

TRAVEL REPORT FORM

출장보고서

결 재	선임연구 원	팀장	팀장	부서장
	09/05	대결 09/05	대결 09/05	대결 09/06
협 조	이성규	이우섭	김선태	김형원

I. Reporter 보고자

Department 소속	Position 직위(직급)	Name 성명	Travel Date 날짜	Note 비고
기후예측본부 정보서비스팀	선임연구원	이성규	08/21 - 08/28	

II. Major Activities 주요업무 수행내용

1. Main Contents and Activities 주요내용 및 활동

■ FOSS4G (Free and Open Source Software for Geospatial) BONN 2016 학술대회 참석

- 학술대회 장소: 독일 본 World Conference Center Bonn (WCCB)
- 학술대회 기간: 2016년 08월 22일 - 26일 (5일)
- ※ 최종프로그램: 붙임 1 참조

가. 08.22. (월) - 23. (화): 워크숍 참석

- 1) 08. 22. (월) 오후: Which is the cultural captial of Europe? An intro to Apache PySpark for Big Data GeoAnalysis (WS21) 워크숍 참석

강사: Dr. Kashif Rasul (nomad-labs.com), Shoaib Bruq (nomad-labs.com)

- PySpark는 Python에서 Apache SPARK 시스템을 활용할 수 있는 라이브러리로써, Apache SPARK의 빅데이터 플랫폼과 연계하여 Python의 다양한 라이브러리와 함께 데이터 분석이 가능한 장점이 있음.
- PySpark를 이용하여 Apache SPARK에 데이터와 공간데이터 업로드/조회, 공간 조인 등을 실습하였음.
- 교재: 붙임 2 참조

- 2) 08. 23. (화) 오전: Managing CityGML-based 3D city models in PostGIS and Cesium using the 3DCityDB Stack (WS31) 워크숍 참석

강사: Felix Kunde (Beuth University of Applied Science), Calus Nagel (virtualcitySYSTEMS GmbH), Zhihang Yao (Technische Universtät München)

- CityGML은 도시 내 공간정보를 GML (Geometry Markup Language) 규격을 이용하여 표현한 데이터 포맷
- 오픈소스소프트웨어인 PostGIS에 CityGML 데이터를 업로드하고, 웹 기반 3D GIS (Geographic

Information System) 라이브러리인 CesiumJS를 이용하여 PostGIS에 저장된 3D 건물 데이터 조회 등을 실습하였음

- 교재: 붙임 3 참조

3) 08. 23. (화) 오후: Enterprise class deployment for GeoServer and GeoWebcache: Optimizing performance and robustness (WS38) 워크숍 참석

강사: Daniel Koch (terrestris GmbH & Co. KG), Nils Bühner (terrestris GmbH & Co. KG), Andre Henn (terrestris GmbH & Co. KG), Simone Gianecchini (GeoSolutions)

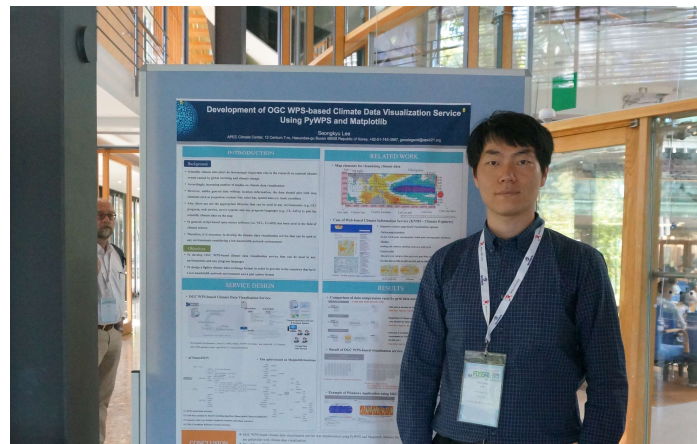
- GeoServer는 공간데이터 (Vector, Raster 등)를 OGC (Open Geospatial Consortium)에서 제정한 공간정보분야 표준스펙 (WMS: Web Map Service, WFS: Web Feature Service, WCS: Web Coverage Service, WPS: Web Processing Service 등)을 기반으로 서비스를 개발할 수 있는 소프트웨어임.
- GeoServer 기반 서비스의 성능 최적화, JMeter를 이용한 성능 테스트 등을 실습하였음.
- 교재: <http://geoserver.geo-solutions.it/edu/en/index.html>

