Table of Contents


DEFENCE GEOSPATIAL INFORMATION WORKING GROUP
DGIWG
SPECULUM ORBIS TERRARUM

DGIWG – xxx + Defence Geoprocessing generic profiles

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Abstract:	This document defines specific DGIWG requirements, recommendations and guidelines for implementations of the OGC Web Processing Service standards.
Copyright:	

Table of Contents

(Mandatory)

List of Figures

(as applicable)

List of Tables

(as applicable)

Executive Summary

(The inclusion of an Executive Summary is the discretion of the author(s)).

Acknowledgement

(The acknowledgement clause is optional. Acknowledgements are listed after the Executive Summary, if present, and precede the table of contents)

(Clauses i-iv are optional, and not mandated for approval of issue, however assist in the management of the document)

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For Document approved for public release use: All questions regarding this document shall be directed to the secretariat@dgiwg.org [mailto:secretariat@dgiwg.org] NOTE: All personal information will be removed when an internal document is made public. This includes names and personal e-mail accounts.

iii.Revision history

Date	Edition number	Primary clauses modified	Description
2019.08.10	0.1	Dimitri Sarafinof	first draft from DGIWG adoc template
2019.10.11	0.2	Dimitri Sarafinof	first draft with generic processes description

iv. Future work

Chapter 1. Introduction

(Mandatory. The introduction is located on a separated page preceding the 'Scope' statement. The introduction is not numbered.)

Geoprocessing is a GIS operation used to manipulate spatial data. A typical geoprocessing operation takes an input dataset, performs an operation on that dataset, and returns the result of the operation as an output dataset. Common geoprocessing operations include geographic feature overlay, feature selection and analysis, topology processing, raster processing, and data conversion. Geoprocessing allows for definition, management, and analysis of information used to form decisions.[Wade, T. and Sommer, S. eds. A to Z GIS]. Geoprocessing may be done locally or remotely on a server (typically trhough the web or a network).

This document defines geoprocesses at the generic level which may be implemented by any version of OGC WPS standard or eventually another geoprocessing API.

Chapter 2. Scope

(Mandatory)

This document defines geoprocesses at the generic level which may be implemented by any version of OGC WPS standard or eventually another geoprocessing API. Following geoprocesses are defined: *- include final list here*

Chapter 3. Conformance

(Mandatory for standards)

3.1. Conformance classes

This document establishes xx conformance classe(s):

- DGIWG process,
- DGIWG generic xxx process profile,
- …

"DGIWG process" class define requirements for defining generic process description *"DGIWG generic xxx process profile"* classes defines generic process profiles according to "DGIWG process" conformance class. Process profiles are blueprints for process implementations and are meant to harmonize process implementations to a certain degree. They serve as a reference for process implementations by providing a description of what the process actually does. These generic processes profiles can be implemented by OGC WPS standards (verions 1 or 2) or possibliby other geoprocessing APIs. Annex A lists the conformance abstract tests which shall be exercised on process profiles claiming to implement these conformance classes.

Conformance class name	Operation or behavior	OGC WPS Conformance Test	DGIWG WPS Conformance Test
DGIWG process http://www.dgiwg.org/std/geoprocessing/1.0/conf/process	DGIWG requirement y to z	-	Annex A.1
DGIWG generic measurement process profile http://www.dgiwg.org/std/geoprocessing/1.0/conf/generic-measurement	DGIWG requirement y to z	-	Annex A.2.1
DGIWG generic elevation process profile http://www.dgiwg.org/std/geoprocessing/1.0/conf/generic-elevation	DGIWG requirement y to z	-	Annex A.2.2

Conformance class name	Operation or behavior	OGC WPS Conformance Test	DGIWG WPS Conformance Test
DGIWG generic xxxx process profile http://www.dgiwg.org/std/geoprocessing/1.0/conf/generic-xxxx	DGIWG requirement y to z	-	Annex A.2.3

Table 1. Conformance classes

3.2. Backward compatibility

Chapter 4. References

(As applicable)

4.1. Normative references

ID	Title	Reference	Version
[1]	OGC® WPS 2.0.2 Interface Standard	OGC 14-065	2.0.2
[2]	OGC® OWS-Common 2.0 Implementation Specification	06-121r9	2.0.0

4.2. Informative references

Title	Reference	Version
OGC® Testbed-13: Workflows ER	OGC 17-029	r1
OGC® Testbed-13: Cloud ER	OGC 17-035	-
OGC® Testbed-14 ERs to be added here	OGC 18-XXX	-

Chapter 5. Terms, definitions, and abbreviations

(As applicable)

5.1. Definitions

For the purposes of this document, terms and definitions found in WPS 2.0 ([Ref-1]) apply.

