Open Geospatial Consortium

Date: 24 November 11

Reference number of this OGC® project document: **OGC 11-094**

Category: OGC® Discussion Paper

Editor: Bastian Baranski

WS-Agreement Application Profile for OGC Web Services

Document type: OGC® Discussion Paper
Document subtype: NA
Document stage: Approved for Public Release
Document language: English

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i. Preface

Suggested additions, changes, and comments on this draft report are welcome and encouraged. Such suggestions may be submitted by email message or by making suggested changes in an edited copy of this document.

ii. Submitting organizations

The following organizations submitted this document to the Open Geospatial Consortium Inc.:

a) con terra GmbH, Münster, Germany

b) Institute for Geoinformatics, University of Münster, Germany

iii. Submission contact points

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iv. Revision history

Date	Release	Author	Paragraph modified	Description
31 Aug 11	0.9	B. Baranski	all	Initial setup of the document.

v. Changes to the OGC® Abstract Specification

The OGC® Abstract Specification does not require changes to other OGC® standards.

Foreword

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. Open Geospatial Consortium Inc. shall not be held responsible for identifying any or all such patent rights. However, to date, no such rights have been claimed or identified.

Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the specification set forth in this document, and to provide supporting documentation.

Introduction

The WS-Agreement Specification [1] defines “a Web Services protocol to establish agreements between two parties, such as between a service provider and consumer, using an extensible XML language for specifying the nature of the agreement, and agreement templates to facilitate discovery of compatible agreement parties”. This document describes a WS-Agreement Application Profile for OGC Web Services. The proposed application profile mainly consists of XML Schema documents defining the domain-specific content of a Service Level Agreements (SLA), an Uniform Resource Name (URN) namespace for identifying domain-specific service properties and business values, and a Domain Specific Language (DSL) for defining and evaluating domain-specific service level guarantees.

WS-Agreement Application Profile for OGC Web Services

1 Scope

This document specifiesa) XML schemas for providing functional and non-functional service descriptions of OGC Web Services (OWS), b) an URN namespace for identifying exposed and measurable service properties of OWS and c) a DSL for defining and evaluating service level guarantees.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

- OGC, OpenGIS® Web Services Common Specification, 06-121r3 [1]
- OGF, Web Services Agreement Specification (WS-Agreement), GFD-R-P.107 [2]
- Carl Reed. A Uniform Resource Name (URN) Namespace for the Open Geospatial Consortium (OGC). RFC 2617, April 2008.[3]

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
Agreement (Service Level Agreement)
An agreement is a dynamically created and managed contract between two parties (e.g. the service consumer and the service provider) about the delivery of a service (e.g. a web service). An agreement may contain not only functional but also non-functional service descriptions and guarantees (e.g. the availability and performance of a web service).

[1] The OWS Common Specification contains a list of normative references that are also applicable to this document.

[2] TheWS-Agreement specification contains a list of normative references that are also applicable to this document.

[3] TheRFC contains a list of normative references that are also applicable to this document.

3.2
Business Value
A Business Value is an assertion representing a value aspect of a Service Level Objective (SLO) attached to the service that is the subject of an agreement. The value may be specified in terms of domain-specific qualities such as importance, cost and others.

3.3
Guarantee (Guarantee Term)
A Guarantee defines the assurance on service quality associated with the service described by aService Description Terms (SDT).

3.4
Service Description Term (SDT)
A Service Description Term describes the functionality that will be delivered under an agreement.

3.5
Service Properties / Key Performance Indicator (KPI)
A Key Performance Indicator (KPI) is an exposed and measurable property of a service (e.g. the response time of a web service) that can be monitoring during agreement life-cycle and that is referenced in a SLO.

3.6
Service Level Objective (SLO)
A Service Level Objective (SLO) is an assertion over the KPIs of an agreement and it represents the quality of service aspect of an agreement.

3.7
Template (Agreement Template)
ATemplate is a document used by the agreement responder (typically the service provider) to advertise the types of agreement offers it is willing to accept.

4 Conventions

4.1 Symbols (and abbreviated terms)

Some frequently used abbreviated terms:

HTTP	Hypertext Transfer Protocol
ISO	International Organization for Standardization
KPI	Key Performance Indicator
OGC	Open Geospatial Consortium
OGF	Open Grid Forum

SLA	Service Level Agreement
SLO	Service Level Objectives
SOAP	Simple Object Access Protocol
UML	Unified Modeling Language
URL	Uniform Resource Locator
URN	Uniform Resource Name
WSDL	Web Services Description Language
XML	eXtended Markup Language

4.2 UML Notation

Any UML used in this document will be conformant with UML 2.0.

5 Context

This section describes the motivation for the proposed work and introduces the WS-Agreement specification, the technical foundation for the proposed WS-Agreement Application Profile for OGC Web Services.

5.1 Service Level Agreements

The motivation for the application of Service Level Agreements (SLAs) in Spatial Data Infrastructures (SDIs) is described in [3] and [28].

Geographic Information Systems (GIS) have been under constant development in recent years. Emerging web services technologies and the SOA paradigm [29] encouraged the evolution from classical desktop- and data-centric GIS to distributed and loosely-coupled architectures composed of open and interoperable web services merged into the Spatial Data Infrastructure (SDI) concept [30]. In the past, open standards based SDIs - for instance based on standards developed by the Open Geospatial Consortium (OGC) – focused on the retrieval, portrayal and processing of geospatial data through web services [31]. Furthermore, they have shown a great potential for enabling the market value of geospatial data as for instance presented in [32].

Current SDI development faces different challenges as for instance an increasing amount of available data due to advanced data acquiring technologies. Along with emerging laws and provisions these challenges result in ambitious requirements regarding the reliability, performance and scalability of geospatial services. The Infrastructure for Spatial Information in the European Community (INSPIRE) directive for instance defines specific Quality of Service (QoS) goals such as a maximum response time and average availability for the so-called INSPIRE View Services [33]. Furthermore, monitoring the

performance of loosely-coupled web services in distributed infrastructures and the ability to react quickly on service quality fluctuations is an essential skill for service providers in future and highly competitive GIS markets. From the service consumer perspective, the QoS-aware service discovery and the benefit-cost ratio analysis of different service offerings is an important key aspect. To ensure that service providers fulfill promised QoS guarantees, normally a formal contract between service consumers and service providers - a Service Level Agreement (SLA) - is concluded [34]. Such contracts formalize business relationships and enable contractual parties to measure, manage and enforce certain QoS guarantees. But existing OGC standards do support neither SLA nor QoS functionality. Therefore, attaching SLA capabilities to OGC Web Services (OWS) will be a substantial step towards an infrastructure that is prepared for future GIS business models on a technological and economical level.

This document does not describe how to manage SLAs in SDIs, but describes an XML document format for describing SLAs that could be applied in SDIs that are based on OGC standards.

5.2 WS-Agreement Specification

This section introduces the Web Services Agreement Specification (WS-Agreement), a "Web Service protocol for establishing agreements between two parties, such as between a service provider and consumer, using an extensible XML language for specifying the nature of the agreement, and agreement templates to facilitate discovery of compatible agreement parties" [1].

The Grid Resource Allocation Agreement Protocol (GRAAP) working group of the Open Grid Forum (OGF) publishes the Web Services Agreement Specification (WS-Agreement) [1] which "comprises a Service Level Agreement (SLA) template format and a Web Services protocol for establishing agreements between two parties such as consumer and provider of a service" [2].

The goal of the WS-Agreement specification is to "standardize the terminology, concepts, overall agreement structure with types of agreement terms, agreement template with creation constraints and a set of port types and operations for creation, expiration and monitoring of agreements, including WSDL needed to express the message exchanges and resources needed to express the state" [1]. The WS- Agreement specification neither defines domain-specific expressions and metrics for service descriptions and service properties, nor defines how and where to measure such properties. Furthermore, the WS-Agreement specification does not define specific condition expression languages for defining domain-specific guarantee terms.

The WS-Agreement specification mainly consists of the three parts. An XML Schema document for specifying the structure of an agreement, an XML Schema document for specifying the structure of an agreement template and a web service interface for managing the life-cycle of an agreement.

Agreement Structure

In the WS-Agreement specification an agreement is conceptually composed of several distinct parts (Figure 1). The *agreement context* part contains general metadata about the entire agreement (e.g. domain-specific information about the participants in the agreement and the agreement's lifetime). The terms section of the agreement contains a set of terms, each expressing the defined consensus or obligations of the participants in the agreement. The *service terms* part contains information to identify the service to which an agreement pertains and to which the guarantee terms can apply. The service terms part is composed of service description, service reference and service property terms. The *service description* section provides a full or partial domain-specific description of the service to which an agreement pertains. The *service reference* section points to the service to which an agreement pertains. The *service properties* section is used to define domain-specific measurable and exposed properties associated with a service. These service properties are used in expressing the domain-specific service level objectives in the guarantee terms part of an agreement. The *guarantee terms* part contains information about the service quality, associated with the service described by the service terms. Each guarantee term is mainly composed of information about the obligated party, an optional condition that must be met for a guarantee to be enforced, an *service level objective* expressed over service properties, and an optional list of *business values* associated with an service level objective.

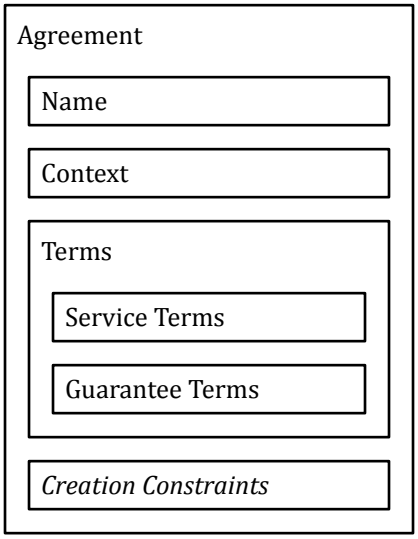

Figure 1 - Structure of an agreement template in WS-Agreement specification

The general structure of an agreement template is the same as that of an agreement. But an agreement template may also contain a creation constraints part that contains constraints on possible values of the service and guarantee terms for creating an agreement.

Service Interface

The WS-Agreement specification defines a web service interface for creating, representing and monitoring agreements. The web service interface is based on the Web Services Resource Framework (WSRF) [4], a Simple Object Access Protocol (SOAP) [5] based web service interface which combines the WS-Resource [6], WS-ResourceProperties [7], WS-ResourceLifetime [8], WS-ServiceGroup [9] and WS-BaseFaults [10] set of specifications and allows the modelling of stateful resources with web services. The WS-Agreement specification defines the following main port types and resource properties. The `AgreementFactory` port type offers a `CreateAgreement`operation for creating agreements. The `Template`resource property of the `AgreementFactory`port type represents a sequence of zero or more templates of agreement offers that can be accepted by the `AgreementFactory`operations in order to create an agreement. The `Agreement`port type offers different resource properties providing static information about an agreement. The `Name`resource property exposes the name of an agreement. The `AgreementId`resource property exposes an unique identifier of an agreement. The `Context`resource property exposes the context information of the entire agreement. The `Terms`resource property exposes the service and guarantee terms of an agreement. The `AgreementState`port type offers different resource properties providing runtime information about an agreement. The `AgreementState`resource property exposes the overall agreement state. The `ServiceTermState`resource property exposes a service runtime state for each service description term of an agreement. The `GuaranteeTermState`resource property exposes a state of fulfillment for each guarantee term of an agreement.

The overall agreement compliance can be observed at agreement runtime by monitoring different types of states. The agreement states could be observed via the `AgreementState`resource property and the primary agreement states are "Pending", "Observed", "Rejected", "Completed" and "Terminated". The "Pending" state means that an agreement offer has been made, but it has been neither accepted nor rejected. The "Observed" state means that an agreement offer has been made and accepted. The "Rejected" state means that an agreement offer has been made and rejected. The "Complete" state means that an agreement offer has been received and accepted, and that all activities pertaining to the agreement are finished. The "Terminated" state means that the agreement initiator has terminated an agreement offer and that the obligation no longer exists. The service runtime states could be observed via the `ServiceTermState`resource property and primary service runtime states are "Not Ready", "Ready" and "Completed". The "Not Ready" state means that a service cannot be used. The "Ready" state means that a service is ready for use by a client. The "Completed" state means that a service cannot be used any more and any service provider activity is finished. The guarantee states could be observed via the `GuaranteeTermState`resource property and primary guarantee states are "Fulfilled", "Violated" and "Not- Determined". The "Fulfilled" state means that currently the specific guarantee is fulfilled. The "Violated" state means that currently the specific guarantee is violated. The "NotDetermined" state is the initial state of a guarantee term and it means

that no activity regarding this guarantee has happened yet that allows evaluating whether the guarantee is met or not.

However, the different state types defined by the WS-Agreement specification are independent of domain-specific service descriptions, service properties and guarantee terms. They can be applied as they are in a broad range of usage domains, but also be extended for other application scenarios.

6 Requirements

The proposed WS-Agreement Application Profile for OGC Web Serviceshas been developed along the following requirements.

- An agreement (template) should allow the definition of functional service descriptionsproviding a partial or full functional description of common OGC Web Services (OWS) types.

- An agreement (template) should allow the definition of non-functional service properties reflecting common web service quality aspects such as the availability or performance of a web service.

- An agreement (template) should allow the definition of service level objectives reflecting common Quality of Service (QoS) aspects of web services.

- An agreement (template) should allow the definition of business values describing (more or less) complex pricing models (e.g. dynamic usage costs depending on the number of served requests, delivered pixels or processed amount of data).

Overall, the proposed WS-Agreement Application Profile for OGC Web Services should match various requirements that allow the application of SLAs in SDIs that are based on OGC standards.

