whose value is to be set to undefined. When not specified, all the current dialog's form item variables will be set to undefined, including associated counters. Scoping prefixes can be used to disambiguate a variable if required.

4.7 DISCONNECT

N2IVR supports the <disconnect> element to force a hangup of the caller.

Element Attribute	Support	Notes
namelist	Supported	*Note that this is a VoiceXML 2.1 attribute.* A namelist can be supplied, and variable values are returned to the interpreter and included in the associated N2IVR EDR. The error.semantic event is thrown when an unknown variable is encountered.

4.8 ELSE

N2IVR supports the use of the <else> element to provide the else block to an if statement in VoiceXML.

Element Attribute	Support	Notes
none		

4.9 ELSEIF

N2IVR supports the use of the <elseif> element to conditionally execute commands as part of the <if> block support.

Element Attribute	Support	Notes
cond	Supported	The elseif condition. This is required, otherwise a VoiceXML compilation error is thrown before the document is executed.

4.10 ERROR

N2IVR supports the <error> element.

When an <error> element is encountered, the VoiceXML logic is translated into the equivalent of:

```
<catch event="error">
...
```

```
</catch>
```

Refer to Section 4.4 for details on the <catch> element.

4.11 EXIT

N2IVR supports the <exit> element to immediately exit from the VoiceXML interpreter and back to the N2IVR call control handler.

Element Attribute	Support	Notes
namelist	Supported	A namelist can be supplied and all variables listed are returned to the SRP call control engine. The named variables and their values are inserted into the N2IVR SRP-VXML-EXIT EDR. The error.semantic event is thrown when an unknown variable is encountered.

4.12 FIELD

N2IVR supports the <field> element for defining VoiceXML fields to be filled during a form interaction. As the N2IVR does not support audio processing other than DTMF processing, it is necessary for field input to be assigned a built-in grammar through either the type attribute, or at least one <option> sub-element.

Element Attribute	Support	Notes
name	Supported	The name of the form item. This in turn becomes the variable for the form item.
expr	Supported	The initial value of the form item variable. See Section 3.6 EMCA Script Compliance for more information on what expressions are supported.
cond	Supported	An expression which, if evaluating to true, allows the field to be visited during FIA processing. If not defined, will be treated as a function always returning true. See Section 3.6 EMCA Script Compliance for more information on what expressions are supported.
type	Supported	If type is not defined, at least one <option> must be included in the field definition. If type is defined, <option>s may also be defined and if the input for the field matches an option, the option value will be used in preference to the value determined by this type attribute. Where a type attribute determines the minimum and maximum of digits input, these override the length of the <option> dtmf digits attribute. See Section 3.9 Grammars for details on the builtin grammar types supported by N2IVR.
slot	Ignored	All supported grammars provide the resulting DTMF to the form field as a string of digits.
modal	Ignored	All form fields must use the selected builtin grammar as defined by the type attribute.

4.13 FILLED

N2IVR supports the <filled> element for executable content once one or more form fields are filled during a form interaction.

<filled> elements are read in document order within a form when the FIA is determining whether to trigger a <filled> element.

Element Attribute	Support	Notes
namelist	Supported	If given, the list of input fields that must be filled to execute this element's executable content. If not given, the namelist is implicitly defined to be the list of form input item fields of the enclosing <form>. An error.badfetch event is triggered if this attribute is defined on a <filled> block within a <field>.
Mode	Supported	If given, must be either any or all. If all, all fields listed by namelist must be filled. If any, only one field must be filled to trigger execution of the <filled> block.

4.14 FORM

N2IVR supports the <form> element for defining VoiceXML dialogs. The form interpretation algorithm (FIA) implemented by the N2SIP VoiceXML interpreter is analogous to the concept algorithm provided by the specification.

Element Attribute	Support	Notes
id	Supported	The name of the form. This can be used to reference this form from the current (and other) VoiceXML documents.
scope	Ignored	Grammars are unsupported. A scope if defined for a form is ignored.

4.15 GOTO

N2IVR supports the use of the <goto> element to:

5. Transition from to an explicit form item within the current form.
6. Transition to another form (or restart the current form) within the current document.
7. Transition to another document (and optionally, an explicit form)

When a transition to a new document is required, N2IVR will use a HTTP GET request to perform the request.