5.2. Abrevations

BBox	Bounding Box
CRS	Coordinate Reference System
HTTP	Hypertext Transfer Protocol
WPS	Web Processing Service
XML	Extensible Markup Language

Chapter 6. DGIWG Process (Normative)

6.1. Introduction

This chapter defines normative requirements to implement "DGIWG process" class.

6.2. Normative requirements

The Normative requirements requested by this conformance class are summarized in Table 2.

No.	Requirement	Compliance
1	a DGIWG generic process profile shall satisfy requirements from http://www.opengis.net/spec/WPS/2.0/req/native-process/model/profile/generic ([OGC-WPS-2.0]) requirement class.	M
2	a DGIWG generic process profile shall additionaly provide elements according to Table 5 for the description of a DGIWG generic process.	M
3	a DGIWG generic process profile shall additionaly provide elements according to Table 6 for the description of input/output parameters.	mail
4	a DGIWG generic process profile shall be documented using template provided in Annex XX.	M

Table 2. DGIWG process Normative Requirements

6.3. Non-Normative Recommendations for Implementation

The non-normative recommandations defined by this conformance class are summarized in Table 3.

No.	Requirement	Compliance
1	A DGIWG process should …	O
2	A DGIWG process should …	O
3	…	…

Table 3. DGIWG process Non-normative Recommendations for DGIWG processes.

6.4. General

While this document definitions and requirements may be used by any geoprocessing implementation, OGC WPS 2.0 specification ([OGC-WPS-2.0]) provides a mechanism to define common processing functionality. Aiming at harmonization, the definitions of process profiles

may be used to foster a common understanding of widely used processing functions. However, they may also be used to harmonize the technical details of process interfaces and thus document particular interoperability arrangements between process providers and consumers.

A process profile is a description of a process on an interface level. Process profiles may have different levels of abstraction and cover several aspects. On a generic level, a process profile may only refer to the provided functionality of a process, i.e. by giving a verbal or formal definition how the outputs are derived from the inputs. On a concrete level a process profile may completely define inputs and outputs including data type definitions and formats. This document specifies requirement to develop process profiles at a generic level.

Figure below provides an UML description of the generic process model. .Generic process model (source [OGC-WPS-2.0]) image::./images/GenericProcess.png[WPS_GenericProcess,align=center]

Requirement 1: a DGIWG generic process profile shall satisfy requirements from http://www.opengis.net/spec/WPS/2.0/req/native-process/model/profile/generic ([OGC-WPS-2.0]) requirement class.

For convenience, detailed requirement from <<>> are repeated below:

Requirement	http://www.opengis.net/spec/WPS/2.0/req/native-process/model/profile/generic/structure A process description shall comply with the structure defined in Figure 13 and Table 18.
Requirement	http://www.opengis.net/spec/WPS/2.0/req/native-process/model/profile/generic/description-language The language of the human-readable elements within the process description shall be identified by a language identifier as specified in IETF RFC 4646.
Requirement	http://www.opengis.net/spec/WPS/2.0/req/native-process/model/profile/generic/io-description-type The description of process inputs and outputs shall comply with the structure defined in Figure 13, Table 19, and Table 20.

Table 4. WPS 2.0 requirements for generic profile requirement class (http://www.opengis.net/spec/WPS/2.0/req/native-process/model/profile/generic)

Requirement 2: a DGIWG generic process profile shall additionaly provide elements according to Table 5 for the description of a DGIWG generic process.

Name	Definition	Data type and Values	Multiplicity and use	DGIWG
Title	Title of the process, input, and output. Normally available for display to a human.	ows:Title	One (mandatory)	No channge

Name	Definition	Data type and Values	Multiplicity and use	DGIWG
Abstract	Brief narrative description of a process, input, and output. Normally available for display to a human.	ows:Abstract	Zero or one (optional) Include when available and useful.	One (mandatory)
Keywords	Keywords that characterize a process, its inputs, and outputs.	ows:Keywords	Zero or more (optional) Include when available and useful.	Mandatory (at least one)
Identifier	Unambiguous identifier of a process.	ows:Identifier Value is a URI or HTTP-URI a	One (mandatory)	HTTP-URI shall be defined with following template http://www.dgiwg.org/service/processing/process/{process-name}.
Metadata	to additional metadata about this item.	ows:Metadata Allowed values are specified in Table 5.	Zero or more (optional)	It is recommended to provide metatatda on the process profile.
Language	Language identifier for the human readable process description elements.	Character String. This language identifier shall be as specified in IETF RFC 4646.	One (mandatory)	English is mandatory in a coalition implementation (en-EN)
Input	Input items (arguments) of a process.	GenericInput structure, see Table 167.	Zero or more (optional)	no change
Output	Output items (results) of a process	GenericOutput structure, see Table 178.	One or more (mandatory)	no change

Table 5. DGIWG generic process structure (edited from Table 18 [OGC-WPS-2.0])

Requirement 3: a DGIWG generic process profile shall additionaly provide elements according

to Table 6 for the description of input/output parameters.