7 Application Profile

This section introduces the WS-Agreement Application Profile for OGC Web Services. The WS-Agreement specification defines an XML based SLA template format and a SOAP based web service protocol for establishing agreements between two parties. The proposed WS-Agreement Application Profile for OGC Web Servicesdefines the domain-specific content of an agreement such as the service description, service properties and service level objectives.

The proposed WS-Agreement Application Profile for OGC Web Servicesmainly consists of the following three parts.

- A set of XML Schema documents specifying the domain-specific content of an agreement (Section 8.1)

- An URN namespace for identifying domain-specific service properties and business values (Section 8.2)

- A condition expression language for defining and evaluating domain-specific guarantee terms (Section 8.3)

In the WS-Agreement specification an agreement is conceptually composed of several distinct parts. The agreement context part contains metadata about the entire agreement. The service terms part is composed of service description, service reference and service property terms. The service description section contains a full or partial domain-specific description of the service, the service reference section contains a reference to the service and the service properties section contains measurable and exposed properties associated with the service. The guarantee terms part mainly contains service level objectives and business values. However, some parts of an agreement may and others must have domain-specific content. The proposed WS-Agreement application profile defines XML Schema documents for the agreement context, the service description terms, the service reference, and the custom service level objectives and business values in the guarantee terms of an agreement. The service properties section of the WS-Agreement specification does not allow to define domain-specific service properties, but requires references to domain-specific service description terms of an agreement (e.g. expressed with XPath expressions).

The XML Schema documents for specifying the domain-specific content of an agreement are described in Section 8.1. The URN namespace for identifying domain-specific service properties and business values is introduced in Section 8.2. The condition expression language for defining and evaluating the status of service level objectives and for calculating custom business values is introduced in Section 8.3. Example XML documents - including certain service properties, service level objectives and business values - can be found in Appendix C.1 (agreement template), Appendix C.2 (agreement offer) and Appendix C.3 (agreement properties).

7.1 XML Schemas

This section describes the XML Schema documents for specifying the domain-specific content of an agreement.

Agreement Context

The agreement context part of the WS-Agreement specification allows defining domain-specific information about the agreement initiator (typically the service provider) and the agreement responder (typically the service consumer). Therefore, the XML Schema of the WS-Agreement specification defines the following XML elements for the agreement initiator and the agreement responder in the agreement context part (Listing 1).

Listing 1: XML Schema for agreement context part (WS-Agreement)

```
<xs:complexType name="AgreementContextType">
```

```
  (...)
<xs:element minOccurs="0" name="AgreementInitiator" type="xs:anyType"/>
<xs:element minOccurs="0" name="AgreementResponder" type="xs:anyType"/>
  (...)
</xs:complexType>
```

The `type="xs:anyType"` attributes allow the definition of any domain-specific information about the agreement initiator and the agreement responder.

The agreement initiator and the agreement responder sections of the proposed WS-Agreement application profile are inspired by the parameters included in the `ServiceProvider`section of a`GetCapabilities` response document as specified in the OGC Web Services Common Standard [11]. The `GetCapabilities`operation of an OWS can return metadata information about the organization operating an OWS. The `ProviderName`element in the `ServiceProvider`section of a`GetCapabilities`response document shall be an unique identifier for a service provider organization. The `ProviderSite` element refers to the most relevant web site of the service provider. The `ServiceContact`element specifies information for contacting a service provider. The element is derived from corresponding classes in ISO 19115 [12] and contains common contact details such as the postal address, telephone or facsimile number, mail address and the hours of service. These elements can be used to describe the agreement responder as well as agreement initiator in the agreement context part of the proposed WS-Agreement application profile.

An XML example of such an agreement responder description that can be embedded in the agreement context part of the proposed WS-Agreement Application Profile for OGC Web Servicescan be found in Listing 2.

Listing 2: Example XML of agreement responder

```
<wsag-ogc:ContractParty>
<wsag-ogc:Name>Institute for Geoinformatics</wsag-ogc:Name>
<wsag-ogc:Site xmlns:xlin="http://www.w3.org/1999/xlink"
xlin:href="http://www.ifgi.de" />
<wsag-ogc:Contact>
<ows:IndividualName>Bastian Baranski</ows:IndividualName>
<ows:PositionName>Research Associate</ows:PositionName>
<ows:ContactInfo>
<ows:Phone>
<ows:Voice>+49 251 8333071</ows:Voice>
<ows:Facsimile>+49 251 8339763</ows:Facsimile>
</ows:Phone>
<ows:Address>
<ows:DeliveryPoint>Weseler Strasse 253</ows:DeliveryPoint>
<ows:City>Muenster</ows:City>
<ows:PostalCode>48151</ows:PostalCode>
<ows:Country>Germany</ows:Country>
<ows:ElectronicMailAddress>bastian.baranski@uni-
muenster.de</ows:ElectronicMailAddress>
</ows:Address>
<ows:HoursOfService>The hours of service are Monday to Friday from 8 AM to 16
PM.</ows:HoursOfService>
<ows:ContactInstructions>Please contact the service desk via phone or
mail.</ows:ContactInstructions>
```

```
</ows:ContactInfo>
</wsag-ogc:Contact>
</wsag-ogc:ContractParty>
```

The XML Schema specifying the domain-specific information about the agreement initiator and the agreement responder in the proposed WS-Agreement Application Profile for OGC Web Servicescan be found in Appendix A.1.

Service Description Terms

The service description part of the WS-Agreement specification requires one or more service description terms. Each service description term should provide a full or partial domain-specific description of the service to which an agreement pertains. Therefore, the XML Schema of the WS-Agreement specification defines the following XML elements for the service description part (Listing 3).

Listing 3: XML Schema for service description part (WS-Agreement)

```
<xs:complexType abstract="true" name="TermType">
<xs:attribute name="Name" type="xs:string" use="required" />
</xs:complexType>

<xs:complexType abstract="true" name="ServiceTermType">
<xs:complexContent>
<xs:extension base="wsag:TermType">
<xs:attribute name="ServiceName" type="xs:string" use="required" />
</xs:extension>
</xs:complexContent>
</xs:complexType>

<xs:complexType name="ServiceDescriptionTermType">
<xs:complexContent>
<xs:extension base="wsag:ServiceTermType">
<xs:sequence>
<xs:any namespace="##other" processContents="strict"/>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
```

The `<xs:any/>` element allows the definition of any domain-specific service description terms.

The proposed WS-Agreement Application Profile for OGC Web Servicesspecifies three different types of domain-specific service description terms.

- A functional service description
- A non-functional service description
- Information about the service availability period

These types of service descriptions allow the parties, which may have obligations in the agreement, to identify relevant service quality aspects that must be monitored during the agreement life-cycle.

Functional Service Description The service description term that represents the functional service description of the proposed WS-Agreement Application Profile for OGC Web Servicesis inspired by the parameters included in the `ServiceIdentification`section of a`GetCapabilities`response document as specified in [11]. The `ServiceIdentification`section contains a human-readable title of the service, a brief narrative description of the service, a list of one or more commonly used keywords used to describe the service and an URN to identify the type of the service. Furthermore, the `ServiceIdentification`section can contain an identifier of an OWS application profile that extends and/or restricts the service capabilities, and a reference to a WSDL document providing a machine-readable description of the service functionality. These elements can be used to provide a functional service description in the service description part of the proposed WS-Agreement application profile.

Table 1 — Parameters included in the Functional Service Description section

Name	Definition
Title	A human-readable title of the service.
Abstract	A brief narrative description of the service.
Keywords	A list of one or more commonly used or formalised word(s) or phrase(s) used to describe the service.
Type [A]	A service type URN from a registry of service types.
Profile	An identifier of an OWS Application Profile that extends and/or restricts the service capabilities.
WSDL	A reference to a WSDL document providing a machine-readable description of the service functionality.

[A] As describes in the "OGC Web Services Common Specification" document [11], the service type shall comply to URNs in the "service" category as specified in the "OGC Naming Authority: Policies and Procedures" document [14].

An XML example of such a functional service description that can be embedded in the service description terms of the proposed WS-Agreement Application Profile for OGC Web Servicescan be found in Listing 4.

Listing 4: Example XML of functional service description

```
<wsag-ogc:ServiceDescription>
<wsag-ogc:Title>INSPIRE Coordinate Transformation Service</wsag-ogc:Title>
<wsag-ogc:Abstract>This WPS instance is an implementation of the INSPIRE
Coordinate Transformation Service specification.</wsag-ogc:Abstract>
<wsag-ogc:Keywords>OGC, WPS, INSPIRE Coordinate Transformation Service</wsag-
ogc:Keywords>
```

```
<wsag-ogc:Type>urn:ogc:wps:1.0.0:INSPIRE:TransformCoordinates:1.0</wsag-
ogc:Type>
<wsag-ogc:Profile />
<wsag-ogc:WSDL />
</wsag-ogc:ServiceDescription>
```

The XML Schema specifying the functional service description terms in the proposed WS-Agreement Application Profile for OGC Web Servicescan be found in Appendix A.2.

Non-Functional Service Description The service description term that represents the non-functional service description of the proposed WS-Agreement Application Profile for OGC Web Servicesshould contain a list of zero or more exposed and measurable Key Performance Indicators (KPIs) of the service to which an agreement pertains. These KPIs could be used to measure the quality of the service and to define service level objectives and business values in the guarantee term part. Each KPI that is listed in the non-functional service description section could be used to measure the quality of the service. They are the foundation of service level objectives and business values in the guarantee term part of the proposed WS-Agreement Application Profile for OGC Web Services. Therefore, each KPI should contain an unique identifier, a human-readable title, a brief narrative description and a KPI type URN from a registry of domain-specific KPIs. Furthermore, each KPI should contain information regarding the monitoring of the KPI. This monitoring information should contain for instance the monitoring hours, the monitoring interval, information about the monitoring request and information about the expected response.

Table 2 — Parameters included in the Non-Functional Service Description section

Name	Definition
Name	An unique identifier of the Key Performance Indicator (KPI).
Title	A human-readable title of the KPI.
Abstract	A brief narrative description of the KPI.
Type	A KPI type URN from a registry of domain-specific KPIs.
Value	The expected value of the defined KPI.
Monitoring	Information regarding the monitoring of the KPI.

Two potential ways for monitoring web service quality could be identified.*Passive Monitoring* describes the process of analysing resource consumption or other service usage statistics by means of logging files from servers, databases, etc. Passive monitoring requires real user traffic and if there is no user interaction with the web service, there are no monitoring information available.*Active Monitoring* describes the process of analysing the behaviour of a system (web service) by means of sending test-requests to the service

and analysing specific Key Performance Indicators (KPIs), such as the service availability and response time. Active monitoring requires no real user traffic because the web service interaction is simulated by sending prepared test request to the web service. Therefore, active monitoring potentially allows the ability to monitor web service behaviour from outside the service providers‟ network. Therefore, the proposed XML Schema document allows the definition of any domain-specific monitoring information for active monitoring. An example for defining the active monitoring is given in in the service property for the service response time.

An XML example of such a non-functional service description that can be embedded in the service description terms of the proposed WS-Agreement Application Profile for OGC Web Servicescan be found in Listing 5.

Listing 5: XML example of non-functional service description

```
<wsag-ogc:ServiceProperties>
<wsag-ogc:Property>
<wsag-ogc:Name>ResponseTime</wsag-ogc:Name>
<wsag-ogc:Title>Initial Response Time</wsag-ogc:Title>
<wsag-ogc:Abstract>The initial response time of the service.</wsag-
ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:kpi-runtime:response</wsag-ogc:Type>
<wsag-ogc:Value>5000</wsag-ogc:Value>
<wsag-ogc:ActiveMonitoring>
<wsag-ogc:Start>00:00+02:00</wsag-ogc:Start>
<wsag-ogc:Stop>24:00+02:00</wsag-ogc:Stop>
<wsag-ogc:Interval>5000</wsag-ogc:Interval>
<wsag-ogc:Capacity>10</wsag-ogc:Capacity>
<wsag-ogc:Request>?SERVICE=WPS&REQUEST=GetCapabilities</wsag-ogc:Request>
</wsag-ogc:ActiveMonitoring>
</wsag-ogc:Property>
<wsag-ogc:Property>
<wsag-ogc:Name>AvailabilityPerDay</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Day)</wsag-ogc:Title>
<wsag-ogc:Abstract>The general availability of the service per day.</wsag-
ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:kpi-runtime:availability:day</wsag-ogc:Type>
<wsag-ogc:Value>96</wsag-ogc:Value>
</wsag-ogc:Property>
  (...)
<wsag-ogc:Property>
<wsag-ogc:Name>CpuCores</wsag-ogc:Name>
<wsag-ogc:Title>Number of CPUs</wsag-ogc:Title>
<wsag-ogc:Abstract>The number of CPU cores.</wsag-ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:kpi-infrastructure:compute:cores</wsag-ogc:Type>
<wsag-ogc:Value>4</wsag-ogc:Value>
</wsag-ogc:Property>
</wsag-ogc:ServiceProperties>
```

The XML Schema specifying the non-functional service description terms in the proposed WS-Agreement Application Profile for OGC Web Servicescan be found in Appendix A.3. The URN namespace for identifying domain-specific KPIs of OWS is introduced in Section 8.2 and a complete overview about all available URNs is provided in Appendix B.1.

Service Availability Period The service description term that represents the service availability period of the proposed WS-Agreement Application Profile for OGC Web Servicesshould contain a start and end time as for instance describe in the Time Constraints Profile [13] published by the Grid Resource Allocation Agreement Protocol (GRAAP) working group of Open Grid Forum (OGF).

Table 3 — Parameters included in the Service Availability Period section

Name	Definition
Start Time	The start time of the service availability.
End Time	The end time of the service availability.

An XML example of such information about the service availability period that can be embedded in the service description terms of the proposed WS-Agreement Application Profile for OGC Web Servicescan be found in Listing 6.