Element Attribute	Support	Notes
next	Supported	HTTP and HTTPS are supported in URIs
expr	Supported	See Section 3.6 EMCA Script Compliance for more information on the extend of support for EMCAScript expressions.
nextitem	Supported	The name of a formitem within the current form to collect input for.
expritem	Supported	Once evaluated, the name of a formitem within the current form to collect input for. See Section 3.6 EMCA Script Compliance for more information on the extend of support for EMCAScript expressions.
fetchaudio	Unsupported	
fetchhint	Ignored	The fetchhint value may be specified but is ignored. All HTTP requests are submitted when executed by the interpreter.
fetchtimeout	Ignored	
maxage	Supported	See Section 3.7 HTTP Requests
maxstale	Supported	See Section 3.7 HTTP Requests

4.16 HELP

N2IVR supports the definition of the <help> element.

When an <help> element is encountered, the VoiceXML logic is translated into the equivalent of:

```
<catch event="help">
...
</catch>
```

Refer to Section 4.4 for details on the <catch> element.

The N2IVR interpreter does not automatically generate help events, however VoiceXML documents can generate the help event using:

```
<throw event="help"/>
```

4.17 IF

N2IVR supports the use of the <if> element to conditionally execute blocks within execution blocks (including <block>, <catch> etc).

Element Attribute	Support	Notes
cond	Supported	The if condition. This is required, otherwise a VoiceXML compilation error is thrown before the document is executed.

4.18 LOG

N2IVR supports the use of the <log> element to generate debug messages to the N2IVR log.

Element Attribute	Support	Notes
Label	Supported	The label, if given, is prefixed to the front of the log message. The label is not used otherwise.

4.19 MENU

N2IVR supports the use of the <menu> element to define DTMF menus.

Element Attribute	Support	Notes
id	Supported	The id attribute is used to give the menu an ID that can be referenced within the same document, or from other documents as a target for initial FIA processing.
scope	Ignored	Grammars are unsupported. A scope if defined for a form is ignored.
dtmf	Supported	The dtmf attribute is supported. When set to true, the first nine <choice> elements within the menu are given the DTMF digits 1..9 in order. Any <choice> where their dtmf attribute is defined and is not *, # or 0 will generate an error.badfetch event. When set to false, all <choice> elements will require a unique DTMF sequence defined using the dtmf attribute to be selectable as an option in the menu.
accept	Ignored	As all menu entry is via DTMF, the accept attribute is ignored.

4.20 META

N2IVR ignores any <meta> tags that occur in received VoiceXML documents. The metadata is skipped. Note that in the case where the <meta> tag is invalid according to the specification, the error.badfetch event is suppressed.

Element Attribute	Support	Notes
name	Ignored	The name attribute is read, and no further processing is done.
content	Ignored	The content attribute is read, and no further processing is done.
http-equiv	Ignored	The http-equiv attribute is read, and no further processing is done. The value of this attribute is not verified to be a valid HTTP response header.

4.21 METADATA

N2IVR ignores any <metadata> tags that occur in received VoiceXML documents. The metadata is skipped.

Element Attribute	Support	Notes
none		

4.22 NOINPUT

N2IVR supports the <noinput> element.

When an <noinput> element is encountered, the VoiceXML logic is translated into the equivalent of:

```
<catch event="noinput">
…
</catch>
```

Refer to Section 4.4 for details on the <catch> element.

4.23 NOMATCH

N2IVR supports the <nomatch> element.

When an <nomatch> element is encountered, the VoiceXML logic is translated into the equivalent of:

```
<catch event="nomatch">
…
</catch>
```

Refer to Section 4.4 for details on the <catch> element.

4.24 OPTION

N2IVR supports the use of the <option> element to define one or more options for a <field>. When the attribute value is specified, any CDATA text is ignored. When neither CDATA text or a value attribute is given, the dtmf value is used as the value for the field.

CDATA text is used as the option value if given, and no value attribute is given. Whitespace at the start and end of the CDATA text is removed, and if the CDATA text is only whitespace, it is ignored.

Element Attribute	Support	Notes
dtmf	Supported	The DTMF digits that will match this option. Whitespace in this attribute is removed.
value	Supported	The value to assign, as a string. Note that no conversion is applied

		even if the <field> type attribute indicates the field should be a Boolean, number or other non-string type.