Name	Definition	Data type and Values	Multiplicity and use	DGIWG
Title	Title of the process, input, and output. Normally available for display to a human.	ows:Title	One (mandatory)	No channge
Abstract	Brief narrative description of a process, input, and output. Normally available for display to a human.	ows:Abstract	Zero or one (optional) Include when available and useful.	One (mandatory)
Keywords	Keywords that characterize a process, its inputs, and outputs.	ows:Keywords	Zero or more (optional) Include when available and useful.	Mandatory (at least one)
Identifier	Unambiguous identifier of a process.	ows:Identifier Value is a URI or HTTP-URI a	One (mandatory)	HTTP-URI shall be defined with following template http://www.dgiwg.org/service/processing/parameter/{parameter-name} or just parameter name ?.
Metadata	to additional metadata about this item.	ows:Metadata Allowed values are specified in Table 5.	Zero or more (optional)	It is recommended to provide metatatda on the process profile.

Name	Definition	Data type and Values	Multiplicity and use	DGIWG
minOccurs	Minimum number of times that values for this parameter are required.	Non-negative integer; defaults to “1”, ‘0’ means the input is optional.	Zero or one (optional)	no change
maxOccurs	Maximum number of times that this parameter may be present.	Non-negative integer, defaults to “1”.	Zero or more (optional)	no change
Input	Nested Input.	GenericInput structure, Table 19 (this table).	Zero or more (optional)	no change

Table 6. DGIWG generic process structure (edited from Table 19 [OGC-WPS-2.0])

Requirement 4: a DGIWG generic process profile shall be documented using template provided in Annex XX.

CAUTION	template to be developped

what king of ows:metadata ?

WARNING	TBD recomandation for registering profile on DGIWG website/registry discussion

Chapter 7. DGIWG Processes Description (Normative)

7.1. Introduction

This chapter defines DGIWG processes at a generic level. These definitions may be implemented through WPS or other APIs. Following DGIWG processes are desribed below:

- elevation analysis
- distance mesurement
- range rings
- viewshed
- slope
- helicopter landing zone
- geocoding
- routing
- geopackage

7.2. Elevation analysis

7.2.1. Generic process : elevation analysis

Process

```
  Identifier
http://www.dgiwg.org/service/processing/process/elevationanalysis
  Title Elevation analysis
  Keywords  elevation, analysis, highest point, lowest point
  Abstract  It provides lowest and highest point(s) on a given area.
  Metadata
```

Input

```
  Identifier    aoi
  Title Area of interest
  Keywords
  Abstract  Area of interest where a process will be executed. This could be
a BBOX, a polygon, or any surface geometry.. (GM_Surface)
  Metadata
  Multiplicity  1
```

Input

```
  Identifier    elavation_data
  Title elevationData
  Keywords  elevation, height, Digital Surface Model, Digital Elevation Model
  Abstract  Digital representation of the earth's surface. Elevation data on
which the process will be executed. It may be internal data (with a choice
for the users) or data provided by the user itself (URI, external service,
…).
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    analysis_type
  Title Choice of highest or lowest points
  Keywords
  Abstract  Information providing if highest or lowest.
  Metadata
  Multiplicity  1
```

Output

```
  Identifier    result_points
  Title Highest or lowest points
  Keywords
  Abstract  Highest or lowest points returned by the process on the provided
area of interest. This may also contain metadata describing the data sources
used, the vertical CRS of the result.
  Metadata
```

7.2.2. Process implementation : elevation analysis

Find below a WPS 2.0 example of the elevation analysis generic process profile.

