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OGC® OWS-6 SWE PulseNet™ Engineering Report

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Preface

This document summarizes the work done by Northrop Grumman with the PulseNet™ product on the SWE thread of OWS-6 in 2008-09.

Forward

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This document summarizes the work done by Northrop Grumman with the PulseNet™ product on the SWE thread of OWS-6 in 2008-09.

OWS-6 Testbed

OWS testbeds are part of OGC's Interoperability Program, a global, hands-on and collaborative prototyping program designed to rapidly develop, test and deliver Engineering Reports and Chnage Requests into the OGC Specification Program, where they are formalized for public release. In OGC's Interoperability Initiatives, international teams of technology providers work together to solve specific geoprocessing interoperability problems posed by the Initiative's sponsoring organizations. OGC Interoperability Initiatives include test beds, pilot projects, interoperability experiments and interoperability support services - all designed to encourage rapid development, testing, validation and adoption of OGC standards.

In April 2008, the OGC issued a call for sponsors for an OGC Web Services, Phase 6 (OWS-6) Testbed activity. The activity completed in June 2009. There is a series of on-line demonstrations available here: http://www.opengeospatial.org/pub/www/ows6/index.html The OWS-6 sponsors are organizations seeking open standards for their interoperability requirements. After analyzing their requirements, the OGC Interoperability Team recommended to the sponsors that the content of the OWS-6 initiative be organized around the following threads:

1. Sensor Web Enablement (SWE)
2. Geo Processing Workflow (GPW)
3. Aeronautical Information Management (AIM)
4. Decision Support Services (DSS)
5. Compliance Testing (CITE)

The OWS-6 sponsoring organizations were:

- U.S. National Geospatial-Intelligence Agency (NGA)
- Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD)
- GeoConnections - Natural Resources Canada
- U.S. Federal Aviation Agency (FAA)
- EUROCONTROL
- EADS Defence and Communications Systems
- US Geological Survey
- Lockheed Martin

- BAE Systems
- ERDAS, Inc.

The OWS-6 participating organizations were:
52North, AM Consult, Carbon Project, Charles Roswell, Compusult, con terra, CubeWerx, ESRI, FedEx, Galdos, Geomatys, GIS.FCU, Taiwan, GMU CSISS, Hitachi Ltd., Hitachi Advanced Systems Corp, Hitachi Software Engineering Co., Ltd., iGSI, GmbH, interactive instruments, lat/lon, GmbH, LISAsoft, Luciad, Lufthansa, NOAA MDL, Northrop Grumman TASC, OSS Nokalva, PCAvionics, Snowflake, Spot Image/ESA/Spacebel, STFC, UK, UAB CREAF, Univ Bonn Karto, Univ Bonn IGG, Univ Bunderswehr, Univ Muenster IfGI, Vightel, Yumetech.

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OGC® OWS-6 SWE PulseNet™ Engineering Report

1 Introduction

1.1 Scope

This OGC® document summarizes work delivered on the Sensor Web Enablement (SWE) thread of OWS-6. In particular, Northrop Grumman's contribution from PulseNet™ to the Common Chemical, Biological, Radiological, and Nuclear (CBRN) Sensor Interface (CCSI) standard-compliant sensors into an OGC SWE-based architecture.

1.2 Document contributor contact points

All questions regarding this document should be directed to the editor or the contributors:

Name	Organization
James Ressler	Northrop Grumman Information Systems, TASC
Scott Fairgrieve	Northrop Grumman Information Systems, TASC

1.3 Revision history

Date	Release	Editor	Primary clauses modified	Description
5/27/2009	0.1	James Ressler	All new	Draft document
6/05/2009	1.0	James Ressler	title	Final Version
7/29/2009	0.3.0	Carl Reed	Various	Prepare for publication

1.4 Future work

Improvements in this document are desirable to more completely document work completed in OWS-6/SWE thread.

2 References

The following documents are referenced in this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

OGC 09-007, *OGC® OWS-6 Common CBRN Sensor Interface (CCSI)-Sensor Web Enablement (SWE) Engineering Report*

OGC 06-121r3, *OpenGIS® Web Services Common Specification*

NOTE This OWS Common Specification contains a list of normative references that are also applicable to this Implementation Specification.