4.25 PROMPT

N2IVR supports the use of <audio> within <prompt>. However, as the N2IVR solution does not support text-to-speech all TTS definitions are unsupported.

In particular, when the VoiceXML interpreter encounters text directly within a <prompt>, an error.unsupported.prompt.builtin.tts event is generated. The only subelements of a <prompt> that are supported are:

- <audio>
- <desc>

Elements such as <mark> and <lexicon> are ignored, and where elements such as <p> or <s> include no text, these are also ignored Other elements, such as <say-as> and <sub> generate an error.unsupport.<element> error when encountered immediately.

Where an <audio> element which is a direct child of a <prompt> element includes alternative content, the alternative content is *always* ignored, even when the alternative content is itself only an <audio> element. The N2SIP implementation requires all referenced audio files to be available and does not support playback of alternative content. However, alternative content if it exists will not generate an error.

For example, the following prompt will play announcement message IDs 1001 and 1002:

```
<prompt bargein="true">
  <audio src="builtin://1001">
      Welcome to the N2IVR demonstration service.
  </audio>
  <audio src="builtin://1002">
      Please pay attention to the following menu.
  </audio>
</prompt>
```

Element Attribute	Support	Notes
bargein	Supported	May be set to true or false.
bargeintype	Ignored	No TTS is supported in the N2IVR. The bargein type is always ignored.
cond	Supported	Conditional expressions on inclusion of the prompt in playback are supported. See Section 3.6 EMCA Script Compliance for more information on what expressions are supported. Note that the condition is tested at moment that the prompt is to be played, not at the moment it is encountered in the document.
count	Supported	
xml:lang	Supported	The value of the xml:lang attribute determines the language to be used when playing audio files defined by the <audio> tag within

		this <prompt> This attribute may be an empty string, in which case the default language of the platform is used. The value of this attribute is mapped to an N2IVR language using the interpreter context configuration map LANGUAGE_MAPPING.
xml:base	Ignored	All audio is read from local disk based on system configuration. The xml:base is not used.
timeout	Supported	

4.26 PROPERTY

N2IVR supports the use of the <property> element to set the value of VoiceXML properties within the current interpreter context. Information on the extent of the support for each property can be found in Section 3.4. When the VoiceXML interpreter encounters a <property> element, the property given by the name attribute will be assigned the value given by the value attribute.

Where the property is supported by the interpreter, the interpreter will verify the value is valid. An error.semantic error will be thrown where the value is invalid.

Where the property is ignored by the interpreter (whether because it is unknown, or because it is not supported by the interpreter), the property value will be set to the given value but not used.

Element Attribute	Support	Notes
name	Supported	Refer to Section 3.3.2 for a list supported property names.
value	Supported	The necessary format of the value will depend on the named property.

4.27 REPROMPT

N2IVR supports the <reprompt> inside <catch> blocks, including any element that translates to a <catch> block (e.g. <noinput>).

Element Attribute	Support	Notes
	none	

4.28 SUBMIT

N2IVR supports the use of the <submit> element to perform a POST or GET request to a HTTP(S) endpoint. The HTTP(S) request is made via the configured N2SVCD REST Client application.

Element Attribute	Support	Notes
next	Supported	HTTP and HTTPS are supported in URIs
expr	Supported	See Section 3.6 EMCA Script Compliance for more information on the extend of support for EMCAScript expressions.
namelist	Supported	A space separate list of variables as available to the VoiceXML interpreter to submit in the encoded format. As specified by [R-10], when not defined all named input variables in scope are submitted.
method	Supported	Supported values: • GET • POST Default is “GET” Validation is case insensitive
enctype	Supported	Supported values: • multipart/form-data • application/x-www-form-urlencoded Default is: application/x-www-form-urlencoded Validation is case-sensitive
fetchaudio	Unsupported	
fetchhint	Ignored	The fetchhint value may be specified but is ignored. All HTTP requests are submitted when executed by the interpreter.
fetchtimeout	Ignored	
maxage	Supported	See Section 3.7 HTTP Requests
maxstale	Supported	See Section 3.7 HTTP Requests

4.29 TRANSFER

N2IVR supports the <transfer> element to transfer the calling party to another off-platform B party.