Listing 6: Example XML of service availability period

```
<res-sla:TimeConstraint>
<res-sla:StartTime>2007-09-01T10:00:00+02:00</res-sla:StartTime>
<res-sla:EndTime>2012-05-31T10:00:00+02:00</res-sla:EndTime>
</res-sla:TimeConstraint>
```

The XML Schema specifying the service availability period in the service description terms in the proposed application profile is originally specified in [13] and can be found in Appendix A.4.

Service Reference

The service reference part of the WS-Agreement specification requires a domain-specific reference to the service to which an agreement pertains. Therefore, the XML Schema of the WS-Agreement specification defines the following XML elements for the service reference part (Listing 7).

Listing 7: XML Schema for service reference part (WS-Agreement)

```
<xs:complexType name="ServiceReferenceType">
<xs:complexContent>
<xs:extension base="wsag:ServiceTermType">
<xs:sequence>
<xs:any namespace="##other" processContents="strict"/>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
```

The <xs:any/> element allows the definition of any domain specific service reference.

In the context of OWS, a service reference could be defined as a simple HTTPURL.

An XML example of such a reference that can be embedded in the service reference of the proposed WS-Agreement Application Profile for OGC Web Servicescan be found in Listing 8.

Listing 8: Example XML of service reference

```
<wsag-ogc:ServiceReference>
<wsag-ogc:URL>http://localhost:8088/sla-proxy/helloworld</wsag-ogc:URL>
</wsag-ogc:ServiceReference>
```

The XML Schema specifying the domain-specific service reference in the proposed WS-Agreement application profile can be found in Appendix A.5.

Service Level Objectives

The guarantee terms part of the WS-Agreement specification requires one or more guarantee terms each containing a service level objective. Therefore, the XML Schema of the WS-Agreement specification defines the following XML elements for a custom service level in the guarantee terms part (Listing 9).

Listing 9: XML Schema for guarantee terms part (1) (WS-Agreement)

```
<xs:complexType name="GuaranteeTermType">
<xs:complexContent>
<xs:extension base="wsag:TermType">
<xs:sequence>
        (...)
<xs:element ref="wsag:ServiceLevelObjective"/>
        (...)
</xs:sequence>
      (...)
</xs:extension>
</xs:complexContent>
</xs:complexType>

<xs:element name="ServiceLevelObjective"
type="wsag:ServiceLevelObjectiveType"/>

<xs:complexType name="ServiceLevelObjectiveType">
<xs:choice>
<xs:element name="KPITarget" type="wsag:KPITargetType"/>
<xs:element name="CustomServiceLevel" type="xs:anyType"/>
</xs:choice>
</xs:complexType>
```

The type="xs:anyType" attribute allows the definition of any domain specific custom service levels.

The custom service levels of the proposed WS-Agreement Application Profile for OGC Web Servicesshould contain an unique identifier, a human-readable title, an a brief narrative description and a domain specific condition expression language which defines the actual state of a service level objective. These custom service levels allow the parties, which may have obligations in the agreement, to define and evaluate the state of fulfillment for each service level objective.

Table 4 — Parameters included in the Service Level Objective section

Name	Definition
Name	An unique identifier of the Service Level Objective (SLO).
Title	A human-readable title of the SLO.
Abstract	A brief narrative description of the SLO.
Status	A domain specific expression for defining and evaluating the status of the SLO.

An XML example of such a custom service level that can be embedded in the guarantee terms part of the proposed WS-Agreement Application Profile for OGC Web Servicescan be found in Listing 10.

Listing 10: Example XML of service level objective

```
<wsag:CustomServiceLevel>
<wsag-ogc:CustomServiceLevel>
<wsag-ogc:Name>InitialResponseTime</wsag-ogc:Name>
<wsag-ogc:Title>Initial Response Time</wsag-ogc:Title>
<wsag-ogc:Abstract>The initial response time of the service is maximum 500
ms.</wsag-ogc:Abstract>
<wsag-ogc:Status>ACT_PERFORMANCE_RESPONSE lt REQ_PERFORMANCE_RESPONSE</wsag-
ogc:Status>
</wsag-ogc:CustomServiceLevel>
</wsag:CustomServiceLevel>
```

The XML Schema specifying the custom service levels in the proposed WS-Agreement Application Profile for OGC Web Services can be found in Appendix A.6. The condition expression language for defining and evaluating the status of service level objectives is described in Section 8.3.

Business Values

The guarantee terms part of the WS-Agreement specification allows defining a business value for each guarantee term. Therefore, the XML Schema of the WS-Agreement specification defines the following XML elements for a custom business value in the guarantee terms part (Listing 11).

Listing 11: XML Schema for guarantee terms part (2) (WS-Agreement)

```
<xs:complexType name="GuaranteeTermType">
<xs:complexContent>
<xs:extension base="wsag:TermType">
<xs:sequence>
        (...)
<xs:element name="BusinessValueList" type="wsag:BusinessValueListType"/>
</xs:sequence>
      (...)
</xs:extension>
</xs:complexContent>
</xs:complexType>

<xs:complexType name="BusinessValueListType">
<xs:sequence>
<xs:element minOccurs="0" name="Importance" type="xs:integer"/>
<xs:element maxOccurs="unbounded" minOccurs="0" name="Penalty"
type="wsag:CompensationType"/>
<xs:element maxOccurs="unbounded" minOccurs="0" name="Reward"
type="wsag:CompensationType"/>
<xs:element minOccurs="0" name="Preference" type="wsag:PreferenceType"/>
<xs:element maxOccurs="unbounded" minOccurs="0" name="CustomBusinessValue"
type="xs:anyType"/>
</xs:sequence>
</xs:complexType>
```

The `type="xs:anyType"` attribute allows the definition of any domain specific custom business values.

The custom business values of the proposed WS-Agreement Application Profile for OGC Web Servicesshould contain an unique identifier, a human-readable title, an a brief narrative description, a business value type URN from a registry of domain-specific business value types and a domain specific condition expression language which defines the actual business value. These custom business values allow the parties, which may have obligations in the agreement, to define and evaluate different business value aspects of the service level objective. Such business value aspects could be for instance rewards or penalties for meeting an objective or not.

Table 5 — Parameters included in the Business Values section

Name	Definition
Name	An unique identifier of the business value.
Title	A human-readable title of the business value.
Abstract	A brief narrative description of the business value.
Type	A business value type URN from a registry of domain-specific business values.

Name	Definition
Value	A domain specific expression for calculating the value of the business value aspect.

An XML example of such a custom business value that can be embedded in the guarantee terms part of the proposed WS-Agreement Application Profile for OGC Web Servicescan be found in Listing 12.

Listing 12: Example XML of business value

```
<wsag-ogc:CustomBusinessValue>
<wsag-ogc:Name>UsageCostsMonth</wsag-ogc:Name>
<wsag-ogc:Title>Usage Costs (Monthly)</wsag-ogc:Title>
<wsag-ogc:Abstract>The monthly use costs are 100 Euro.</wsag-ogc:Abstract>
<wsag-ogc:Type>urn:ogc:sla:business:cost:month</wsag-ogc:Type>
<wsag-ogc:Value>500</wsag-ogc:Value>
</wsag-ogc:CustomBusinessValue>
```

The XML Schema specifying the custom business values in the proposed WS-Agreement Application Profile for OGC Web Servicescan be found in Appendix A.7. The URN namespace for identifying domain-specific business value aspects is introduced in Section 8.2 and a complete overview about all available URNs is provided in Appendix B.2. The condition expression language for calculation custom business values is described in Section 8.3.

7.2 Uniform Resource Name

This section describes an URN namespace schema for identifying service property types that are used to describe common Key Performance Indicators (KPIs) of OGC Web Services (OWS). Furthermore, the URN schema could be used to identify business value types in the guarantee terms part of the proposed SLA model.

OGC Namespace Structure

The Open Geospatial Consortium (OGC) defines an URN namespace [15] for identifying resources that are published by the OGC. Furthermore, the OGC describes "procedures used by the OGC Naming Authority for the assignment and registration of OGC names" [14]. An OGC Namespace Specific String (NSS) is structured in accordance with the syntax described in [16]. The formal OGC Namespace Identifier (NID) is "ogc" and the generic syntax for describing all OGC URNs is defined in [17]. Expressed in Extended Backus Naur Form (BNF) [18] [19] all URNs used by the OGC have the following hierarchical structured form (Listing 13).

Listing 13: OGC URN Schema

```
urn:ogc:{category.label}:{resource.group}:{resource.type}{-
resource.subtype}?{[doc. id]}?:{[resource.label]}?:{[release]}?:{[parameters]}
```

The `category.label` token must be "specification", "service", "def" or "tc" [20]. The "specification" category identifies all published OGC specifications. The "service" category identifies access to an OWS. The "tc" category identifies work products of the various OGC working groups and committees. The "def" category references "definitions of coordinate reference systems, coordinate (transformation) operations, and components thereof, that are specified or recognized by the OGC in a formal OGC document" [17]. The specific use of the "def" category is described in [14] but "may be expanded in the future to accommodate the needs of new OGC standards" [17].

Service Property Types

To identify domain-specific Key Performance Indicators (KPIs) in the service properties part of the proposed WS-Agreement Application Profile for OGC Web Services, the following extension of the "def" category is proposed.

The `category.label` token must be "def". The `resource.group` token must be "sla". The `resource.type` token must be "kpi". The `resource.subtype` token must be one of "resources", "runtime", "data", "transaction", "security", "infrastructure" or "business". The `doc.id` token and the `release` token remain empty. The proposed extension of the OGC URN namespace has the following hierarchical structured form (Listing 14).

Listing 14: OGC URN Schema Extension for Service Properties

```
urn:ogc:def:sla:kpi-{resource.subtype}:{[resource.label]}?:{[parameters]}
```

The meaning and the potential value of the `resource.subtype`, the `resource.label` and the `parameters` token depend on the KPI category. The following three sections describe the meaning and the structure for the “resources”, the “runtime” and the “infrastructure” resource subtype.

Resource Properties To give service providers and service consumer the ability to measure the difference between the offered set of resources and the implemented set of resources, the SLA model must allow the definition of the following resource related KPIs. Depending on the web service type (e.g. if the service is responsible for data portrayal or data processing), a ’resource’ can be for instance an optional service operation, an available layer, an available featureset or an offered geospatial process.

If the `resource.subtype` token is "resource", the `resource.label` token must be one of "operation", "layer", "feature" or "process". The "operation" resource label defines which operation is supported by the web service. The "layer" resource label defines which layer is offered by the web service. The "feature" resource label defines which feature is offered by the web service. The "process" resource label defines which geoprocess is offered by the web service.

EXAMPLE 1 The URN for the offered processes of a geoprocessing service.

```
urn:ogc:def:sla:kpi-resource:process
```

Runtime Properties To give service providers and service consumer the ability to negotiate general web services quality, the SLA model must allow the definition of service runtime related KPIs.

Considering several common Quality of Service (QoS) attributes for web services as for instance defined in [21], the following list of URNs and corresponding KPIs is selected to be relevant for the SLA model.

If the `resource.subtype` token is "runtime", the `resource.label` token must be one of "throughput", "response", "reliability", "capacity or "availability". The "throughput" resource label represents information about the number of completed web service requests over a specific period of time that should be provided with guaranteed performance. In that case, the parameters token must be one of "day", "week", "month" or "year". Each parameter indicates the time period for measuring the throughput of the web service. The "response" resource label represents information about the time required to complete a service request. In that case, the parameters token must be one of "initial" or "complete". The “initial” parameter defines the initial response time of a web service (receiving the first byte of a response) and the “complete” parameter defines the overall response time (receiving the complete response). The "reliability" resource label represents the ability of a web service to perform its expected functionality for a specific period of time. In that case, the parameters token must be one of "mtbf" or "mttr" The “mtbf” parameter defines the mean time between failures (MTBF), the "expected or observed time between consecutive failures in a system or component" [21]. The "mttr" parameter defines the mean time to repair (MTTR), the "expected or observed time required to repair a system or component and return it to normal operations" [21]. The "capacity" resource label represents the ability of a web service to handle a minimum number of served simultaneous service requests which are provided with guaranteed performance. The "availability" resource label represents information about the probability whether a web service is up and running over a specific period of time. In that case, the parameters token must be one of "day", "week", "month" or "year". Each parameter indicates the time period for measuring the availability of the web service.

EXAMPLE 2 The URN for the availability of an OGC Web Service per month.

```
urn:ogc:def:sla:kpi-runtime:availability:month
```

There are more runtime relate QoS attributes in literature, but most of them are fuzzy and not measurable (e.g. the scalability of a web service), overlapping or depending on each other (e.g. reliability and accuracy), are convertible or declare same meanings with different measurement units. The presented list of runtime related parameters is sufficient for matching all identified requirements in the proposed SLA model.

Infrastructure Properties To give service providers the ability offer services based on defined compute resource levels and to allow service consumers to specify their compute resource requirements, the SLA model must allow the definition of infrastructure related KPIs.

The following infrastructure related labels and attributes are taken from the Open Cloud Computing Interface (OCCI) Core [23] and Infrastructure [24] specification, the Job Submission Description Language (JSDL) specification [25] and other related publications.The OCCI is produced by the OCCI working group of the Open Grid Forum (OGF) and defines an Representational State Transfer (REST) [26] based protocol and Application Programming Interface (API) for remote management of Infrastructure as a Service (IaaS) model-based services. It details interoperable resource types, their attributes and the actions that can be taken on each resource type. The JSDL specification [25] is produced by the JSDL working group of the OGF and defines an Extensible Markup Language (XML) based language for describing the requirements of computational jobs for submission to Grid Computing environments, though not restricted to the latter.