OGC 07-092r1, *Definition identifier URNs in OGC Namespace*

OGC 06-021r4, *OpenGIS® Sensor Web Enablement Architecture*

OGC 07-000, *OpenGIS® Sensor Model Language (SensorML)*

OGC 07-122r2, *OpenGIS® SensorML Encoding Standard v 1.0 Schema Corregendum 1 (1.01)*

OGC 06-009r6, *OpenGIS® Sensor Observation Service*

OGC 07-014r3, *OpenGIS® Sensor Planning Service*

OGC 06-028r5, *OpenGIS® Sensor Alert Service*

OGC 07-006r1, *OpenGIS® Catalogue Service Implementation Specification*

OGC 07-110r2, *CSW-ebRIM Registry Service – Part 1: ebRIM profile of CSW (1.0.0)*

OGC 07-165, *Sensor Web Enablement: Overview and High Level Architecture*

http://www.ws-i.org/Profiles/BasicProfile-1.1.html, *WS-I Basic Profile 1.1*

http://www.w3.org/TR/soap/, *SOAP*

http://www.w3.org/TR/wsdl, *WSDL*

JPEO-CBD CCSI v1.0 Volume III, *Common Chemical, Biological, Radiological, Nuclear (CBRN) Sensor Interface (CCSI): Volume III – Software Interface Standards*

3 Terms and definitions

For the purposes of this report, the definitions specified in Clause 4 of the OWS Common Implementation Specification [OGC 06-121r3 and in the documents referenced in Clause 2 shall apply. In addition, the following terms and definitions apply.

3.1
channel
a logical grouping of information transmitted to or from a CCSI sensor

3.2
command
a message sent to a CCSI sensor that causes the sensor to perform a specific action

3.3
controlling application
host application

an application that connects to and interacts with a CCSI sensor

4 Conventions

4.1 Abbreviated terms

ACK	Positive Acknowledgement
API	Application Programmer's Interface
CBRN	Chemical, Biological, Radiological, Nuclear
CCSI	Common CBRN Sensor Interface
CS/W	Catalog Service for the Web
EMCON	Emission Control
GPS	Global Positioning System
GUID	Globally Unique Identifier
MUC	Multi-User Chat
NAK	Negative Acknowledgement
NTP	Network Time Protocol
O & M	Observations and Measurements
OSI	Open Systems Interconnection
OWS	Open Web Services
PDP	Policy Decision Point
PEP	Policy Enforcement Point
SAS	Sensor Alert Service
SensorML	Sensor Model Language
SIS	Sensor Interface Service

SOAP	Simple Object Access Protocol
SOS	Sensor Observation Service
SPS	Sensor Planning Service
STS	Security Token Service
SWE	Sensor Web Enablement
TML	Transducer Markup Language
URI	Uniform Resource Identifier
URN	Uniform Resource Name
UTC	Coordinated Universal Time
UUID	Universally Unique Identifier
WNS	Web Notification Service
WSDL	Web Service Description Language
WS-Security	Web Services Security
WS-Trust	Web Services Trust Language
XSLT	eXtensible Stylesheet Language Transformation

5 OWS-6 SWE PulseNet™ Engineering Report Overview

This summary portion of this report contains the following sections:

- Achievements
- PulseNET™ Enhancements
- Lessons Learned
- Recommendations

A significant portion of this report references our principle deliverable document for SWE, the CCSI Engineering Report (09-007). Rather than duplicate information, the appropriate sections of that report are referenced in this summary report.

6 Achievements

Northrop Grumman was responsible for the development of Common Chemical, Biological, Radiological, Nuclear (CBRN) sensor (CCSI) interfaces within the OGC's SWE architecture. The CBRN sensors interface with SWE services through an intermediary web service called the Sensor Interface Service (SIS). Using the SIS, the SWE SOS, SAS, and SPS services provide clients access to gather information and communicate with the CRBN sensors. An overview of the SWE architecture is described in section 7 of the CCSI ER (09-007).

To describe the CBRN sensors and their data, we developed SensorML and O & M for CCSI sensors. eXtensible Stylesheet Language Transformation (XSLT) transforms were then developed to convert CCSI sensor descriptions and messages (coming from the CCSI emulator provided by JPEO-CBD) into SensorML and O & M.

To visualize and interactively query the sensors within the SWE architecture, Northrop Grumman provided the PULSENet™ Client, a .NET 2.0 based client application utilizing Skyline's TerraExplorer Pro v5.1 3D visualization product. The PULSENet™ Client was configured to interact with the CBRN sensors through the SWE interfaces developed by Compusult, then used in the final SWE demonstration.

