

Australian/New Zealand Standard™

**Geographic information—Web Feature
Service**



AS/NZS ISO 19142:2011

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee IT-004, Geographical Information/Geomatics. It was approved on behalf of the Council of Standards Australia on 15 November 2011 and on behalf of the Council of Standards New Zealand on 14 November 2011. This Standard was published on 23 December 2011.

The following are represented on Committee IT-004:

ANZLIC—The Spatial Information Council
Australasian Fire and Emergency Service Authorities Council
Australian Antarctic Division
Australian Hydrographic Office
Australian Map Circle
CSIRO Exploration and Mining
Department of Lands, NSW
Department of Primary Industries and Water, Tas.
Geoscience Australia
Land Information New Zealand
Mercury Project Solutions
Office of Spatial Data Management
The University of Melbourne

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Web Shop at www.saiglobal.com.au or Standards New Zealand web site at www.standards.co.nz and looking up the relevant Standard in the on-line catalogue.

For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia or Standards New Zealand at the address shown on the back cover.

This Standard was issued in draft form for comment as DR AS/NZS ISO 19142.

Australian/New Zealand Standard™

Geographic information—Web Feature Service

First published as AS/NZS ISO 19142:2011.

COPYRIGHT

© Standards Australia Limited/Standards New Zealand

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Australia) or the Copyright Act 1994 (New Zealand).

Jointly published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001 and by Standards New Zealand, Private Bag 2439, Wellington 6140.

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee IT-004, Geographical Information/Geomatics.

The objective of this Standard is to specify the behaviour of a web feature service that provides transactions on and access to geographic features in a manner independent of the underlying data store.

This Standard is identical with, and has been reproduced from ISO 19142:2010, *Geographic information—Web Feature Service*.

As this Standard is reproduced from an International Standard, the following applies:

- (a) Its number appears on the cover and title page while the International Standard number appears only on the cover.
- (b) In the source text ‘this International Standard’ should read ‘this Australian/New Zealand Standard’.
- (c) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>		<i>Australian/New Zealand Standard</i>	
ISO/TS		AS/NZS	ISO
19103	Geographic information— Conceptual schema language	19103	Geographic information—Conceptual schema language
ISO		19143	Geographic information—Filter encoding
19143	Geographic information—Filter encoding		

Only documents that have been adopted as Australian or Australian/New Zealand Standards have been listed.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the annex to which they apply. A ‘normative’ annex is an integral part of a Standard, whereas an ‘informative’ annex is only for information and guidance.

CONTENTS

1	Scope	1
2	Conformance	2
3	Normative references	3
4	Terms and definitions	4
5	Conventions	8
5.1	Abbreviated terms	8
5.2	Use of examples	9
5.3	XML schemas	9
5.4	UML Notation	9
5.4.1	Class diagrams	9
5.4.2	State machine notation	10
6	Basic service elements	11
6.1	Introduction	11
6.2	Version numbering and negotiation	11
6.2.1	Version number form and value	11
6.2.2	Appearance in service metadata and in requests	11
6.2.3	Version number negotiation	11
6.2.4	Request encoding	11
6.2.5	KVP parameter encoding rules	12
6.3	Namespaces	13
6.4	Service bindings	13
7	Common elements	13
7.1	Encoding of features	13
7.2	Resource identifiers	13
7.2.1	Assigning resource identifiers	13
7.2.2	Encoding resource identifiers	14
7.2.3	Version identification	14
7.3	Property references	14
7.3.1	XPath subset	14
7.3.2	Accessor function	14
7.4	Predicate expression encoding	15
7.5	Exception reporting	15
7.6	Common request parameters	17
7.6.1	Introduction	17
7.6.2	Base request type	17
7.6.3	Standard presentation parameters	19
7.6.4	Standard resolve parameters	22
7.6.5	Standard input parameters	25
7.6.6	Additional common keywords for KVP-encoded requests	26
7.7	Standard response parameters	27
7.7.1	Parameter semantics	27
7.7.2	XML encoding	27
7.7.3	KVP encoding	27
7.7.4	Parameter discussion	27
7.8	Use of the schemaLocation attribute	30
7.9	Query expressions	30