If the `resource.subtype` token is "infrastructure", the `resource.label` token must be one of "compute", "os", "application", "network", "storage" or "vm". The "compute" resource label represents information about the hardware resources of a compute resource (e.g. a physical server or a virtual machine). In that case, the parameters token must be one of "architecture", "cores", "speed" or "memory". The "architecture" parameter defines the Central Processing Unit (CPU) architecture of a compute resource. The "cores" parameter defines the numbers of available CPU cores at a compute resource and the "speed" parameter defines the CPU clock speed of each available CPU core. Finally, the "memory" parameter defines the available Random Access Memory (RAM) of the compute resource. The "os" resource label defines the operating system that is installed on a compute resource. In that case, the parameters token with the value "name" defines which Operating System (OS) is installed on the compute resource. The "application" resource label defines which applications and services are installed on the compute node. In that case, the parameters token must be "name". The "name" parameter defines which application is installed on the compute node. The "network" resource label represents information about the network connectivity of a compute resource. In that case, the parameters token must be one of "bandwith" or "delay". The "bandwith" parameter defines how fast data can be moved over a network and the "delay" parameter defines how long it takes to send one bit from one compute resource to another one. The "storage" resource label represents information about the available (disk) storage of a compute resource. In that case, the parameters token with the value "size" defines the available storage size at a compute resource. The "vm" resource subtype represents information about a virtualized compute resource. In that case, the parameters token must be one of "name" or "persistance". The "name" parameter defines which Virtual Machine (VM) should represent the compute resource and the "persistance" parameter defines whether a VM is persistent or not.

EXAMPLE 3 The URN for the number of CPUs assigned to a web service instance.

```
urn:ogc:def:sla:kpi-infrastructure:compute:cores
```

Appendix B.1 provides a detailed overview and explanation of all proposed URNs. Although the presented list of URNs and corresponding KPIs is quite comprehensive and sufficient for matching all identified requirements, it is not complete and could be expanded in the future to accommodate the needs of other application scenarios.

Business Value Types

To identify domain-specific Business Values that are attached to the Service Level Objectives (SLOs) in the guarantee terms part of the proposed WS-Agreement Application Profile for OGC Web Services, the following extension of the "def" category is proposed.

The `category.label` token must be "def". The `resource.group` token must be "sla". The `resource.type` token must be "slo". The `resource.subtype` token must be “business” and the `resource.label` token must be one of “cost”, “reward” or “penalty”. The `doc.id` token and the `release` token remain empty. The proposed extension of the OGC URN namespace has the following hierarchical structured form (Listing 15).

Listing 15: OGC URN Schema Extension for Business Values

```
urn:ogc:def:sla:slo-{resource.subtype}:{[resource.label]}?:{[parameters]}
```

The meaning and the potential value of the `resource.label` and the `parameters`token depend on the business valuecategory.

The "cost" resource label represents information about the service usage costs. In that case, the parameters token must be one of "day", "week", "month" or "year". Each parameter indicates the time period for calculating the service usage costs.The "reward" resource label represents information about the reward for anobligated party for meeting a service level objective. In that case, the parameters token must be one of "day", "week", "month" or "year". Each parameter indicates the time period for calculating the reward for meeting a service level objective.The "penalty" resource label represents information about thepenalty for anobligated party for not meeting a service level objective. In that case, the parameters token must be one of "day", "week", "month" or "year". Each parameter indicates the time period for calculating the penalty for not meeting a service level objective.

EXAMPLE 4 The URN for the monthly service usage costs.

```
urn:ogc:def:sla:slo-business:cost:month
```

Appendix B.2 provides a detailed overview and explanation of all proposed URNs. Although the presented list of URNs and corresponding business value aspects is quite

comprehensive and sufficient for matching all identified requirements, it is not complete and could be expanded in the future to accommodate the needs of other application scenarios.

7.3 Domain Specific Language

This section describes a Domain Specific Language (DSL) that is designed to evaluate the SLO status (either 'fulfilled' or 'violated') and to calculate business related values (e.g. monthly service usage costs) in the proposed WS-Agreement Application Profile for OGC Web Services. The presented DSL is based on the Java EXpression Language (JEXL)[4], an expression language inspired by Apache Velocity[5] and the Expression Language defined in the JavaServer Pages Standard Tag Library (JSTL) [6]and JavaServer Pages (JSP)[7].Information about the basic JEXL syntax and grammar is available at the JEXL project homepage.

Depending on the service properties defined in the service description terms of an agreement, the expressions for service level objectives and business values have access to various implicit objects that are dynamically linked into the expressions.

EXAMPLE 5.1 A SLO expression that defines the monthly service availability.

```
ACT_AVAILABILITY_MONTH gt REQ_AVAILABILITY_MONTH
```

The `REQ_AVAILABILITY_MONTH`object defines the required service availability. Its actual value is defined by a variable from the service properties section that references the service description terms of an agreement.

EXAMPLE 6 A variable from the service properties section of an agreement.

```
<wsag:Variable wsag:Name="REQ_AVAILABILITY_MONTH" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:month']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
```

[4]http://commons.apache.org/jexl/

[5]http://velocity.apache.org/

[6]http://www.oracle.com/technetwork/java/index-jsp-135995.html

[7]http://www.oracle.com/technetwork/java/javaee/jsp/index.html

The ACT_AVAILABILITY_MONTH object defines the current service availability that is permanently measured during service availability period. Its actual valued is defined by a variable from the agreement properties section of a created agreement.

EXAMPLE 7 A variable from the service properties section of an agreement.

```
<wsag:Variable wsag:Name="ACT_AVAILABILITY_MONTH" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:month']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
```

However, such an expression language is typical for the application of the WS-Agreement specification in job submission and/or Grid Computing environments.

8 Application Scenario

The proposed WS-Agreement Application Profile for OGC Web Services is applied in the Service Level Agreements for D-Grid (SLA4D-Grid)project[8].The SLA4D-Grid Project is designing and realising a Service Level Agreement layer for the Germany's national Grid Computing infrastructure D-Grid. The Service Level Agreement layer offers individual users, whole D-Grid communities, and the providers of D-Grid resources service usage under given guarantees, quality-of-service requirements and pre-defined business conditions. For this purpose, service level requests and the corresponding offers are linked by binding Service Level Agreements. By means of the SLA layer and with the assistance of other D-Grid services, such as monitoring and accounting, SLAs can be automatically created, negotiated and their observance monitored, so that the D-Grid can be used by academic and industrial users in an economically efficient manner, in accordance with their respective business models.In the project, the proposed WS-Agreement Application Profile for OGC Web Services is used to provide geospatial service offerings (mainly the OGC Web Processing Service, WPS) to potential service consumers. The service properties and corresponding service quality guarantees reflectD-Grid infrastructure provider related information (such as detailed information about the Virtual Machine, VM that hosts the offered service) and common Quality of Service (QoS) requirements.

[8]http://www.sla4d-grid.de/

9 Conclusion

The proposed WS-Agreement Application Profile for OGC Web Services defines XML Schema documents for the agreement context, the service description terms, the service reference, and the custom service levels and business values in the guarantee terms of agreements as defined by the WS-Agreement specification. These XML Schema documents allow to define domain-specific content for the application of the WS-Agreement specification in the context of Spatial Data Infrastructure (SDI) services that are based on standards developed by the Open Geospatial Consortium (OGC). The proposed domain-specific content of the agreement context part is aligned to the service provider metadata element as defined in OGC Web Services Common Standard. The proposed domain-specific content of the functional service description section is aligned to the service identification metadata element as defined in OGC Web Services Common Standard. The proposed URN schema for identifying domain-specific service properties and business values are inspired by common service quality and business value aspects used in the context of web services. The proposed condition expression language for evaluating the status of service level objectives and for calculation the custom business values is compliant to the common Java EXpression Language (JEXL) language, which is extended with a set of implicit object that are available in the context of the proposed WS-Agreement application profile.

The proposed WS-Agreement Application Profile for OGC Web Services defines how to structure and create the domain-specific content of an agreement. The proposed WS-Agreement Application Profile for OGC Web Services neither defines how to monitor defined service properties nor how responsible parties can fulfill guarantee terms. Such aspects are related but outside the scope of the WS-Agreement specification. Furthermore, this document does not specify how to integrate the agreement negotiation task (which is defined by the WS-Agreement specification) into the publish-find-bind workflow that is adopted in SDIs. This is a topic for further research and standardization work. A pragmatic solution for the publish-find-agree-bind workflow is developed in the SLA4D-Grid project. The SLA management framework developed in the SLA4D-Grid project implements a Representational State Transfer (REST) binding of the WS-Agreement specification as defined in [27] and relies on the proposed WS-Agreement Application Profile for OGC Web Services. All presented service properties are monitored and the states of the guarantee terms, express in the presented condition expression language, are evaluated during service availability period. SDI service consumers and service providers are able to dynamically create SLAs and use negotiated services without a need to change existing OGC standards and best practices.

Annex A
(normative)

XML Schema

A.1 XML Schema for Agreement Context

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<xs:schema xmlns:wsag-ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.ifgi.org/namespaces/wsag/ogc"
elementFormDefault="qualified">
<xs:import schemaLocation="ows/ows19115subset.xsd"
namespace="http://www.opengis.net/ows/2.0"/>
<xs:element name="Contact" type="wsag-ogc:ContactType"/>
<xs:complexType name="ContactType">
<xs:sequence>
<xs:element name="Name" type="xs:string"/>
<xs:element name="Site" type="ows:OnlineResourceType"/>
<xs:element name="Contact" type="ows:ResponsiblePartySubsetType"/>
</xs:sequence>
</xs:complexType>
</xs:schema>
```

A.2 XML Schema for Functional Service Description

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<xs:schema xmlns:wsag-ogc="http://www.ifgi.org/namespaces/wsag/ogc" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.ifgi.org/namespaces/wsag/ogc"
elementFormDefault="qualified">
<xs:element name="ServiceDescription" type="wsag-ogc:ServiceDescriptionType"/>
<xs:complexType name="ServiceDescriptionType">
<xs:sequence>
<xs:element minOccurs="0" maxOccurs="1" name="Title" type="xs:string"/>
<xs:element minOccurs="0" maxOccurs="1" name="Abstract" type="xs:string"/>
<xs:element minOccurs="0" maxOccurs="1" name="Keywords" type="xs:string"/>
<xs:element minOccurs="0" maxOccurs="1" name="Type" type="xs:anyURI"/>
<xs:element minOccurs="0" maxOccurs="1" name="Profile" type="xs:anyURI"/>
<xs:element minOccurs="0" maxOccurs="1" name="WSDL" type="xs:string"/>
</xs:sequence>
</xs:complexType>
</xs:schema>
```

A.3 XML Schema for Non-Functional Service Description

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<xs:schema xmlns:wsag-ogc="http://www.ifgi.org/namespaces/wsag/ogc" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.ifgi.org/namespaces/wsag/ogc"
elementFormDefault="qualified">
<xs:element name="ServiceProperties" type="wsag-ogc:ServicePropertiesType"/>
```

```
<xs:element name="Property" type="wsag-ogc:PropertyType"/>
<xs:complexType name="PropertyType">
<xs:sequence>
<xs:element minOccurs="1" maxOccurs="1" name="Name" type="xs:string"/>
<xs:element minOccurs="1" maxOccurs="1" name="Title" type="xs:string"/>
<xs:element minOccurs="0" maxOccurs="1" name="Abstract" type="xs:string"/>
<xs:element minOccurs="1" maxOccurs="1" name="Type" type="xs:string"/>
<xs:element minOccurs="1" maxOccurs="1" name="Value" type="xs:string"/>
<xs:element minOccurs="1" maxOccurs="1" name="ActiveMonitoring" type="wsag-
ogc:ActiveMonitoringType"/>
<xs:element minOccurs="1" maxOccurs="1" name="PassiveMonitoring"
type="xs:anyType"/>
</xs:sequence>
</xs:complexType>
<xs:complexType name="ActiveMonitoringType">
<xs:sequence>
<xs:element minOccurs="0" maxOccurs="1" name="Start" type="xs:time"/>
<xs:element minOccurs="0" maxOccurs="1" name="Stop" type="xs:time"/>
<xs:element minOccurs="0" maxOccurs="1" name="Interval" type="xs:int"/>
<xs:element minOccurs="0" maxOccurs="1" name="Capacity" type="xs:int"/>
<xs:element minOccurs="0" maxOccurs="1" name="Request" type="xs:string"/>
<xs:element minOccurs="0" maxOccurs="1" name="Response" type="xs:string"/>
</xs:sequence>
</xs:complexType>
<xs:complexType name="ServicePropertiesType">
<xs:sequence>
<xs:element minOccurs="0" maxOccurs="unbounded" ref="wsag-ogc:Property"/>
</xs:sequence>
</xs:complexType>
</xs:schema>
```

A.4 XML Schema for Service Availability Period

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<xs:schema xmlns:res-sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-
extensions" xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-
extensions" elementFormDefault="qualified" attributeFormDefault="qualified">
<xs:complexType name="TimeConstraintType">
<xs:sequence>
<xs:element name="StartTime" type="xs:dateTime" minOccurs="0" maxOccurs="1"/>
<xs:element name="EndTime" type="xs:dateTime" minOccurs="0" maxOccurs="1"/>
<xs:element name="Duration" type="xs:int" minOccurs="0" maxOccurs="1"/>
</xs:sequence>
</xs:complexType>
<xs:element name="TimeConstraint" type="res-sla:TimeConstraintType"/>
</xs:schema>
```

A.5 XML Schema for Service Reference

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<xs:schema xmlns:wsag-ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.ifgi.org/namespaces/wsag/ogc"
elementFormDefault="qualified">
<xs:element name="ServiceReference" type="wsag-ogc:ServiceReferenceType"/>
<xs:complexType name="ServiceReferenceType">
<xs:sequence>
<xs:element minOccurs="1" maxOccurs="1" name="URI" type="xs:anyURI"/>
</xs:sequence>
</xs:complexType>
```