elevationAnalysis.xml

```
<wps:GenericProcess xmlns:ows="http://www.opengis.net/ows/2.0" xmlns:wps=
"http://www.opengis.net/wps/2.0" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation=
"http://www.opengis.net/wps/2.0 http://schemas.opengis.net/wps/2.0/wps.xsd">
  <ows:Title>Elevation analysis</ows:Title>
  <ows:Abstract> It provides lowest and highest point(s) on a given
area.</ows:Abstract>
  <ows:Keywords>
    <ows:Keyword>elevation</ows:Keyword>
    <ows:Keyword>analysis</ows:Keyword>
    <ows:Keyword>highest point</ows:Keyword>
    <ows:Keyword>lowest point</ows:Keyword>
  </ows:Keywords>

<ows:Identifier>http://www.dgiwg.org/service/processing/process/elevationanal
ysis</ows:Identifier>
 <!--

    HTML page providing human readable description of the generic profile
with examples.

-->
  <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html"/>
  <wps:Input>
    <ows:Title>Area of interest</ows:Title>
    <ows:Abstract>
      Area of interest where a process will be executed. This could be a
BBOX, a polygon, or any surface geometry (GM_Surface).
    </ows:Abstract>
    <ows:Identifier>aoi</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#aoi"/>
  </wps:Input>
  <wps:Input>
    <ows:Title>Elevation data</ows:Title>
    <ows:Abstract>
```

```
      Digital representation of the earth's surface. Elevation data on which
the process will be executed. It may be internal data (with a choice for the
users) or data provided by the user itself (URI, external service, …).
    </ows:Abstract>
    <ows:Keywords>
      <ows:Keyword>elevation</ows:Keyword>
      <ows:Keyword>height</ows:Keyword>
      <ows:Keyword>Digital Surface Model</ows:Keyword>
      <ows:Keyword>Digital Elevation Model</ows:Keyword>
    </ows:Keywords>
    <ows:Identifier>elevationData</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#elevationData"/>
  </wps:Input>
  <wps:Input>
    <ows:Title>Choice of highest or lowest points</ows:Title>
    <ows:Abstract>
      Parameter indicating wether lowest points or highest points are
requested.
    </ows:Abstract>
    <ows:Identifier>analysis_type</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#analysis_type"/>
  </wps:Input>
  <wps:Output>
    <ows:Title>Highest or lowest points</ows:Title>
    <ows:Abstract>
    Highest or lowest points returned by the process on the provided area of
interest. This may also contain metadata describing the data sources used,
the vertical CRS of the result.
    </ows:Abstract>
    <ows:Identifier>result_points</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#result_points"/>
  </wps:Output>
</wps:GenericProcess>
```

7.3. Distance mesurement

7.3.1. Generic process : distance measurement

Process

```
  Identifier
http://www.dgiwg.org/service/processing/process/distancemeasurement
  Title Distance measurement
  Keywords  distance
  Abstract  It provides the distance between two or more points.
  Metadata
```

Input

```
  Identifier    points_list
  Title List of points
  Keywords
  Abstract  List of two or more points in a given CRS. CRS may be 2D or 3D
(with Z or height information).
  Metadata
  Multiplicity  1
```

Input

```
  Identifier    measurement_method
  Title Method of measurement
  Keywords
  Abstract  Method of measurement to be used for the calculation (for example
euclidean, geodesic, …). This could include Z coordinate (or height above
elispoid).
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    uom
  Title Unit of measure
  Keywords
  Abstract  Unit of measure for the measured distance(s) to be returned.
  Metadata
  Multiplicity  1
```

Output

```
  Identifier    distance_results
  Title Distance results
  Keywords
  Abstract  Result set containing indivual distance between each point pair
and/or the sum. This should include uom.
  Metadata
```

7.3.2. Process implementation : distance measurement

Find below a WPS 2.0 example of the distance measurement generic process profile.