7.9.1	Introduction	30
7.9.2	Ad hoc query expression	30
7.9.3	Stored query expression	40
8	GetCapabilities operation	42
8.1	Introduction	42
8.2	Request	43
8.2.1	Request semantics	43
8.2.2	XML encoding	43
8.2.3	KVP encoding	43
8.3	Response	43
8.3.1	Response semantics	43
8.3.2	XML encoding	44
8.3.3	Capabilities document	45
8.3.4	FeatureTypeList section	45
8.3.5	Parameters domains and constraints	48
8.4	Extension points	52
8.5	Exceptions	54
9	DescribeFeatureType operation	54
9.1	Introduction	54
9.2	Request	54
9.2.1	Request semantics	54
9.2.2	XML Encoding	54
9.2.3	KVP Encoding	55
9.2.4	Parameter discussion	55
9.3	Response	56
9.3.1	Introduction	56
9.3.2	Supporting multiple namespaces	56
9.4	Exceptions	57
10	GetPropertyValue operation	57
10.1	Introduction	57
10.2	Request	57
10.2.1	Request semantics	57
10.2.2	XML Encoding	58
10.2.3	KVP Encoding	58
10.2.4	Parameter discussion	58
10.3	Response	60
10.3.1	Response semantics	60
10.3.2	XML encoding	60
10.3.3	State parameter	61
10.3.4	Standard response parameters	61
10.4	Exceptions	61
11	GetFeature operation	62
11.1	Introduction	62
11.2	Request	62
11.2.1	Request semantics	62
11.2.2	XML encoding	63
11.2.3	KVP encoding	63
11.2.4	Parameter discussions	64
11.3	Response	64
11.3.1	Response semantics	64
11.3.2	XML encoding	65
11.3.3	Parameter discussions	66
11.3.4	Additional objects	69
11.3.5	GetFeatureById response	69
11.4	Exceptions	70
12	LockFeature operation	70
12.1	Introduction	70

12.2	Request.....	70
12.2.1	Request semantics.....	70
12.2.2	XML encoding.....	71
12.2.3	KVP encoding.....	71
12.2.4	Parameter discussions.....	72
12.2.5	State machine for WFS locking.....	73
12.3	Response.....	74
12.3.1	Response semantics.....	74
12.3.2	XML encoding.....	74
12.4	Exceptions.....	75
13	GetFeatureWithLock operation.....	75
13.1	Introduction.....	75
13.2	Request.....	75
13.2.1	Request semantics.....	75
13.2.2	XML encoding.....	75
13.2.3	KVP encoding.....	76
13.2.4	Parameter discussion.....	76
13.3	Response.....	77
13.3.1	Introduction.....	77
13.3.2	lockId parameter.....	77
13.4	Exceptions.....	77
14	Stored query management.....	77
14.1	Introduction.....	77
14.2	Defining stored queries.....	78
14.2.1	XML encoding.....	78
14.2.2	Parameter discussion.....	78
14.3	ListStoredQueries operation.....	81
14.3.1	Request semantics.....	81
14.3.2	XML encoding.....	82
14.3.3	KVP encoding.....	82
14.3.4	Response.....	82
14.3.5	Exceptions.....	83
14.4	DescribeStoredQueries operations.....	83
14.4.1	Request semantics.....	83
14.4.2	XML encoding.....	83
14.4.3	KVP encoding.....	84
14.4.4	Response.....	84
14.5	CreateStoredQuery operation.....	85
14.5.1	Request semantics.....	85
14.5.2	XML encoding.....	85
14.5.3	KVP encoding.....	85
14.5.4	Parameter discussions.....	85
14.5.5	Response.....	86
14.6	DropStoredQuery operations.....	86
14.6.1	Request semantics.....	86
14.6.2	XML encoding.....	87
14.6.3	KVP encoding.....	87
14.6.4	Response.....	87
14.7	Exceptions.....	87
15	Transaction operation.....	88
15.1	Introduction.....	88
15.2	Request.....	88
15.2.1	Request semantics.....	88
15.2.2	XML encoding.....	89
15.2.3	Parameter discussions.....	90
15.2.4	Insert action.....	91
15.2.5	Update action.....	92
15.2.6	Replace action.....	94