```
</xs:schema>
```

A.6 XML Schema for Custom Service Level

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<xs:schema xmlns:wsag-ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.ifgi.org/namespaces/wsag/ogc"
elementFormDefault="qualified">
<xs:element name="CustomServiceLevel" type="wsag-ogc:CustomServiceLevelType"/>
<xs:complexType name="CustomServiceLevelType">
<xs:sequence>
<xs:element minOccurs="1" maxOccurs="1" name="Name" type="xs:string"/>
<xs:element minOccurs="1" maxOccurs="1" name="Title" type="xs:string"/>
<xs:element minOccurs="1" maxOccurs="1" name="Abstract" type="xs:string"/>
<xs:element minOccurs="1" maxOccurs="1" name="Status" type="xs:string"/>
</xs:sequence>
</xs:complexType>
</xs:schema>
```

A.7 XML Schema for Custom Business Values

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<xs:schema xmlns:wsag-ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.ifgi.org/namespaces/wsag/ogc"
elementFormDefault="qualified">
<xs:element name="CustomBusinessValue" type="wsag-
ogc:CustomBusinessValueType"/>
<xs:complexType name="CustomBusinessValueType">
<xs:sequence>
<xs:element minOccurs="1" maxOccurs="1" name="Name" type="xs:string"/>
<xs:element minOccurs="1" maxOccurs="1" name="Title" type="xs:string"/>
<xs:element minOccurs="1" maxOccurs="1" name="Abstract" type="xs:string"/>
<xs:element minOccurs="1" maxOccurs="1" name="Type" type="xs:string"/>
<xs:element minOccurs="1" maxOccurs="1" name="Value" type="xs:string"/>
</xs:sequence>
</xs:complexType>
</xs:schema>
```

Annex B
(normative)

Uniform Resource Names (URNs)

B.1 Service Property Types

Table 6 provides a detailed overview and explanation of all Uniform Resource Names (URNs) that are used to identify domain-specific Key Performance Indicators (KPIs) in the service properties part of the proposed WS-Agreement Application Profile for OGC Web Services. All URNs are structured in accordance with the OGC URN Schema described in [15] and have the form

```
urn:ogc:def:sla:kpi-{URN}
```

where the `URN` token must be one of the following URNs.

Table 6 — URN dictionary for service property types

URN	Definition
`resource:operation`	The (optional) web service operation that is supported by a web service instance.
`resource:layer`	The layer that is offered by an OWS.
`resource:feature`	The feature that is offered by an OWS.
`resource:process`	The process that is offered by an OWS.
`runtime:throughput:day`	The number of completed web service requests per day, which are provided with guaranteed performance.
`runtime:throughput:week`	The number of completed web service requests per week, which are provided with guaranteed performance.
`runtime:throughput:month`	The number of completed web service requests per month, which are provided with guaranteed performance.

URN	Definition
runtime:throughput:year	The number of completed web service requests per year, which are provided with guaranteed performance.
runtime:response:initial	The initial response time of the service. The time between sending the service request and receiving the first byte of the service response.
runtime:response:complete	The overall response time of the service. The time between sending the service request and receiving the complete service response.
runtime:reliability:mtbf	The expected mean time between consecutive failures of the service (mean time between failure, MTBF).
runtime:reliability:mttr	The expected mean time required to repair the service and return it to normal operations (mean time to repair, MTTR).
runtime:capacity	The number of served simultaneous service requests which are provided with guaranteed performance.
runtime:availability:day	The probability over a day whether a web service is up and running.
runtime:availability:week	The probability over a week whether a web service is up and running.
runtime:availability:month	The probability over a month whether a web service is up and running.
runtime:availability:year	The probability over a year whether a web service is up and running.
infrastructure:compute:architecture	The Central Processing Unit (CPU) architecture of a compute resource.
infrastructure:compute:cores	The number of available CPU cores at a compute resource.
infrastructure:compute:speed	The CPU clock speed of each available CPU core at a compute resource.

URN	Definition
infrastructure:compute:memory	The available Random Access Memory (RAM) of a compute resource.
infrastructure:os:name	The Operating System (OS) that is installed on a compute resource.
infrastructure:application:name	An application that is installed on a compute resource.
infrastructure:network:bandwith	How fast data can be moved over a network.
infrastructure:network:delay	How long it takes to send a bit from a compute resource to another one over a network.
infrastructure:storage:size	The amount of available storage at a compute resource.
infrastructure:vm:name	A Virtual Machine (VM) that represents a compute resource.
infrastructure:vm:persistance	Indicator whether a VM is persistent or not.

B.2 Business ValueTypes

Table 7 provides a detailed overview and explanation of all URNs that are used to express domain specific business value aspects in the Service Level Objective (SLO) part of the proposed WS-Agreement Application Profile for OGC Web Services. All URNs are structured in accordance with the OGC URN Schema described in [15] and have the form

```
urn:ogc:def:sla:slo-{URN}
```

where the `URN` token must be one of the following URNs.

Table 7 — URN dictionary for business value types

URN	Definition
business:cost:day	The cost to be assessed for using the service on a daily basis.

URN	Definition
business:cost:week	The cost to be assessed for using the service on a weekly basis.
business:cost:month	The cost to be assessed for using the service on a monthly basis.
business:cost:year	The cost to be assessed for using the service on a yearly basis.
business:penalty:day	The penalty to be assessed for not meeting service level objectives on a daily basis.
business:penalty:week	The penalty to be assessed for not meeting service level objectives on a weekly basis.
business:penalty:month	The penalty to be assessed for not meeting service level objectives on a monthly basis.
business:penalty:year	The penalty to be assessed for not meeting service level objectives on a yearly basis.
business:reward:day	The reward to be assessed for meeting service level objectives on a daily basis.
business:reward:week	The reward to be assessed for meeting service level objectives on a weekly basis.
business:reward:month	The reward to be assessed for meeting service level objectives on a monthly basis.
business:reward:year	The reward to be assessed for meeting service level objectives on a yearly basis.

Annex C
(informative)

XML Documents

C.1 Example Agreement Template

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<wsag:Template xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:wsag-ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:ows="http://www.opengis.net/ows/2.0" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:addressing="http://www.w3.org/2005/08/addressing"
wsag:TemplateId="WSAG_DEFAULT_TEMPLATE_5">
    <wsag:Name>INSPIRE_COORDINATE_TRANSFORMATION_SERVICE_TEMPLATE</wsag:Name>
    <!-- AGREEMENT CONTEXT -->
    <wsag:Context>
        <wsag:ServiceProvider>AgreementResponder</wsag:ServiceProvider>
        <!-- SERVICE PROVIDER INFORMATION -->
        <wsag:AgreementResponder>
            <wsag-ogc:Contact>
                <wsag-ogc:Name>Institute for Geoinformatics</wsag-ogc:Name>
                <wsag-ogc:Site xmlns:xlin="http://www.w3.org/1999/xlink"
xlin:href="http://www.ifgi.de" />
                <wsag-ogc:Contact>
                    <ows:IndividualName>Bastian Baranski</ows:IndividualName>
                    <ows:PositionName>Research Associate</ows:PositionName>
                    <ows:ContactInfo>
                        <ows:Phone>
                            <ows:Voice>+49 251 8333071</ows:Voice>
                            <ows:Facsimile>+49 251 8339763</ows:Facsimile>
                        </ows:Phone>
                        <ows:Address>
                            <ows:DeliveryPoint>Weseler Strasse
253</ows:DeliveryPoint>
                            <ows:City>Muenster</ows:City>
                            <ows:PostalCode>48151</ows:PostalCode>
                            <ows:Country>Germany</ows:Country>
                            <ows:ElectronicMailAddress>bastian.baranski@uni-
muenster.de</ows:ElectronicMailAddress>
                        </ows:Address>
                        <ows:HoursOfService>The hours of service are Monday to
Friday from 8 AM to 16 PM.</ows:HoursOfService>
                        <ows:ContactInstructions>Please contact the service desk
via phone or mail.</ows:ContactInstructions>
                    </ows:ContactInfo>
                </wsag-ogc:Contact>
            </wsag-ogc:Contact>
        </wsag:AgreementResponder>
        <wsag:TemplateId>WSAG_DEFAULT_TEMPLATE_5</wsag:TemplateId>

    <wsag:TemplateName>INSPIRE_COORDINATE_TRANSFORMATION_SERVICE_TEMPLATE</wsag:
TemplateName>
    </wsag:Context>
    <wsag:Terms>
```

```
        <wsag:All>
            <!-- FUNCTIONAL SERVICE DESCRIPTION -->
            <wsag:ServiceDescriptionTerm wsag:Name="SERVICE_DESCRIPTION_SDT"
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE">
                <wsag-ogc:ServiceDescription>
                    <wsag-ogc:Title>INSPIRE Coordinate Transformation
Service</wsag-ogc:Title>
                    <wsag-ogc:Abstract>This WPS instance is an implementation of
the INSPIRE Coordinate Transformation Service specification.</wsag-
ogc:Abstract>
                    <wsag-ogc:Keywords>OGC, WPS, INSPIRE Coordinate
Transformation Service</wsag-ogc:Keywords>
                    <wsag-
ogc:Type>urn:ogc:wps:1.0.0:INSPIRE:TransformCoordinates:1.0</wsag-ogc:Type>
                    <wsag-ogc:Profile />
                    <wsag-ogc:WSDL />
                </wsag-ogc:ServiceDescription>
            </wsag:ServiceDescriptionTerm>
            <!-- NON-FUNCTIONAL SERVICE DESCRIPTION -->
            <wsag:ServiceDescriptionTerm wsag:Name="SERVICE_PROPERTIES_SDT"
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE">
                <wsag-ogc:ServiceProperties>
                    <wsag-ogc:Property>
                        <wsag-ogc:Name>ResponseTime</wsag-ogc:Name>
                        <wsag-ogc:Title>Initial Response Time</wsag-ogc:Title>
                        <wsag-ogc:Abstract>The initial response time of the
service.</wsag-ogc:Abstract>
                        <wsag-
ogc:Type>urn:ogc:def:sla:runtime:performance:response</wsag-ogc:Type>
                        <wsag-ogc:Value>5000</wsag-ogc:Value>
                    </wsag-ogc:Property>
                    <wsag-ogc:Property>
                        <wsag-ogc:Name>AvailabilityPerDay</wsag-ogc:Name>
                        <wsag-ogc:Title>Availability (Day)</wsag-ogc:Title>
                        <wsag-ogc:Abstract>The general availability of the
service per day.</wsag-ogc:Abstract>
                        <wsag-
ogc:Type>urn:ogc:def:sla:runtime:availability:day</wsag-ogc:Type>
                        <wsag-ogc:Value>96</wsag-ogc:Value>
                    </wsag-ogc:Property>
                    <wsag-ogc:Property>
                        <wsag-ogc:Name>AvailabilityPerWeek</wsag-ogc:Name>
                        <wsag-ogc:Title>Availability (Week)</wsag-ogc:Title>
                        <wsag-ogc:Abstract>The general availability of the
service per week.</wsag-ogc:Abstract>
                        <wsag-
ogc:Type>urn:ogc:def:sla:runtime:availability:week</wsag-ogc:Type>
                        <wsag-ogc:Value>98</wsag-ogc:Value>
                    </wsag-ogc:Property>
                    <wsag-ogc:Property>
                        <wsag-ogc:Name>AvailabilityPerMonth</wsag-ogc:Name>
                        <wsag-ogc:Title>Availability (Month)</wsag-ogc:Title>
                        <wsag-ogc:Abstract>The general availability of the
service per month.</wsag-ogc:Abstract>
                        <wsag-
ogc:Type>urn:ogc:def:sla:runtime:availability:month</wsag-ogc:Type>
                        <wsag-ogc:Value>99</wsag-ogc:Value>
                    </wsag-ogc:Property>
                    <wsag-ogc:Property>
                        <wsag-ogc:Name>AvailabilityPerYear</wsag-ogc:Name>
                        <wsag-ogc:Title>Availability (Year)</wsag-ogc:Title>
```

```
                        <wsag-ogc:Abstract>The general availability of the
service per year.</wsag-ogc:Abstract>
                        <wsag-
ogc:Type>urn:ogc:def:sla:runtime:availability:year</wsag-ogc:Type>
                        <wsag-ogc:Value>99</wsag-ogc:Value>
                    </wsag-ogc:Property>
                    <wsag-ogc:Property>
                        <wsag-ogc:Name>CpuCores</wsag-ogc:Name>
                        <wsag-ogc:Title>Number of CPUs</wsag-ogc:Title>
                        <wsag-ogc:Abstract>The number of CPU cores.</wsag-
ogc:Abstract>
                        <wsag-
ogc:Type>urn:ogc:def:sla:infrastructure:compute:cores</wsag-ogc:Type>
                        <wsag-ogc:Value>4</wsag-ogc:Value>
                    </wsag-ogc:Property>
                </wsag-ogc:ServiceProperties>
            </wsag:ServiceDescriptionTerm>
            <!-- CONTRACT RUNTIME -->
            <wsag:ServiceDescriptionTerm wsag:Name="CONTRACT_RUNTIME_SDT"
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE">
                <res-sla:TimeConstraint>
                    <res-sla:StartTime>2010-07-04T13:00:00+02:00</res-
sla:StartTime>
                    <res-sla:EndTime>2012-07-09T13:00:00+02:00</res-sla:EndTime>
                </res-sla:TimeConstraint>
            </wsag:ServiceDescriptionTerm>
            <!-- SERVICE REFERENCE -->
            <wsag:ServiceReference wsag:Name="SERVICE_REFERENCE"
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE">
                <wsag-ogc:ServiceReference>
                    <wsag-ogc:URI>http://localhost:8088/sla-
proxy/helloworld</wsag-ogc:URI>
                </wsag-ogc:ServiceReference>
            </wsag:ServiceReference>
            <!-- SERVICE PROPERTIES -->
            <wsag:ServiceProperties wsag:Name="SERVICE_PROPERTIES"
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE">
                <wsag:VariableSet>
                    <wsag:Variable wsag:Name="REQ_PERFORMANCE_RESPONSE"
wsag:Metric="xs:integer">
                        <wsag:Location>declare namespace
ws='http://schemas.ggf.org/graap/2007/03/ws-agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:performance:response']/wsag-
ogc:Value/text()</wsag:Location>
                    </wsag:Variable>
                    <wsag:Variable wsag:Name="REQ_AVAILABILITY_DAY"
wsag:Metric="xs:integer">
                        <wsag:Location>declare namespace
ws='http://schemas.ggf.org/graap/2007/03/ws-agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:day']/wsag-
ogc:Value/text()</wsag:Location>
                    </wsag:Variable>
                    <wsag:Variable wsag:Name="REQ_AVAILABILITY_WEEK"
wsag:Metric="xs:integer">
```

```
                    <wsag:Location>declare namespace
ws='http://schemas.ggf.org/graap/2007/03/ws-agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:week']/wsag-
ogc:Value/text()</wsag:Location>
                </wsag:Variable>
                <wsag:Variable wsag:Name="REQ_AVAILABILITY_MONTH"
wsag:Metric="xs:integer">
                    <wsag:Location>declare namespace
ws='http://schemas.ggf.org/graap/2007/03/ws-agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:month']/wsag-
ogc:Value/text()</wsag:Location>
                </wsag:Variable>
                <wsag:Variable wsag:Name="REQ_AVAILABILITY_YEAR"
wsag:Metric="xs:integer">
                    <wsag:Location>declare namespace
ws='http://schemas.ggf.org/graap/2007/03/ws-agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:year']/wsag-
ogc:Value/text()</wsag:Location>
                </wsag:Variable>
                <wsag:Variable wsag:Name="REC_COMPUTE_CORES"
wsag:Metric="xs:integer">
                    <wsag:Location>declare namespace
ws='http://schemas.ggf.org/graap/2007/03/ws-agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:infrastructure:compute:cores']/wsag-
ogc:Value/text()</wsag:Location>
                </wsag:Variable>

                <wsag:Variable wsag:Name="ACT_PERFORMANCE_RESPONSE"
wsag:Metric="xs:integer">
                    <wsag:Location>declare namespace
ws='http://schemas.ggf.org/graap/2007/03/ws-agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:performance:response']/wsag-
ogc:Value/text()</wsag:Location>
                </wsag:Variable>
                <wsag:Variable wsag:Name="ACT_AVAILABILITY_DAY"
wsag:Metric="xs:integer">
                    <wsag:Location>declare namespace
ws='http://schemas.ggf.org/graap/2007/03/ws-agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
```

```
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:day']/wsag-
ogc:Value/text()</wsag:Location>
                    </wsag:Variable>
                    <wsag:Variable wsag:Name="ACT_AVAILABILITY_WEEK"
wsag:Metric="xs:integer">
                        <wsag:Location>declare namespace
ws='http://schemas.ggf.org/graap/2007/03/ws-agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:week']/wsag-
ogc:Value/text()</wsag:Location>
                    </wsag:Variable>
                    <wsag:Variable wsag:Name="ACT_AVAILABILITY_MONTH"
wsag:Metric="xs:integer">
                        <wsag:Location>declare namespace
ws='http://schemas.ggf.org/graap/2007/03/ws-agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:month']/wsag-
ogc:Value/text()</wsag:Location>
                    </wsag:Variable>
                    <wsag:Variable wsag:Name="ACT_AVAILABILITY_YEAR"
wsag:Metric="xs:integer">
                        <wsag:Location>declare namespace
ws='http://schemas.ggf.org/graap/2007/03/ws-agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:year']/wsag-
ogc:Value/text()</wsag:Location>
                    </wsag:Variable>
                </wsag:VariableSet>
            </wsag:ServiceProperties>
            <!-- GUARANTEE TERMS -->
            <wsag:GuaranteeTerm wsag:Name="GUARANTEE_PERFORMANCE_RESPONSE"
wsag:Obligated="ServiceProvider">
                <wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE" />
                <wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
                <wsag:ServiceLevelObjective>
                    <wsag:CustomServiceLevel>
                        <wsag-ogc:CustomServiceLevel>
                <wsag-ogc:Name>InitialResponseTime</wsag-ogc:Name>
                            <wsag-ogc:Title>Initial Response Time</wsag-ogc:Title>
                            <wsag-ogc:Abstract>The initial response time of the
service is maximum 500 ms.</wsag-ogc:Abstract>
                            <wsag-ogc:Status>ACT_PERFORMANCE_RESPONSE lt
REQ_PERFORMANCE_RESPONSE</wsag-ogc:Status>
                        </wsag-ogc:CustomServiceLevel>
                    </wsag:CustomServiceLevel>
                </wsag:ServiceLevelObjective>
                <wsag:BusinessValueList />
            </wsag:GuaranteeTerm>

            <wsag:GuaranteeTerm wsag:Name="GUARANTEE_AVAILABILITY_DAY"
wsag:Obligated="ServiceProvider">
```

```
                <wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE" />
                <wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
                <wsag:ServiceLevelObjective>
                    <wsag:CustomServiceLevel>
                        <wsag-ogc:CustomServiceLevel>
                <wsag-ogc:Name>AvailabilityDay</wsag-ogc:Name>

                            <wsag-ogc:Title>Availability (Day)</wsag-ogc:Title>
                            <wsag-ogc:Abstract>Text</wsag-ogc:Abstract>
                            <wsag-ogc:Status>ACT_AVAILABILITY_DAY gt
REQ_AVAILABILITY_DAY</wsag-ogc:Status>
                        </wsag-ogc:CustomServiceLevel>
                    </wsag:CustomServiceLevel>
                </wsag:ServiceLevelObjective>
                <wsag:BusinessValueList />
            </wsag:GuaranteeTerm>
            <wsag:GuaranteeTerm wsag:Name="GUARANTEE_AVAILABILITY_WEEK"
wsag:Obligated="ServiceProvider">
                <wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE" />
                <wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
                <wsag:ServiceLevelObjective>
                    <wsag:CustomServiceLevel>
                        <wsag-ogc:CustomServiceLevel>
                <wsag-ogc:Name>AvailabilityWeek</wsag-ogc:Name>

                            <wsag-ogc:Title>Availability (Week)</wsag-ogc:Title>
                            <wsag-ogc:Abstract>Text</wsag-ogc:Abstract>
                            <wsag-ogc:Status>ACT_AVAILABILITY_WEEK gt
REQ_AVAILABILITY_WEEK</wsag-ogc:Status>
                        </wsag-ogc:CustomServiceLevel>
                    </wsag:CustomServiceLevel>
                </wsag:ServiceLevelObjective>
                <wsag:BusinessValueList />
            </wsag:GuaranteeTerm>
            <wsag:GuaranteeTerm wsag:Name="GUARANTEE_AVAILABILITY_MONTH"
wsag:Obligated="ServiceProvider">
                <wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE" />
                <wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
                <wsag:ServiceLevelObjective>
                    <wsag:CustomServiceLevel>
                        <wsag-ogc:CustomServiceLevel>
                <wsag-ogc:Name>AvailabilityMonth</wsag-ogc:Name>

                            <wsag-ogc:Title>Availability (Month)</wsag-ogc:Title>
                            <wsag-ogc:Abstract>Text</wsag-ogc:Abstract>
                            <wsag-ogc:Status>ACT_AVAILABILITY_MONTH gt
REQ_AVAILABILITY_MONTH</wsag-ogc:Status>
                        </wsag-ogc:CustomServiceLevel>
                    </wsag:CustomServiceLevel>
                </wsag:ServiceLevelObjective>
                <wsag:BusinessValueList />
            </wsag:GuaranteeTerm>
            <wsag:GuaranteeTerm wsag:Name="GUARANTEE_AVAILABILITY_YEAR"
wsag:Obligated="ServiceProvider">
                <wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE" />
```

```
                <wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
                <wsag:ServiceLevelObjective>
                    <wsag:CustomServiceLevel>
                        <wsag-ogc:CustomServiceLevel>
                <wsag-ogc:Name>AvailabilityYear</wsag-ogc:Name>

                            <wsag-ogc:Title>Availability (Year)</wsag-ogc:Title>
                            <wsag-ogc:Abstract>Text</wsag-ogc:Abstract>
                            <wsag-ogc:Status>ACT_AVAILABILITY_YEAR gt
REQ_AVAILABILITY_YEAR</wsag-ogc:Status>
                        </wsag-ogc:CustomServiceLevel>
                    </wsag:CustomServiceLevel>
                </wsag:ServiceLevelObjective>
                <wsag:BusinessValueList />
            </wsag:GuaranteeTerm>
        </wsag:All>
    </wsag:Terms>
</wsag:Template>
```