distanceMeasurement.xml

```
<wps:GenericProcess xmlns:ows="http://www.opengis.net/ows/2.0" xmlns:wps=
"http://www.opengis.net/wps/2.0" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation=
"http://www.opengis.net/wps/2.0 http://schemas.opengis.net/wps/2.0/wps.xsd">
  <ows:Title>Distance measurement</ows:Title>
  <ows:Abstract>
    It provides the distance between two or more points.
  </ows:Abstract>
  <ows:Keywords>
    <ows:Keyword>distance</ows:Keyword>
  </ows:Keywords>
  <ows:Identifier>
  http://www.dgiwg.org/service/processing/process/distancemeasurement
  </ows:Identifier>
   <!--

    HTML page providing human readable description of the generic profile
with examples.

  -->
  <ows:Metadata xlink:role=
```

```
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/distancemeasureme
nt.html"/>
  <wps:Input>
    <ows:Title>List of points</ows:Title>
    <ows:Abstract>
    List of two or more points in a given CRS. CRS may be 2D or 3D (with Z or
height information).
    </ows:Abstract>
    <ows:Identifier>points_list</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#points_list"/>
    </wps:Input>
    <wps:Input>
    <ows:Title>Method of measurement</ows:Title>
    <ows:Abstract>
      Method of measurement to be used for the calculation (for example
euclidean, geodesic, ⋯). This could include Z coordinate (or height above
elispoid).
    </ows:Abstract>
    <ows:Identifier>measurement_method</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#measurement_method"/>
  </wps:Input>
  <wps:Input>
    <ows:Title>Unit of measure</ows:Title>
    <ows:Abstract>
    Unit of measure for the measured distance(s) to be returned.
    </ows:Abstract>
    <ows:Identifier>uom</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#uom"/>
  </wps:Input>
  <wps:Output>
    <ows:Title>Distance results</ows:Title>
    <ows:Abstract>
    Result set containing indivual distance between each point pair and/or
the sum. This should include uom..
    </ows:Abstract>
    <ows:Identifier>distance_results</ows:Identifier>
    <ows:Metadata xlink:role=
```

```
 "http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
 xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
 .html#distance_results"/>
   </wps:Output>
 </wps:GenericProcess>
```

Chapter 8. Range rings

8.1. Generic process : range rings

Process

```
  Identifier    http://www.dgiwg.org/service/processing/process/rangerings
  Title Range rings analysis
  Keywords
  Abstract  It creates ranges rings. Two methods are proposed, either by
providing a list of radius values (radius_value), or by providing a number of
rings (rings_nb) and an equal spacing (rings_spacing). Radials may be added
(radials_nb) to divide range rings into sectors.
  Metadata
```

Input

```
  Identifier    center_point
  Title A center point.
  Keywords
  Abstract  A center point from which the rings will be defined in a given
CRS.
  Metadata
  Multiplicity  1
```

Input

```
  Identifier    radius_value
  Title Radius value(s)
  Keywords
  Abstract  One or more radius value(s) with UOM defining the range(s) around
the center point.
  Metadata
  Multiplicity  0..n
```

Input

```
  Identifier    rings_nb
  Title Number of rings
  Keywords
  Abstract  The number of ring(s) around the center points, with an equal
space (rings_spacing).
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    rings_spacing
  Title Spacing between rings
  Keywords
  Abstract  The spacing with UOM that is used to create ring_nb ring(s).
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    radials_nb
  Title Number of radials
  Keywords
  Abstract  Number of the radials dividing the range rings into sectors.
  Metadata
  Multiplicity  0..1
```

Output

```
  Identifier    range_rings
  Title Range rings
  Keywords
  Abstract  A geometry representing the created range rings and optional
radials.
  Metadata
```

Chapter 9. Viewshed analysis

9.1. Generic process : viewshed analysis

Process

```
  Identifier    http://www.dgiwg.org/service/processing/process/viewshed
  Title Viewshed
  Keywords  visibility, sight
  Abstract  Visibility of one observer around him (at 360°)
  Metadata
```

Input

```
  Identifier    elavation_data
  Title Elevation data
  Keywords  elevation, height, Digital Surface Model, Digital Elevation Model
  Abstract  Digital representation of the earth's surface. Elevation data on
which the process will be executed. It may be internal data (with a choice
for the users) or data provided by the user itself (URI, external service,
…).
  Metadata
  Multiplicity  0..1
  Data format   raster, tif
```

Input

```
  Identifier    observer_position
  Title Marker/point(s) denoting observer(s)
  Keywords  observer
  Abstract  Marker/point(s) in a given CRS.
  Metadata
  Multiplicity  1
```

Input

```
Identifier    observer_height
Title Height of observer
Keywords  observer, height
Abstract  Eye-level height of observer(s).
Metadata
Multiplicity  1
```

Input

```
Identifier    target_height
Title Line of sight target
Keywords  observer, height, target
Abstract  Height of observable objects
Metadata
Multiplicity  1
```

Input

```
Identifier    viewshed_distance
Title Line of sight distance
Keywords  observer, distance, target
Abstract  Limit of viewshed analysis
Metadata
Multiplicity  1
```

Input

```
Identifier    earth_curvature
Title Earth curvature
Keywords  curvature
Abstract  Whether earth curvature shall be taken into account or not.
Metadata
Multiplicity  0..1
```

Input

```
  Identifier    Athm_refraction
  Title Athmosphere refraction
  Keywords  refraction
  Abstract  Whether Athmosphere refraction shall be taken into account or
not.
  Metadata
  Multiplicity  0..1
```