15.2.7	Delete action.....	94
15.2.8	Native action.....	95
15.3	Response.....	96
15.3.1	Response semantics.....	96
15.3.2	TransactionResponse element.....	96
15.3.3	TransactionSummary element.....	97
15.3.4	InsertResults element.....	97
15.3.5	UpdateResults element.....	98
15.3.6	ReplaceResults element.....	98
15.4	Exceptions.....	98
Annex A (normative) Conformance testing.....		99
A.1	Conformance classes.....	99
A.1.1	Simple WFS.....	99
A.1.2	Basic WFS.....	99
A.1.3	Transactional WFS.....	99
A.1.4	Locking WFS.....	100
A.1.5	HTTP GET.....	100
A.1.6	HTTP POST.....	100
A.1.7	SOAP.....	100
A.1.8	Inheritance.....	101
A.1.9	Remote resolve.....	101
A.1.10	Response paging.....	101
A.1.11	Standard joins.....	101
A.1.12	Spatial joins.....	101
A.1.13	Temporal joins.....	102
A.1.14	Feature versions.....	102
A.1.15	Manage stored queries.....	102
A.2	Basic tests.....	102
A.2.1	Version negotiation.....	102
A.2.2	Lists version number 2.0.0 as a supported request version number.....	103
A.2.3	Invalid version number.....	103
A.2.4	Version negotiation for the GetCapabilities request.....	103
A.2.5	Response to XML- and KVP-encoded. requests.....	103
A.2.6	Parameter ordering and case.....	104
A.2.7	Unrecognized parameters.....	104
A.2.8	Server operates on GML features.....	104
A.2.9	Feature identifiers.....	105
A.2.10	Invariant identifier.....	105
A.2.11	Versioning.....	105
A.2.12	XPath subset.....	106
A.2.13	Predicate encoding.....	106
A.2.14	Exception reporting.....	106
A.2.15	Common request parameters.....	107
A.2.16	Standard presentation parameters.....	108
A.2.17	Standard resolve parameters.....	109
A.2.18	Standard input parameters.....	112
A.2.19	Standard response parameters.....	113
A.2.20	Response paging.....	114
A.2.21	schemaLocation parameter.....	115
A.2.22	Query expressions.....	115
A.2.23	Declaring conformance.....	120
Annex B (informative) Examples.....		121
B.1	Exception report example.....	121
B.2	DescribeFeatureType examples.....	121
B.2.1	Example 1.....	121
B.2.2	Example 2.....	124

B.3	GetFeature examples	128
B.3.1	Introduction	128
B.3.2	Example 1	128
B.3.3	Example 2	128
B.3.4	Example 3	129
B.3.5	Example 4	129
B.3.6	Example 5	131
B.3.7	Example 6	131
B.3.8	Example 7	131
B.3.9	Example 8	132
B.3.10	Example 9	134
B.3.11	Example 10	136
B.3.12	Example 11	137
B.3.13	Example 12	138
B.3.14	Example 13	139
B.3.15	Example 14	142
B.3.16	Example 15	143
B.3.17	Example 16	143
B.3.18	Example 17	144
B.3.19	Example 18	145
B.3.20	Example 19	145
B.4	GetPropertyValue examples	146
B.4.1	Introduction	146
B.4.2	Example 1	147
B.4.3	Example 2	149
B.4.4	Example 3	149
B.4.5	Example 4	151
B.4.6	Example 5	152
B.4.7	Example 6	153
B.4.8	Example 7	154
B.4.9	Example 8	154
B.4.10	Example 9	155
B.5	LockFeature examples	156
B.5.1	Example 1	156
B.5.2	Example 2	157
B.5.3	Example 3	157
B.5.4	Example 4	158
B.6	Transaction examples	159
B.6.1	Insert example	159
B.6.2	Update examples	160
B.6.3	Delete examples	162
B.6.4	Mixed transaction example	163
B.6.5	Transaction response example	166
B.7	GetCapabilities example	167
B.8	KVP examples	182
B.8.1	Conventions	182
B.8.2	DescribeFeatureType examples	182
B.8.3	GetPropertyValue examples	183
B.8.4	GetFeature examples	185
B.8.5	LockFeature examples	190
Annex C	(informative) Consolidated XML schema	192
C.1	Introduction	192
C.2	wfs.xsd	192
Annex D	(normative) Service bindings	203
D.1	Introduction	203