Element Attribute	Support	Notes
name	Supported	The name of the form variable that the transfer result will be stored in. If not given, an internal name is generated. If the value of this field is not undefined, the transfer will not trigger during form evaluation via the FIA.
expr	Supported	The value to give the transfer's associated form variable at initialisation. By defining the expression, the <transfer> will not occur by default and the variable name must be cleared for the transfer to occur. See Section 3.6 EMCA Script Compliance for more information on what script expressions are supported.
cond	Supported	An additional condition as to whether the transfer should occur (in addition to whether the form variable for the transfer is undefined). See Section 3.6 EMCA Script Compliance for more information on what script expressions are supported.
dest	Supported	A fixed destination to connect to, in the form defined by RFC 2806 for telephony digits: `tel:456-7890;phone-context=213` Note that only the telephone digits are used. All other content of the URI are dropped and removed before the transfer is initiated. The underlying SIP call control layer of N2IVR will rebuild the destination SIP URI.
destexpr	Supported	The destination for the transfer can be generated by ECMAScript expression. The output of this expression must be an RFC 2806 tel: URI as supported by the dest attribute. See Section 3.6 EMCA Script Compliance for more information on what script expressions are supported.
bridge	Supported	Both bridge and no-bridge transfer are supported by N2IVR. If bridge is specified, type must not be.
type	Supported	The VoiceXML v2.1 attribute type is supported. Bridge, blind and consultation transfer is supported. If type is specified, bridge must not be.
connecttimeout	Supported	The default connection timeout is configured by the underlying N2IVR SIP call control platform. An explicit timeout for the transfer can be defined in this attribute. Only used if bridge is set to true.
maxtime	Supported	The maximum talk time for a bridged call. The default is 0, which is considered to mean there is no maximum talk time. Only used if bridge is set to true.
transferaudio	Ignored	The transferaudio attribute is unsupported by N2IVR. Any value in this attribute is ignored.

aai	Ignored	The aai attribute is ignored and not used by N2IVR.
aaiexpr	Ignored	The aaiexpr attribute is ignored and not used by N2IVR.

4.30 THROW

N2IVR supports the <throw> element to generate an event to be caught by a <catch> element (or the VoiceXML interpreter).

Element Attribute	Support	Notes
event	Supported	The event to generate. This is a fixed string. Use eventexpr to generate the event from ECMAScript code.
eventexpr	Supported	Event expressions are supported to the extent the interpreter supports general ECMAScript expressions. See Section 3.6 EMCA Script Compliance for more information on what script expressions are supported.
message	Supported	The message to pass as the _message variable to the <catch> handler. This is a fixed string. Use messageexpr to generate the message from ECMAScript code.
messageexpr	Supported	Expressions to generate the message are supported to the extent the interpreter supports general ECMAScript expressions. See Section 3.6 EMCA Script Compliance for more information on what script expressions are supported.

4.31 VAR

N2IVR supports the <var> element to define variables within VoiceXML document. The <var> element is supported at all scopes.

Element Attribute	Support	Notes
name	Supported	The name of the variable. Variable names are validated. Names that do not adhere to the VoiceXML 2.0 variable naming rules cause an error.semantic event to be thrown.
expr	Partially Supported	Variable expressions are supported to the extent the interpreter supports general ECMAScript expressions. See Section 3.6 EMCA Script Compliance for more information on what script expressions are supported.

4.32 VXML

N2IVR supports the <vxml> element to define a VoiceXML document.

Element Attribute	Support	Notes
version	Supported	The VoiceXML document version is verified to be a supported version. See Section 3.2 VoiceXML Versions for supported versions.
application	Unsupported	The N2IVR does not support application documents.
xml:base	Supported	The xml:base attribute if defined determines the base URI for any request for a VoiceXML document made with a relative URI.
xml:lang	Supported	The value of the xml:lang attribute determines the default language to be used when playing audio files defined by the <audio> tag. This attribute may be an empty string, in which case the default language of the platform is used. The value of this attribute is mapped to an N2IVR language using the interpreter context configuration map LANGUAGE_MAPPING.
xmlns	Supported	The content of the xmlns attribute is verified to be "http://www.w3.org/2001/vxml" during interpretation by N2IVR.