C.2 Example Agreement Offer

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<ws:AgreementOffer xmlns:ws="http://schemas.ggf.org/graap/2007/03/ws-agreement"
ws:AgreementId="cb557edd-9a34-4896-bf6c-6f940d45cfd3">
<wsag:Context xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions">
<wsag:AgreementInitiator>
<wsag-ogc:Contact>
<wsag-ogc:Name>Instititute for Geoinformatics</wsag-ogc:Name>
<wsag-ogc:Site xmlns:xlin="http://www.w3.org/1999/xlink"
xlin:href="http://www.ifgi.de"/>
<wsag-ogc:Contact>
<ows:IndividualName>Kristof Lange</ows:IndividualName>
<ows:PositionName>Student Assistance</ows:PositionName>
<ows:ContactInfo>
<ows:Phone>
<ows:Voice>+49 251 833307</ows:Voice>
<ows:Facsimile>+49 251 8339763</ows:Facsimile>
</ows:Phone>
<ows:Address>
<ows:DeliveryPoint>Weseler Strasse 253</ows:DeliveryPoint>
<ows:City>Muenster</ows:City>
<ows:PostalCode>48151</ows:PostalCode>
<ows:Country>Germany</ows:Country>
<ows:ElectronicMailAddress>kristof.lange@uni-
muenster.de</ows:ElectronicMailAddress>
</ows:Address>
<ows:OnlineResource xmlns:xlin="http://www.w3.org/1999/xlink"
xlin:href="http://www.ifgi.de"/>
</ows:ContactInfo>
</wsag-ogc:Contact>
</wsag-ogc:Contact>
</wsag:AgreementInitiator>
<wsag:ServiceProvider>AgreementResponder</wsag:ServiceProvider>
<!-- SERVICE PROVIDER INFORMATION -->
<wsag:AgreementResponder>
```

```
<wsag-ogc:Contact>
<wsag-ogc:Name>Institute for Geoinformatics</wsag-ogc:Name>
<wsag-ogc:Site xmlns:xlin="http://www.w3.org/1999/xlink"
xlin:href="http://www.ifgi.de"/>
<wsag-ogc:Contact>
<ows:IndividualName>Bastian Baranski</ows:IndividualName>
<ows:PositionName>Research Associate</ows:PositionName>
<ows:ContactInfo>
<ows:Phone>
<ows:Voice>+49 251 8333071</ows:Voice>
<ows:Facsimile>+49 251 8339763</ows:Facsimile>
</ows:Phone>
<ows:Address>
<ows:DeliveryPoint>Weseler Strasse 253</ows:DeliveryPoint>
<ows:City>Muenster</ows:City>
<ows:PostalCode>48151</ows:PostalCode>
<ows:Country>Germany</ows:Country>
<ows:ElectronicMailAddress>bastian.baranski@uni-
muenster.de</ows:ElectronicMailAddress>
</ows:Address>
<ows:HoursOfService>The hours of service are Monday to Friday from 8 AM to 16
PM.</ows:HoursOfService>
<ows:ContactInstructions>Please contact the service desk via phone or
mail.</ows:ContactInstructions>
</ows:ContactInfo>
</wsag-ogc:Contact>
</wsag-ogc:Contact>
</wsag:AgreementResponder>
<wsag:TemplateId>WSAG_DEFAULT_TEMPLATE_5</wsag:TemplateId>
<wsag:TemplateName>INSPIRE_COORDINATE_TRANSFORMATION_SERVICE_TEMPLATE</wsag:Tem
plateName>
</wsag:Context>
<ws:Terms>
<ws:All>
<wsag:ServiceDescriptionTerm xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions"
wsag:Name="SERVICE_DESCRIPTION_SDT"
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE">
<wsag-ogc:ServiceDescription>
<wsag-ogc:Title>INSPIRE Coordinate Transformation Service</wsag-ogc:Title>
<wsag-ogc:Abstract>This WPS instance is an implementation of the INSPIRE
Coordinate Transformation Service specification.</wsag-ogc:Abstract>
<wsag-ogc:Keywords>OGC, WPS, INSPIRE Coordinate Transformation Service</wsag-
ogc:Keywords>
<wsag-ogc:Type>urn:ogc:wps:1.0.0:INSPIRE:TransformCoordinates:1.0</wsag-
ogc:Type>
<wsag-ogc:Profile/>
<wsag-ogc:WSDL/>
</wsag-ogc:ServiceDescription>
</wsag:ServiceDescriptionTerm>
<wsag:ServiceDescriptionTerm xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions"
```