Output

```
  Identifier    viewshed_results
  Title Viewshed results
  Keywords
  Abstract  The unimpeded view or access from one point to another point
across a terrain or surface.  Compound line of sight results in areas visible
by multiple observers.
  Metadata
```

Chapter 10. Slope

10.1. Generic process : slope

Process

```
  Identifier    http://www.dgiwg.org/service/processing/process/slope
  Title Slope analysis
  Keywords  slope
  Abstract  Calculates the slope on a given area of interest. Slope may be
percentage or angle in degrees. Result is a raster coverage.
  Metadata
```

Input

```
  Identifier    aoi
  Title Area of interest
  Keywords
  Abstract  Area of interest where a process will be executed. This could be
a BBOX, a polygon, or any surface geometry.. (GM_Surface)
  Metadata
  Multiplicity  1
```

Input

```
  Identifier    elavation_data
  Title Elevation data
  Keywords  elevation, height, Digital Surface Model, Digital Elevation Model
  Abstract  Digital representation of the earth's surface. Elevation data on
which the process will be executed. It may be internal data (with a choice
for the users) or data provided by the user itself (URI, external service,
…).
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    slope_units
  Title Slope units
  Keywords  slope,units, degrees, percentage
  Abstract  Units to be used for the slope measurement.
  Metadata
  Multiplicity  1
```

Output

```
  Identifier    slope_results
  Title Slope analysis results
  Keywords
  Abstract  Slope (in degrees or percentage) calculated by the analysis
representing  the steepness of  each cell. This may also contain metadata
describing the data sources and the units used.
  Metadata
```

Chapter 11. Helicopter Landing Zone

11.1. Generic process : HLZ

Process

```
  Identifier    http://www.dgiwg.org/service/processing/process/hlz
  Title Helicopter Landing Zone
  Keywords  helicopter, landing zone, slope, obstacle
  Abstract  Helicopter landing zones contain one or more helicopter landing
sites.
  Metadata
```

Input

```
  Identifier    elevation_data
  Title Elevation data
  Keywords  elevation, height, Digital Surface Model, Digital Elevation Model
  Abstract  Digital representation of the earth's surface. Elevation data on
which the process will be executed. It may be internal data (with a choice
for the users) or data provided by the user itself (URI, external service,
…).
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    land_cover
  Title Land cover
  Keywords  land, cover, vegetation, water, brush;
  Abstract  General land cover and vegetation types over areas of land,
including water.
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    max_slope_tolerance
  Title Maximum slope tolerance
  Keywords  slope, units
  Abstract  The maximum slope tolerance with units (degrees or percentage).
  Metadata
  Multiplicity  1
```

Input

```
  Identifier    min_radius
  Title Minimum radius
  Keywords  radius
  Abstract  The minimum necessary radius of landing zone, based on aircraft
used.  See aircraft specs or operational guidance.
  Metadata
  Multiplicity  1
```

Input

```
  Identifier    height_tolerance
  Title Surface obstructions height tolerance
  Keywords  z value, obstacle
  Abstract  Maximum size object suitable in HLZ with UOM ; ground clearance
of aircraft.
  Metadata
  Multiplicity  1
```

Output

```
  Identifier    hlz_results
  Title HLZ analysis results
  Keywords
  Abstract  A coverage depicting zones large enough for a helicopter to land
and take off.
  Metadata
```

Chapter 12. Routing

12.1. Generic process : routing

Process

```
  Identifier    http://www.dgiwg.org/service/processing/process/routing
  Title Routing
  Keywords  route
  Abstract  It provides route according specified parameters.
  Metadata
```

Input

```
  Identifier    way_points
  Title Way points
  Keywords
  Abstract  A list of points along the route. At least two points have to be
provided (start and end point).
  Metadata
  Multiplicity  2..n
```

Input

```
  Identifier    preference
  Title Routing preference
  Keywords  shortest, fastest
  Abstract  The routing preference (shortest, fastest or other specific by
the service or API). Fastest is the default value.
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    max_height
  Title Maximum height of the vehicle.
  Keywords
  Abstract  A height restriction for vehicles in meters to consider when
computing the route. Support for this parameter is not required and the
parameter may be removed from the API definition.
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    max_weight
  Title Maximum weight of the vehicle.
  Keywords
  Abstract  A weight restriction for vehicles in tons to consider when
computing the route. Support for this parameter is not required and the
parameter may be removed from the API definition.
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    max_weight
  Title Maximum weight of the vehicle.
  Keywords
  Abstract  A weight restriction for vehicles in tons to consider when
computing the route.Support for this parameter is not required and the
parameter may be removed from the API definition.
  Metadata
  Multiplicity  0..1
```