D.2	HTTP GET and POST binding.....	203
D.3	HTTP status codes	203
D.4	SOAP binding.....	204
D.4.1	Introduction	204
D.4.2	SOAP Envelope.....	205
D.4.3	SOAP Header.....	205
D.4.4	SOAP Body.....	205
D.4.5	Encoding XML Schema in a SOAP Body	206
D.4.6	SOAP Fault	207
D.4.7	SOAP HTTP Binding.....	208
Annex E	(normative) Web Service Description Language (WSDL).....	209
E.1	Introduction	209
E.2	WFS Operations in WSDL	209
E.3	SOAP Binding	209
E.4	Binding style	210
E.5	Service	211
E.6	Service description using WSDL	211
E.6.1	Introduction	211
E.6.2	wfs-xml-interfaces.wsdl	211
E.6.3	wfs-kvp-interfaces.wsdl	213
E.6.4	wfs-responses.wsdl.....	215
E.6.5	wfs-http-bindings.wsdl.....	215
E.6.6	wfs-kvp-bindings.wsdl	218
E.6.7	wfs-soap-bindings.wsdl	219
E.6.8	Ancillary files.....	221
E.6.9	Examples (informative)	226
Annex F	(informative) Abstract model	229
F.1	Overview	229
F.2	Abstract Resource Model	229
F.2.1	Introduction	229
F.2.2	Basic Accessor Functions.....	229
F.3	Mapping of the General Feature Model (GFM) to the WFS Abstract Model.....	231
F.4	Identifiers.....	231
F.5	valueOf() function	231
F.6	WFS Operations	231
F.6.1	Introduction	231
F.6.2	featureTypeNameList() function.....	232
F.6.3	featureType() function.....	232
F.6.4	Query function	232
F.6.5	propertyValue() function	233
F.6.6	lock() function	234
F.6.7	transaction() function.....	234
F.6.8	Stored query operations	235
F.7	WFS Operations	236
F.8	Conceptual schema.....	236
	Bibliography.....	238

Figures

Figure 1 — UML notation in class diagrams	9
Figure 2 — Summary of UML state diagram notations	10
Figure 3 — BaseRequest	17
Figure 4 — StandardPresentationParameters	19
Figure 5 — StandardResolveParameters	22
Figure 6 — StandardInputParameters	25
Figure 7 — StandardResponseParameters	27
Figure 8 — Ad hoc query expression	31
Figure 9 — Query projection clause	35
Figure 10 — Query sorting clause	39
Figure 11 — StoredQuery	41
Figure 12 — GetCapabilities request	43
Figure 13 — GetCapabilities response	44
Figure 14 — DescribeFeatureType request	54
Figure 15 — GetPropertyValue request	57
Figure 16 — GetPropertyValue response	60
Figure 17 — GetFeature request	63
Figure 18 — GetFeature response	65
Figure 19 — LockFeature request	70
Figure 20 — State diagram for a WFS lock	73
Figure 21 — LockFeature response	74
Figure 22 — GetFeatureWithLock request	75
Figure 23 — ListStoredQueries request	81
Figure 24 — ListStoredQueriesResponse	82
Figure 25 — DescribeStoredQueries request	83
Figure 26 — DescribeStoredQueriesResponse	84
Figure 27 — CreateStoredQuery request	85
Figure 28 — CreateStoredQuery response	86
Figure 29 — DropStoredQuery request	86

