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Integration of Service Level Agreements (SLA) in Spatial Data Infrastructures (SDI)

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With the advent of the Service-oriented architecture (SOA) paradigm [1] and general advancements in Web Services technology, the geoinformation (GI) world underwent a substantial change from standalone applications to distributed service architectures manifested in Spatial Data Infrastructures (SDI) [2]. Existing SDIs are mainly focused on data retrieval, data visualization and data processing [3]. An open standard based – for example an Open Geospatial Consortium (OGC) based - SDI mostly supports the retrieval, visualization and processing of data through web services. The availability of OGC Web Services (OWS) rapidly grew for the last decade and they'll play a major role in emerging e-commerce models.

Monitoring the performance of loosely coupled web services in a distributed infrastructure and the ability to react quickly on service quality fluctuations is an essential skill for service consumers and service providers. On this account, typically a formal contract between a service consumer and a service provider - the Service Level Agreement (SLA) – will be negotiated. The SLA formalizes a business relationship and enables contractual parties to measure, manage and enforce certain Quality of Service (QoS) guarantees. Quality of Service (QoS) is defined by the International Telecommunications Union (ITU-T) as "the collective effect of service performances, which determine the degree of satisfaction of a user of the service" [4] and it "is characterized by the combined aspects of service support performance, service operability performance, service integrity and other factors specific to each service" [5]. A SLA consists of several distinct parts. The context part contains general information such as the contractual parties and the lifetime of an agreement. The service part contains domain-specific information about the services to which an agreement is related and a set of domain- specific measurable and exposed properties associated with these services. The guarantee part references to the measurable characteristics described in the service part and specifies the service quality goals that the parties are agreeing. The guarantee part also defines the consequences of not meeting the stipulated service quality goals. Each violation of a guarantee term may cause for example a certain penalty. To establish such agreements between two parties in a SOA, a common protocol is required. The WS-Agreement Specification [6] is such a protocol and is used in large parts of the presented work.

With respect to the thoughts about emerging e-commerce models and the resulting requirements on SDI, you have to notice that existing OWS specifications and standards do not support any kind of license, agreement or service quality enforcement functionality and therefore, attaching SLA functionality to OWS will pose a great advancement for future business models. Particularly with regard to the upcoming Infrastructure for Spatial Information in the European Community (INSPIRE) directive, in which several performance criteria requirements for network services are defined.

The first part of the presentation will illustrate an abstract architecture in which different service qualities (QoS) in a Spatial Data Infrastructure (SDI) can be measured and managed by attaching Service Level Agreement (SLA) functionality to existing OGC Web Services (OWS). The presented approach is developed with respect to existing ambitious efforts on attaching license enforcement functionality to OWS and without replacing any previous OGC specification. Furthermore, the application of Grid Computing and related technologies for active enforcement of negotiated service quality goals will be investigated.

The second part of the presentation will demonstrate the relevance of this work in two real-world scenar-

ios. The first scenario focuses on data retrieval under an commercial management point of view. The second scenario focuses on data processing in an emergency situation.

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