Output

```
  Identifier    result_points
  Title Highest or lowest points
  Keywords
  Abstract  Highest or lowest points returned by the process on the provided
area of interest. This may also contain metadata describing the data sources
used, the vertical CRS of the result.
  Metadata
```

Chapter 13. Geopackage

13.1. Generic process : geopackage

Process

```
  Identifier    http://www.dgiwg.org/service/processing/process/geopackage
  Title Geopackage creation
  Keywords  Geopackage, vector, raster, imagery, coverage
  Abstract  It provides geopackage file from input data.
  Metadata
```

Input

```
  Identifier    aoi
  Title Area of interest
  Keywords
  Abstract  Area of interest where a process will be executed. This could be
a BBOX, a polygon, or any surface geometry.. (GM_Surface)
  Metadata
  Multiplicity  1
```

Input

```
  Identifier    name
  Title Geopackage name
  Keywords
  Abstract  Name of the generated geopackage
  Metadata
  Multiplicity  1
```

Input

```
  Identifier    description
  Title Geopackage description
  Keywords
  Abstract  Description of the generated geopackage
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    data_sources
  Title Data sources
  Keywords  tiles, chart maps, imagery, vector, elevation
  Abstract  Selection of input data to compute the geopackage file. A same
source can contain different layers; desired layers to be package shall be
specified in the request.
  Metadata
  Multiplicity  1..n
```

Input

```
  Identifier    dataset
  Title Input dataset
  Keywords
  Abstract  The source dataset to use for calculating the route.
  Metadata
  Multiplicity  1
```

Input

```
  Identifier    engine
  Title Routing engine
  Keywords
  Abstract  The routing engine to use for calculating the route.
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    algorithm
  Title graph solving algorithm
  Keywords
  Abstract  The routing / graph solving algorithm to use for calculating the
route.
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    when
  Title Time of departure or arrival
  Keywords
  Abstract   The time of departure or arrival. Default is "now".
  Metadata
  Multiplicity  0..1
```

Input

```
  Identifier    departure
  Title Departure
  Keywords
  Abstract  Specifies whether the value of `when` refers to the time of
departure or arrival. Default is departure.
  Metadata
  Multiplicity  0..1
```

Output

```
  Identifier    route
  Title Calculated route
  Keywords  gpkg
  Abstract  Calculated route according specified parameters.
  Metadata
```

Appendix A: Abstract Test Suite

Test identifier	/test/case/id
Test purpose:	Confirm that the IUT satisfies all applicable requirements for conformance class xxx.
Test method:	Functional testing performed in an automated and/or manual manner. Verify the behaviour …
Requirement:	DGIWG-XXX : clause 2.2
Test type:	Capability

Table 7. A.1.1 Conformance level 1

Test identifier	http://www.dgiwg.org/xxx/xxx
Test purpose:	The XML response entity is valid.
Test method:	Validate content of response entity against corresponding element declaration.
Requirement:	DGIWG-XXX : clause. 10.2.5.1, p. 118
Test type:	Capability

Table 8. A.1.2 Test case for validity of XML response entity

Test identifier	/test/case/id
Test purpose:	Confirm that the IUT satisfies all applicable requirements for conformance level 1.
Test method:	Functional testing performed in an automated and/or manual manner. Verify the behaviour of …
Requirement:	DGIWG XXX: cl. 2.2
Test type:	Capability

Table 9. A.2.1 Conformance level 2

Test identifier	http://www.dgiwg.org/xxx/xxx
Test purpose:	The XML response entity is valid.
Test method:	Validate content of response entity against corresponding element declaration.
Requirement:	OGC DGIWG XXX: clause. 10.2.5.1, p. 118
Test type:	Capability