To demonstrate the CCSI capability, Northrop Grumman provided a recorded video of the PULSENet™ client interacting with CCSI sensors, which was incorporated into the overall CCSI movie.

Northrop Grumman collaborated with the other participants in the SWE thread: Compusult (Robert Thomas, Bob Grace, and Angela Amirault), who provided the SWE services that utilized the SIS; the sponsors, NGA (Dave Wesloh) and JPEO-CBD (Claude Speed, Tom Swanson, and Cheryl Putnam), who also provided the CRBN emulator; and the SWE thread lead architect, Ingo Simonis (International Geospatial Services Institute (iGSI) GmbH).

A timeline of accomplishments throughout the OWS-6 period is summarized below.

Month, Year	**Accomplishment**
Oct. 2008	Scott Fairgrieve attended the OWS-6 kickoff meeting Oct 14-16, 2008 at George Mason University. Worked with Compusult and the CCSI sponsor to clarify roles on the CCSI thread.

Month, Year	Accomplishment
Nov. 2008	Began developing an API for the Sensor Interface Service (SIS), which is a SOAP/WSDL-based web service that acts as a CCSI Client and will allow SWE service interfaces to more easily work with CCSI sensors. Developed the outline for the CCSI-SWE engineering report. The SWE client is available for the other participants to use.
Dec. 2008	Wrote XSLT to translate CCSI readings into O & M format, and implemented the Sensor Interface Service (SIS). We provided a sample SIS which Compusult has begun using to develop their SOS and SPS interfaces.
Jan. 2009	Submitted the draft CCSI-SWE Engineering Report for review. Began to use the CRBN sensor emulator provided by JPEO-CBD with the SIS.
Feb. 2009	Completed initial delivery of the Sensor Interface Service (SIS) implementation and added methods to support SPS and SAS functionality. SIS was improved to make it more robust. Provided input to the proposed CCSI-SWE demonstration scenario that includes our developed services and PULSENet client.
Mar. 2009	Our contribution to the CCSI video was delivered per instructions for composition by Robert Thomas/Compusult into the final video. Scott Fairgrieve updated the PULSENet Client to better handle the Compusult SWE services, provided input to Compusult to improve their SWE service implementations, and improved support for CCSI maintenance channel messages. A potential issue was identified concerning the SIS and SWE Client security interface (SAML, XAMCL), which is still incomplete.

Month, Year	Accomplishment
Apr. 2009	Completed the SWE CCSI SIS, which was integrated with Compusult's SWE service implementations and recorded with other partners for the OWS-6 demonstration video. Delivered a final version of the SWE-CCSI Engineering Report (# 09-007). The SWE Client security interface (SAML, XAMCL) was incomplete. We made several attempts to work with con terra to utilize the secure services from GPW in the SWE Client. We prepared to participate in the OWS-6 webinar on 29 April, but it was canceled by the OGC.
May 2009	Delivered this report.

Deliverable Status

We completed the following deliverables for the SWE thread.

Work Item	Type	Milestone	Note
CCSI-SWE Engineering Report	Report	Draft: January 12, 2009 Final: April 17, 2009	Completed Apr 17
SWE Client	Software	Draft: January 16, 2009 Final: March 13, 2009	Complete
TML/SensorML/ IEEE1451 data	Data	Final Data Loading - March 13, 2009	Complete

Work Item	**Type**	**Milestone**	**Note**
SIS to CCSI (unofficial deliverable)	Software	Initial: Jan 2009 Final: integrated test Feb 2009	Complete

7 PULSENet™ Enhancements

Primarily a reusable component that works with SWE services, minor enhancements were made to the PULSENet™ client for CBRN sensors and the Compusult SPS.

The SIS development consisted of defining and developing the SIS to communicate with CCSI sensors. Some of the specific enhancements to the SIS implemented for CCSI sensors are:

- Converted CCSI identifiers to a URN according to OGC's naming conventions
- READGS, Status, and Maintenance channels of sensor observations mapped to O & M
- CCSI ALERTS channel converted to both O & M and SAS Alert
- CCSI commands were converted to SPS input messages

Section 10 of the CCSI ER (09-007) provides the technical detail of the SIS implementation of CCSI.

8 Lessons Learned

Challenges in the SWE CCSI architecture and testing are described in section 12 of the CCSI ER (09-007).

9 Recommendations for future work

The recommended future work for the SWE CCSI is described in section 13 of the CCSI ER (09-007).