Figure 30 — Transaction request	89
Figure 31 — Transaction response	96
Figure F.1 — Web Feature Service interfaces overview	237

Tables

Table 1 — Conformance Classes.....	2
Table 2 — Operation request encoding.....	12
Table 3 — WFS exception codes	16
Table 4 — KVP encoding of the base request type.....	18
Table 5 — KVP encoding of standard presentation parameters	19
Table 6 — KVP encoding of standard resolve parameters	23
Table 7 — Additional common keywords for KVP-encoded. WFS requests.....	26
Table 8 — Keywords for Ad hoc query KVP encoding	32
Table 9 — KVP encoding of projection clause	35
Table 10 — Keywords for Stored query KVP encoding.....	41
Table 11 — Elements to describe feature types.....	47
Table 12 — Parameter domains for WFS operations.....	48
Table 13 — Service constraints.....	50
Table 14 — Operation Constraints	51
Table 15 — DescribeFeatureType KVP encoding.....	55
Table 16 — Keywords for GetPropertyValue KVP encoding	58
Table 17 — Keywords for GetFeature KVP encoding	64
Table 18 — Keywords for LockFeature KVP encoding	71
Table 19 — Additional keywords for GetFeatureWithLock KVP encoding.....	76
Table 20 — Keywords for ListStoredQueries KVP encoding	82
Table 21 — Keywords for DescribeStoredQueries KVP encoding.....	84
Table 22 — Keywords for DropStoredQuery KVP encoding.....	87
Table D.1 — Request encoding and transport methods	203
Table D.2 — Correlate OWS and WFS exception codes to HTTP status codes	204
Table F.1 — Mapping the WFS Abstract Model operations to WFS operations	236

INTRODUCTION

The Web Feature Service (WFS) represents a change in the way geographic information is created, modified and exchanged on the Internet. Rather than sharing geographic information at the file level using File Transfer Protocol (FTP), for example, the WFS offers direct fine-grained access to geographic information at the feature and feature property level. Web feature services allow clients to only retrieve or modify the data they are seeking, rather than retrieving a file that contains the data they are seeking and possibly much more. That data can then be used for a wide variety of purposes, including purposes other than their producers' intended ones.

In the taxonomy of services defined in ISO 19119, the WFS is primarily a feature access service but also includes elements of a feature type service, a coordinate conversion/transformation service and a geographic format conversion service.

AUSTRALIAN/NEW ZEALAND STANDARD

Geographic information—Web Feature Service

1 Scope

This International Standard specifies the behaviour of a web feature service that provides transactions on and access to geographic features in a manner independent of the underlying data store. It specifies discovery operations, query operations, locking operations, transaction operations and operations to manage stored parameterized query expressions.

Discovery operations allow the service to be interrogated to determine its capabilities and to retrieve the application schema that defines the feature types that the service offers.

Query operations allow features or values of feature properties to be retrieved from the underlying data store based upon constraints, defined by the client, on feature properties.

Locking operations allow exclusive access to features for the purpose of modifying or deleting features.

Transaction operations allow features to be created, changed, replaced and deleted from the underlying data store.

Stored query operations allow clients to create, drop, list and describe parameterized query expressions that are stored by the server and can be repeatedly invoked using different parameter values.

NOTE This International Standard does not address the access control issues.

This International Standard defines 11 operations:

- GetCapabilities (discovery operation);
- DescribeFeatureType (discovery operation);
- GetPropertyValue (query operation);
- GetFeature (query operation);
- LockFeature (locking operation);
- GetFeatureWithLock (query and locking operation);
- Transaction (transaction operation);
- CreateStoredQuery (stored query operation);
- DropStoredQuery (stored query operation);
- ListStoredQueries (stored query operation);
- DescribeStoredQueries (stored query operation).