Table 10. A.2.2 Test case for validity of XML response entity

Appendix B: DGIWG Generic profiles examples

elevationAnalysis.xml

```
<wps:GenericProcess xmlns:ows="http://www.opengis.net/ows/2.0" xmlns:wps=
"http://www.opengis.net/wps/2.0" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation=
"http://www.opengis.net/wps/2.0 http://schemas.opengis.net/wps/2.0/wps.xsd">
  <ows:Title>Elevation analysis</ows:Title>
  <ows:Abstract> It provides lowest and highest point(s) on a given
area.</ows:Abstract>
  <ows:Keywords>
    <ows:Keyword>elevation</ows:Keyword>
    <ows:Keyword>analysis</ows:Keyword>
    <ows:Keyword>highest point</ows:Keyword>
    <ows:Keyword>lowest point</ows:Keyword>
  </ows:Keywords>

<ows:Identifier>http://www.dgiwg.org/service/processing/process/elevationanal
ysis</ows:Identifier>
 <!--

    HTML page providing human readable description of the generic profile
with examples.

-->
  <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html"/>
  <wps:Input>
    <ows:Title>Area of interest</ows:Title>
    <ows:Abstract>
      Area of interest where a process will be executed. This could be a
BBOX, a polygon, or any surface geometry (GM_Surface).
    </ows:Abstract>
    <ows:Identifier>aoi</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#aoi"/>
  </wps:Input>
  <wps:Input>
    <ows:Title>Elevation data</ows:Title>
    <ows:Abstract>
```

```
      Digital representation of the earth's surface. Elevation data on which
the process will be executed. It may be internal data (with a choice for the
users) or data provided by the user itself (URI, external service, …).
    </ows:Abstract>
    <ows:Keywords>
      <ows:Keyword>elevation</ows:Keyword>
      <ows:Keyword>height</ows:Keyword>
      <ows:Keyword>Digital Surface Model</ows:Keyword>
      <ows:Keyword>Digital Elevation Model</ows:Keyword>
    </ows:Keywords>
    <ows:Identifier>elevationData</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#elevationData"/>
  </wps:Input>
  <wps:Input>
    <ows:Title>Choice of highest or lowest points</ows:Title>
    <ows:Abstract>
      Parameter indicating wether lowest points or highest points are
requested.
    </ows:Abstract>
    <ows:Identifier>analysis_type</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#analysis_type"/>
  </wps:Input>
  <wps:Output>
    <ows:Title>Highest or lowest points</ows:Title>
    <ows:Abstract>
    Highest or lowest points returned by the process on the provided area of
interest. This may also contain metadata describing the data sources used,
the vertical CRS of the result.
    </ows:Abstract>
    <ows:Identifier>result_points</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#result_points"/>
  </wps:Output>
</wps:GenericProcess>
```

distanceMeasurement.xml

```
<wps:GenericProcess xmlns:ows="http://www.opengis.net/ows/2.0" xmlns:wps=
```

```
"http://www.opengis.net/wps/2.0" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation=
"http://www.opengis.net/wps/2.0 http://schemas.opengis.net/wps/2.0/wps.xsd">
  <ows:Title>Distance measurement</ows:Title>
  <ows:Abstract>
    It provides the distance between two or more points.
  </ows:Abstract>
  <ows:Keywords>
    <ows:Keyword>distance</ows:Keyword>
  </ows:Keywords>
  <ows:Identifier>
  http://www.dgiwg.org/service/processing/process/distancemeasurement
  </ows:Identifier>
   <!--

    HTML page providing human readable description of the generic profile
with examples.

  -->
  <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/distancemeasureme
nt.html"/>
  <wps:Input>
    <ows:Title>List of points</ows:Title>
    <ows:Abstract>
    List of two or more points in a given CRS. CRS may be 2D or 3D (with Z or
height information).
    </ows:Abstract>
    <ows:Identifier>points_list</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#points_list"/>
    </wps:Input>
    <wps:Input>
    <ows:Title>Method of measurement</ows:Title>
    <ows:Abstract>
      Method of measurement to be used for the calculation (for example
euclidean, geodesic, …). This could include Z coordinate (or height above
elispoid).
    </ows:Abstract>
    <ows:Identifier>measurement_method</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#measurement_method"/>
```

```
  </wps:Input>
  <wps:Input>
    <ows:Title>Unit of measure</ows:Title>
    <ows:Abstract>
    Unit of measure for the measured distance(s) to be returned.
    </ows:Abstract>
    <ows:Identifier>uom</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#uom"/>
  </wps:Input>
  <wps:Output>
    <ows:Title>Distance results</ows:Title>
    <ows:Abstract>
    Result set containing indivual distance between each point pair and/or
the sum. This should include uom..
    </ows:Abstract>
    <ows:Identifier>distance_results</ows:Identifier>
    <ows:Metadata xlink:role=
"http://www.opengis.net/spec/wps/2.0/def/process/description/documentation"
xlink:href="http://www.dgiwg.org/service/processing/process/elevationanalysis
.html#distance_results"/>
  </wps:Output>
</wps:GenericProcess>
```

Appendix C: Bibliography