```
wsag:Name="SERVICE_PROPERTIES_SDT"
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE">
<wsag-ogc:ServiceProperties>
<wsag-ogc:Property>
<wsag-ogc:Name>ResponseTime</wsag-ogc:Name>
<wsag-ogc:Title>Initial Response Time</wsag-ogc:Title>
<wsag-ogc:Abstract>The initial response time of the service.</wsag-
ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:runtime:performance:response</wsag-ogc:Type>
<wsag-ogc:Value>5000</wsag-ogc:Value>
</wsag-ogc:Property>
<wsag-ogc:Property>
<wsag-ogc:Name>AvailabilityPerDay</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Day)</wsag-ogc:Title>
<wsag-ogc:Abstract>The general availability of the service per day.</wsag-
ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:runtime:availability:day</wsag-ogc:Type>
<wsag-ogc:Value>96</wsag-ogc:Value>
</wsag-ogc:Property>
<wsag-ogc:Property>
<wsag-ogc:Name>AvailabilityPerWeek</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Week)</wsag-ogc:Title>
<wsag-ogc:Abstract>The general availability of the service per week.</wsag-
ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:runtime:availability:week</wsag-ogc:Type>
<wsag-ogc:Value>98</wsag-ogc:Value>
</wsag-ogc:Property>
<wsag-ogc:Property>
<wsag-ogc:Name>AvailabilityPerMonth</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Month)</wsag-ogc:Title>
<wsag-ogc:Abstract>The general availability of the service per month.</wsag-
ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:runtime:availability:month</wsag-ogc:Type>
<wsag-ogc:Value>99</wsag-ogc:Value>
</wsag-ogc:Property>
<wsag-ogc:Property>
<wsag-ogc:Name>AvailabilityPerYear</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Year)</wsag-ogc:Title>
<wsag-ogc:Abstract>The general availability of the service per year.</wsag-
ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:runtime:availability:year</wsag-ogc:Type>
<wsag-ogc:Value>99</wsag-ogc:Value>
</wsag-ogc:Property>
<wsag-ogc:Property>
<wsag-ogc:Name>CpuCores</wsag-ogc:Name>
<wsag-ogc:Title>Number of CPUs</wsag-ogc:Title>
<wsag-ogc:Abstract>The number of CPU cores.</wsag-ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:infrastructure:compute:cores</wsag-ogc:Type>
<wsag-ogc:Value>4</wsag-ogc:Value>
</wsag-ogc:Property>
</wsag-ogc:ServiceProperties>
</wsag:ServiceDescriptionTerm>
<ws:ServiceDescriptionTerm ws:Name="TIME_CONSTRAINT_SDT"
ws:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE">
<wsag:TimeConstraint xmlns:wsag="http://schemas.wsag4j.org/2009/07/wsag4j-
scheduling-extensions">
<wsag:StartTime>2011-05-27T11:00:00</wsag:StartTime>
<wsag:EndTime>2011-09-27T11:00:00</wsag:EndTime>
</wsag:TimeConstraint>
</ws:ServiceDescriptionTerm>
<wsag:ServiceProperties xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
```

```
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions"
wsag:Name="SERVICE_PROPERTIES"
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE">
<wsag:VariableSet>
<wsag:Variable wsag:Name="REQ_PERFORMANCE_RESPONSE" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:performance:response']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="REQ_AVAILABILITY_DAY" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:day']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="REQ_AVAILABILITY_WEEK" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:week']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="REQ_AVAILABILITY_MONTH" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:month']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="REQ_AVAILABILITY_YEAR" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:year']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="REC_COMPUTE_CORES" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
```

```
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:infrastructure:compute:cores']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="ACT_PERFORMANCE_RESPONSE" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:performance:response']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="ACT_AVAILABILITY_DAY" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:day']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="ACT_AVAILABILITY_WEEK" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:week']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="ACT_AVAILABILITY_MONTH" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:month']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="ACT_AVAILABILITY_YEAR" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:year']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
</wsag:VariableSet>
</wsag:ServiceProperties>
<wsag:ServiceReference xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
```

```
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions"
wsag:Name="SERVICE_REFERENCE"
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE">
<wsag-ogc:ServiceReference>
<wsag-ogc:URI>http://localhost:8088/sla-proxy/helloworld</wsag-ogc:URI>
</wsag-ogc:ServiceReference>
</wsag:ServiceReference>
<wsag:GuaranteeTerm xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions"
wsag:Name="GUARANTEE_PERFORMANCE_RESPONSE" wsag:Obligated="ServiceProvider">
<wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE"/>
<wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
<wsag:ServiceLevelObjective>
<wsag:CustomServiceLevel>
<wsag-ogc:CustomServiceLevel>
<wsag-ogc:Name>InitialResponseTime</wsag-ogc:Name>
<wsag-ogc:Title>Initial Response Time</wsag-ogc:Title>
<wsag-ogc:Abstract>The initial response time of the service is maximum 500
ms.</wsag-ogc:Abstract>
<wsag-ogc:Status>ACT_PERFORMANCE_RESPONSE lt REQ_PERFORMANCE_RESPONSE</wsag-
ogc:Status>
</wsag-ogc:CustomServiceLevel>
</wsag:CustomServiceLevel>
</wsag:ServiceLevelObjective>
<wsag:BusinessValueList/>
</wsag:GuaranteeTerm>
<wsag:GuaranteeTerm xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions"
wsag:Name="GUARANTEE_AVAILABILITY_DAY" wsag:Obligated="ServiceProvider">
<wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE"/>
<wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
<wsag:ServiceLevelObjective>
<wsag:CustomServiceLevel>
<wsag-ogc:CustomServiceLevel>
<wsag-ogc:Name>AvailabilityDay</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Day)</wsag-ogc:Title>
<wsag-ogc:Abstract>Text</wsag-ogc:Abstract>
<wsag-ogc:Status>ACT_AVAILABILITY_DAY gt REQ_AVAILABILITY_DAY</wsag-ogc:Status>
</wsag-ogc:CustomServiceLevel>
</wsag:CustomServiceLevel>
</wsag:ServiceLevelObjective>
<wsag:BusinessValueList/>
</wsag:GuaranteeTerm>
<wsag:GuaranteeTerm xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
```

```
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions"
wsag:Name="GUARANTEE_AVAILABILITY_WEEK" wsag:Obligated="ServiceProvider">
<wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE"/>
<wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
<wsag:ServiceLevelObjective>
<wsag:CustomServiceLevel>
<wsag-ogc:CustomServiceLevel>
<wsag-ogc:Name>AvailabilityWeek</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Week)</wsag-ogc:Title>
<wsag-ogc:Abstract>Text</wsag-ogc:Abstract>
<wsag-ogc:Status>ACT_AVAILABILITY_WEEK gt REQ_AVAILABILITY_WEEK</wsag-
ogc:Status>
</wsag-ogc:CustomServiceLevel>
</wsag:CustomServiceLevel>
</wsag:ServiceLevelObjective>
<wsag:BusinessValueList/>
</wsag:GuaranteeTerm>
<wsag:GuaranteeTerm xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions"
wsag:Name="GUARANTEE_AVAILABILITY_MONTH" wsag:Obligated="ServiceProvider">
<wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE"/>
<wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
<wsag:ServiceLevelObjective>
<wsag:CustomServiceLevel>
<wsag-ogc:CustomServiceLevel>
<wsag-ogc:Name>AvailabilityMonth</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Month)</wsag-ogc:Title>
<wsag-ogc:Abstract>Text</wsag-ogc:Abstract>
<wsag-ogc:Status>ACT_AVAILABILITY_MONTH gt REQ_AVAILABILITY_MONTH</wsag-
ogc:Status>
</wsag-ogc:CustomServiceLevel>
</wsag:CustomServiceLevel>
</wsag:ServiceLevelObjective>
<wsag:BusinessValueList/>
</wsag:GuaranteeTerm>
<wsag:GuaranteeTerm xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions"
wsag:Name="GUARANTEE_AVAILABILITY_YEAR" wsag:Obligated="ServiceProvider">
<wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE"/>
<wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
<wsag:ServiceLevelObjective>
<wsag:CustomServiceLevel>
<wsag-ogc:CustomServiceLevel>
<wsag-ogc:Name>AvailabilityYear</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Year)</wsag-ogc:Title>
<wsag-ogc:Abstract>Text</wsag-ogc:Abstract>
```

```
<wsag-ogc:Status>ACT_AVAILABILITY_YEAR gt REQ_AVAILABILITY_YEAR</wsag-
ogc:Status>
</wsag-ogc:CustomServiceLevel>
</wsag:CustomServiceLevel>
</wsag:ServiceLevelObjective>
<wsag:BusinessValueList/>
</wsag:GuaranteeTerm>
</ws:All>
</ws:Terms>
</ws:AgreementOffer>
```

C.3 Example Agreement Properties

```
<ws:AgreementProperties xmlns:ws="http://schemas.ggf.org/graap/2007/03/ws-
agreement">
<ws:Name xsi:nil="true" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"/>
<ws:AgreementId>6ba3e981-1eda-48ee-9891-629dad45cc2c</ws:AgreementId>
<wsag:Context xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions">
<wsag:AgreementInitiator>
<wsag-ogc:Contact>
<wsag-ogc:Name>Instititute for Geoinformatics</wsag-ogc:Name>
<wsag-ogc:Site xlin:href="http://www.ifgi.de"
xmlns:xlin="http://www.w3.org/1999/xlink"/>
<wsag-ogc:Contact>
<ows:IndividualName>Kristof Lange</ows:IndividualName>
<ows:PositionName>Student Assistance</ows:PositionName>
<ows:ContactInfo>
<ows:Phone>
<ows:Voice>+49 251 833307</ows:Voice>
<ows:Facsimile>+49 251 8339763</ows:Facsimile>
</ows:Phone>
<ows:Address>
<ows:DeliveryPoint>Weseler Strasse 253</ows:DeliveryPoint>
<ows:City>Muenster</ows:City>
<ows:PostalCode>48151</ows:PostalCode>
<ows:Country>Germany</ows:Country>
<ows:ElectronicMailAddress>kristof.lange@uni-
muenster.de</ows:ElectronicMailAddress>
</ows:Address>
<ows:OnlineResource xlin:href="http://www.ifgi.de"
xmlns:xlin="http://www.w3.org/1999/xlink"/>
</ows:ContactInfo>
</wsag-ogc:Contact>
</wsag-ogc:Contact>
</wsag:AgreementInitiator>
<wsag:ServiceProvider>AgreementResponder</wsag:ServiceProvider>
<!--SERVICE PROVIDER INFORMATION-->
<wsag:AgreementResponder>
<wsag-ogc:Contact>
<wsag-ogc:Name>Institute for Geoinformatics</wsag-ogc:Name>
<wsag-ogc:Site xlin:href="http://www.ifgi.de"
xmlns:xlin="http://www.w3.org/1999/xlink"/>
<wsag-ogc:Contact>
<ows:IndividualName>Bastian Baranski</ows:IndividualName>
<ows:PositionName>Research Associate</ows:PositionName>
```

```
<ows:ContactInfo>
<ows:Phone>
<ows:Voice>+49 251 8333071</ows:Voice>
<ows:Facsimile>+49 251 8339763</ows:Facsimile>
</ows:Phone>
<ows:Address>
<ows:DeliveryPoint>Weseler Strasse 253</ows:DeliveryPoint>
<ows:City>Muenster</ows:City>
<ows:PostalCode>48151</ows:PostalCode>
<ows:Country>Germany</ows:Country>
<ows:ElectronicMailAddress>bastian.baranski@uni-
muenster.de</ows:ElectronicMailAddress>
</ows:Address>
<ows:HoursOfService>The hours of service are Monday to Friday from 8 AM to 16
PM.</ows:HoursOfService>
<ows:ContactInstructions>Please contact the service desk via phone or
mail.</ows:ContactInstructions>
</ows:ContactInfo>
</wsag-ogc:Contact>
</wsag-ogc:Contact>
</wsag:AgreementResponder>
<wsag:TemplateId>WSAG_DEFAULT_TEMPLATE_5</wsag:TemplateId>
<wsag:TemplateName>INSPIRE_COORDINATE_TRANSFORMATION_SERVICE_TEMPLATE</wsag:Tem
plateName>
</wsag:Context>
<ws:Terms>
<ws:All>
<wsag:ServiceDescriptionTerm wsag:Name="SERVICE_DESCRIPTION_SDT"
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE"
xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions">
<wsag-ogc:ServiceDescription>
<wsag-ogc:Title>INSPIRE Coordinate Transformation Service</wsag-ogc:Title>
<wsag-ogc:Abstract>This WPS instance is an implementation of the INSPIRE
Coordinate Transformation Service specification.</wsag-ogc:Abstract>
<wsag-ogc:Keywords>OGC, WPS, INSPIRE Coordinate Transformation Service</wsag-
ogc:Keywords>
<wsag-ogc:Type>urn:ogc:wps:1.0.0:INSPIRE:TransformCoordinates:1.0</wsag-
ogc:Type>
<wsag-ogc:Profile/>
<wsag-ogc:WSDL/>
</wsag-ogc:ServiceDescription>
</wsag:ServiceDescriptionTerm>
<wsag:ServiceDescriptionTerm wsag:Name="SERVICE_PROPERTIES_SDT"
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE"
xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions">
<wsag-ogc:ServiceProperties>
<wsag-ogc:Property>
<wsag-ogc:Name>ResponseTime</wsag-ogc:Name>
<wsag-ogc:Title>Initial Response Time</wsag-ogc:Title>
<wsag-ogc:Abstract>The initial response time of the service.</wsag-
ogc:Abstract>
```

```
<wsag-ogc:Type>urn:ogc:def:sla:runtime:performance:response</wsag-ogc:Type>
<wsag-ogc:Value>5000</wsag-ogc:Value>
</wsag-ogc:Property>
<wsag-ogc:Property>
<wsag-ogc:Name>AvailabilityPerDay</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Day)</wsag-ogc:Title>
<wsag-ogc:Abstract>The general availability of the service per day.</wsag-
ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:runtime:availability:day</wsag-ogc:Type>
<wsag-ogc:Value>96</wsag-ogc:Value>
</wsag-ogc:Property>
<wsag-ogc:Property>
<wsag-ogc:Name>AvailabilityPerWeek</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Week)</wsag-ogc:Title>
<wsag-ogc:Abstract>The general availability of the service per week.</wsag-
ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:runtime:availability:week</wsag-ogc:Type>
<wsag-ogc:Value>98</wsag-ogc:Value>
</wsag-ogc:Property>
<wsag-ogc:Property>
<wsag-ogc:Name>AvailabilityPerMonth</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Month)</wsag-ogc:Title>
<wsag-ogc:Abstract>The general availability of the service per month.</wsag-
ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:runtime:availability:month</wsag-ogc:Type>
<wsag-ogc:Value>99</wsag-ogc:Value>
</wsag-ogc:Property>
<wsag-ogc:Property>
<wsag-ogc:Name>AvailabilityPerYear</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Year)</wsag-ogc:Title>
<wsag-ogc:Abstract>The general availability of the service per year.</wsag-
ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:runtime:availability:year</wsag-ogc:Type>
<wsag-ogc:Value>99</wsag-ogc:Value>
</wsag-ogc:Property>
<wsag-ogc:Property>
<wsag-ogc:Name>CpuCores</wsag-ogc:Name>
<wsag-ogc:Title>Number of CPUs</wsag-ogc:Title>
<wsag-ogc:Abstract>The number of CPU cores.</wsag-ogc:Abstract>
<wsag-ogc:Type>urn:ogc:def:sla:infrastructure:compute:cores</wsag-ogc:Type>
<wsag-ogc:Value>4</wsag-ogc:Value>
</wsag-ogc:Property>
</wsag-ogc:ServiceProperties>
</wsag:ServiceDescriptionTerm>
<ws:ServiceDescriptionTerm ws:Name="TIME_CONSTRAINT_SDT"
ws:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE">
<wsag:TimeConstraint xmlns:wsag="http://schemas.wsag4j.org/2009/07/wsag4j-
scheduling-extensions">
<wsag:StartTime>2011-05-27T11:00:00</wsag:StartTime>
<wsag:EndTime>2011-09-27T11:00:00</wsag:EndTime>
</wsag:TimeConstraint>
</ws:ServiceDescriptionTerm>
<wsag:ServiceProperties wsag:Name="SERVICE_PROPERTIES"
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE"
xmlns:wsrf="http://docs.oasis-open.org/wsrf/bf-2"
xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-agreement"
xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions">
<wsag:VariableSet>
```

```
<wsag:Variable wsag:Name="REQ_PERFORMANCE_RESPONSE" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:performance:response']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="REQ_AVAILABILITY_DAY" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:day']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="REQ_AVAILABILITY_WEEK" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:week']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="REQ_AVAILABILITY_MONTH" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:month']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="REQ_AVAILABILITY_YEAR" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:year']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="REC_COMPUTE_CORES" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:Terms/ws:All/wsag:ServiceDescriptionTerm/
wsag-ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:infrastructure:compute:cores']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="ACT_PERFORMANCE_RESPONSE" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
```

```
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:performance:response']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="ACT_AVAILABILITY_DAY" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:day']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="ACT_AVAILABILITY_WEEK" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:week']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="ACT_AVAILABILITY_MONTH" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:month']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
<wsag:Variable wsag:Name="ACT_AVAILABILITY_YEAR" wsag:Metric="xs:integer">
<wsag:Location>declare namespace ws='http://schemas.ggf.org/graap/2007/03/ws-
agreement';declare namespace wsag-
ogc='http://www.ifgi.org/namespaces/wsag/ogc';declare namespace
wsag='http://schemas.ggf.org/graap/2007/03/ws-
agreement';/ws:AgreementProperties/ws:ServiceTermState/wsag-
ogc:ServiceProperties/wsag-ogc:Property[./wsag-
ogc:Type/text()='urn:ogc:def:sla:runtime:availability:year']/wsag-
ogc:Value/text()</wsag:Location>
</wsag:Variable>
</wsag:VariableSet>
</wsag:ServiceProperties>
<ws:ServiceReference>
<wsag-ogc:ServiceReference xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc">
<wsag-ogc:URI>http://localhost:8088/sla-proxy/helloworld/6ba3e981-1eda-48ee-
9891-629dad45cc2c</wsag-ogc:URI>
</wsag-ogc:ServiceReference>
</ws:ServiceReference>
<wsag:GuaranteeTerm wsag:Name="GUARANTEE_PERFORMANCE_RESPONSE"
wsag:Obligated="ServiceProvider" xmlns:wsrf="http://docs.oasis-
open.org/wsrf/bf-2" xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-
agreement" xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
```

```
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions">
<wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE"/>
<wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
<wsag:ServiceLevelObjective>
<wsag:CustomServiceLevel>
<wsag-ogc:CustomServiceLevel>
<wsag-ogc:Name>InitialResponseTime</wsag-ogc:Name>
<wsag-ogc:Title>Initial Response Time</wsag-ogc:Title>
<wsag-ogc:Abstract>The initial response time of the service is maximum 500
ms.</wsag-ogc:Abstract>
<wsag-ogc:Status>ACT_PERFORMANCE_RESPONSE lt REQ_PERFORMANCE_RESPONSE</wsag-
ogc:Status>
</wsag-ogc:CustomServiceLevel>
</wsag:CustomServiceLevel>
</wsag:ServiceLevelObjective>
<wsag:BusinessValueList/>
</wsag:GuaranteeTerm>
<wsag:GuaranteeTerm wsag:Name="GUARANTEE_AVAILABILITY_DAY"
wsag:Obligated="ServiceProvider" xmlns:wsrf="http://docs.oasis-
open.org/wsrf/bf-2" xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-
agreement" xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions">
<wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE"/>
<wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
<wsag:ServiceLevelObjective>
<wsag:CustomServiceLevel>
<wsag-ogc:CustomServiceLevel>
<wsag-ogc:Name>AvailabilityDay</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Day)</wsag-ogc:Title>
<wsag-ogc:Abstract>Text</wsag-ogc:Abstract>
<wsag-ogc:Status>ACT_AVAILABILITY_DAY gt REQ_AVAILABILITY_DAY</wsag-ogc:Status>
</wsag-ogc:CustomServiceLevel>
</wsag:CustomServiceLevel>
</wsag:ServiceLevelObjective>
<wsag:BusinessValueList/>
</wsag:GuaranteeTerm>
<wsag:GuaranteeTerm wsag:Name="GUARANTEE_AVAILABILITY_WEEK"
wsag:Obligated="ServiceProvider" xmlns:wsrf="http://docs.oasis-
open.org/wsrf/bf-2" xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-
agreement" xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions">
<wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE"/>
<wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
<wsag:ServiceLevelObjective>
<wsag:CustomServiceLevel>
<wsag-ogc:CustomServiceLevel>
<wsag-ogc:Name>AvailabilityWeek</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Week)</wsag-ogc:Title>
<wsag-ogc:Abstract>Text</wsag-ogc:Abstract>
```

```
<wsag-ogc:Status>ACT_AVAILABILITY_WEEK gt REQ_AVAILABILITY_WEEK</wsag-
ogc:Status>
</wsag-ogc:CustomServiceLevel>
</wsag:CustomServiceLevel>
</wsag:ServiceLevelObjective>
<wsag:BusinessValueList/>
</wsag:GuaranteeTerm>
<wsag:GuaranteeTerm wsag:Name="GUARANTEE_AVAILABILITY_MONTH"
wsag:Obligated="ServiceProvider" xmlns:wsrf="http://docs.oasis-
open.org/wsrf/bf-2" xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-
agreement" xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions">
<wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE"/>
<wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
<wsag:ServiceLevelObjective>
<wsag:CustomServiceLevel>
<wsag-ogc:CustomServiceLevel>
<wsag-ogc:Name>AvailabilityMonth</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Month)</wsag-ogc:Title>
<wsag-ogc:Abstract>Text</wsag-ogc:Abstract>
<wsag-ogc:Status>ACT_AVAILABILITY_MONTH gt REQ_AVAILABILITY_MONTH</wsag-
ogc:Status>
</wsag-ogc:CustomServiceLevel>
</wsag:CustomServiceLevel>
</wsag:ServiceLevelObjective>
<wsag:BusinessValueList/>
</wsag:GuaranteeTerm>
<wsag:GuaranteeTerm wsag:Name="GUARANTEE_AVAILABILITY_YEAR"
wsag:Obligated="ServiceProvider" xmlns:wsrf="http://docs.oasis-
open.org/wsrf/bf-2" xmlns:wsag="http://schemas.ggf.org/graap/2007/03/ws-
agreement" xmlns:ows="http://www.opengis.net/ows/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:wsag-
ogc="http://www.ifgi.org/namespaces/wsag/ogc"
xmlns:addressing="http://www.w3.org/2005/08/addressing" xmlns:res-
sla="http://schemas.wsag4j.org/2009/07/wsag4j-scheduling-extensions">
<wsag:ServiceScope
wsag:ServiceName="INSPIRE_COORDINATE_TRANSFORMATION_SERVICE"/>
<wsag:QualifyingCondition>SERVICE_PROPERTIES_STATE eq
'Ready'</wsag:QualifyingCondition>
<wsag:ServiceLevelObjective>
<wsag:CustomServiceLevel>
<wsag-ogc:CustomServiceLevel>
<wsag-ogc:Name>AvailabilityYear</wsag-ogc:Name>
<wsag-ogc:Title>Availability (Year)</wsag-ogc:Title>
<wsag-ogc:Abstract>Text</wsag-ogc:Abstract>
<wsag-ogc:Status>ACT_AVAILABILITY_YEAR gt REQ_AVAILABILITY_YEAR</wsag-
ogc:Status>
</wsag-ogc:CustomServiceLevel>
</wsag:CustomServiceLevel>
</wsag:ServiceLevelObjective>
<wsag:BusinessValueList/>
</wsag:GuaranteeTerm>
</ws:All>
</ws:Terms>
<ws:AgreementState>
<ws:State>Observed</ws:State>
</ws:AgreementState>
```

```
<ws:ServiceTermState ws:termName="SERVICE_DESCRIPTION_SDT">
<ws:State>Ready</ws:State>
</ws:ServiceTermState>
<ws:ServiceTermState ws:termName="SERVICE_PROPERTIES_SDT">
<ws:State>Ready</ws:State>
<ogc:ServiceProperties xmlns:ogc="http://www.ifgi.org/namespaces/wsag/ogc">
<ogc:Property>
<ogc:Name>ResponseTime</ogc:Name>
<ogc:Title>Initial Response Time</ogc:Title>
<ogc:Abstract>The initial response time of the service.</ogc:Abstract>
<ogc:Type>urn:ogc:def:sla:runtime:performance:response</ogc:Type>
<ogc:Value>76</ogc:Value>
</ogc:Property>
<ogc:Property>
<ogc:Name>[Monitor] Availability</ogc:Name>
<ogc:Title>Text</ogc:Title>
<ogc:Abstract>Text</ogc:Abstract>
<ogc:Type>urn:ogc:def:sla:runtime:availability</ogc:Type>
<ogc:Value>true</ogc:Value>
</ogc:Property>
<ogc:Property>
<ogc:Name>AvailabilityPerDay</ogc:Name>
<ogc:Title>Availability (Day)</ogc:Title>
<ogc:Abstract>The general availability of the service per day.</ogc:Abstract>
<ogc:Type>urn:ogc:def:sla:runtime:availability:day</ogc:Type>
<ogc:Value>0</ogc:Value>
</ogc:Property>
<ogc:Property>
<ogc:Name>AvailabilityPerWeek</ogc:Name>
<ogc:Title>Availability (Week)</ogc:Title>
<ogc:Abstract>The general availability of the service per week.</ogc:Abstract>
<ogc:Type>urn:ogc:def:sla:runtime:availability:week</ogc:Type>
<ogc:Value>0</ogc:Value>
</ogc:Property>
<ogc:Property>
<ogc:Name>AvailabilityPerMonth</ogc:Name>
<ogc:Title>Availability (Month)</ogc:Title>
<ogc:Abstract>The general availability of the service per month.</ogc:Abstract>
<ogc:Type>urn:ogc:def:sla:runtime:availability:month</ogc:Type>
<ogc:Value>0</ogc:Value>
</ogc:Property>
<ogc:Property>
<ogc:Name>AvailabilityPerYear</ogc:Name>
<ogc:Title>Availability (Year)</ogc:Title>
<ogc:Abstract>The general availability of the service per year.</ogc:Abstract>
<ogc:Type>urn:ogc:def:sla:runtime:availability:year</ogc:Type>
<ogc:Value>0</ogc:Value>
</ogc:Property>
</ogc:ServiceProperties>
</ws:ServiceTermState>
<ws:ServiceTermState ws:termName="TIME_CONSTRAINT_SDT">
<ws:State>Ready</ws:State>
</ws:ServiceTermState>
<ws:GuaranteeTermState ws:termName="GUARANTEE_PERFORMANCE_RESPONSE">
<ws:State>Fulfilled</ws:State>
</ws:GuaranteeTermState>
<ws:GuaranteeTermState ws:termName="GUARANTEE_AVAILABILITY_DAY">
<ws:State>Violated</ws:State>
</ws:GuaranteeTermState>
<ws:GuaranteeTermState ws:termName="GUARANTEE_AVAILABILITY_WEEK">
<ws:State>Violated</ws:State>
</ws:GuaranteeTermState>
<ws:GuaranteeTermState ws:termName="GUARANTEE_AVAILABILITY_MONTH">
```

```
<ws:State>Violated</ws:State>
</ws:GuaranteeTermState>
<ws:GuaranteeTermState ws:termName="GUARANTEE_AVAILABILITY_YEAR">
<ws:State>Violated</ws:State>
</ws:GuaranteeTermState>
</ws:AgreementProperties>
```

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