나. 08.24. (수) - 26. (금): 학술대회 참석 및 발표

1) Academic & Regular Session 참석

2) Poster Session 참석 및 발표

- 발표제목: Development of OGC WPS-based Climate Data Visualization Service Using PyWPS and Matplotlib
- 발표 포스터: 붙임 4 참조



2. Relevance to APEC Climate Center's Activities 결론 및 소감

- 독일 본에서 개최된 금번 국제학술회의는 약 1,000 명의 연구자와 소프트웨어 개발자가 참가하여 다양한 주제의 연구 및 활용사례가 발표되었으며, 전세계적으로 Free and Open Source Software for Geospatial (FOSS4G)에 대한 관심이 증가하고 있음을 알 수 있었음.
- 과거 FOSS4G는 공간정보분야의 대표적인 FOSS4G 소프트웨어인 geoserver, mapserver, openlayers, postgis, pgRouting, qgis 등을 위주로 2차원 공간데이터를 활용한 연구가 주로 발표되었음.
- 올해는 전세계적으로 공간정보의 관심이 2차원에서 3차원으로 이동함에 따라, 3차원 실내·외 공간정보를 다루기 위한 기존 FOSS4G 소프트웨어 개선, 새로운 소프트웨어 및 플랫폼에 대한 내용이 주로 발표되었음.
- APCC에서도 부산시와 공동으로 추진 중인 '부산시 도시침수 스마트 재난관리 시스템 개발' 프로젝트

트에 3차원 공간정보와 3차원 GIS를 활용하는 것이 필요함.

- FOSS4G 소프트웨어 이외 재난재해 분야에서는 위성영상과 GIS(Geographic Information System)를 활용하여 주로 과거피해지역 또는 현시점에 대한 홍수피해지역 관리, 알림 서비스 등의 연구내용이 발표되었음.
- 또한, 2015년도에 ESA (European Space Agency)에서 쏘아 올린 Sentinel 위성의 자료가 최근 공개로 배포됨에 따라 이를 활용한 자료 처리 서비스 개발, 응용연구 등의 발표가 많았음.
- ESA의 Sentinel 위성의 경우 International Research에 대한 유료화 정책이 현재는 없기 때문에, APCC의 태도국 사업에서 고해상도 위성영상이 필요할 경우 ESA의 10 meter 급 공간해상도를 가진 Sentinel 위성 활용이 가능할 것으로 생각됨.
- 올해 기상청 사업 ‘아·태지역 재난재해 연구플랫폼 기반기술 개발’의 일환인 ‘공간정보기술을 활용한 기후 메타데이터(CF metadata) 기반의 데이터 가공을 위한 인터페이스 확장’에 사용할 PyWPS 라이브러리의 개발자와 의견을 교환할 수 있었으며, 획득한 정보 및 인적 네트워크는 향후 연구개발에 활용할 예정임.

III. References 참고사항

(with attachment of any information or report in case of attendance of conferences, workshops and meetings) 학술대회, 워크숍, 회의 등 참석 시 관련 정보 및 문서 첨부

1. Presented and Collected Materials 주요 수집자료

가. FOSS4G BONN 2016 워크숍 자료

- 1) Which is the cultural capital of Europe? An intro to Apache PySpark for Big Data GeoAnalysis
- 붙임 2 참조
- 2) Managing CityGML-based 3D city models in PostGIS and Cesium using the 3DCityDB Stack
- 붙임 3 참조
- 3) Enterprise class deployment for GeoServer and GeoWebcache: Optimizing performance and robustness
- <http://geoserver.geo-solutions.it/edu/en/index.html>

나. FOSS4G BONN 2016 학술대회 프로시딩 책

2. Suggestions and Remarks 건의사항

Development of OGC WPS-based Climate Data Visualization Service Using PyWPS and Matplotlib

Seongkyu Lee

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Abstract

Nowadays, scientific climate data plays an increasingly important role in the research on unusual climate events caused by global warming and climate change. Accordingly, the study on climate data visualization is also increasing. Unlike data plots on bar, line and so on, the scientific climate data should plot with map elements such as projection, contour line, and so on. Script-based open source software such as NCL (NCAR Command Language) and GrADS (Grid Analysis and Display System) is mainly used in the field of climate science because of the above features. However, the program developers who are not specialized in climate science discipline may have trouble developing a service running on any environments (graphical user interface program, server system, web service, etc.) Therefore, this study aims to develop an OGC WPS-based climate data visualization service that the developers can be added a climate data visualization function to their developing program. So, I investigated data exchange formats and map elements for visualizing climate data, then designed JSON-based light-weight data exchange format with GZIP compression algorithm and plot options. And the service was implemented using PyWPS and Matplotlib libraries. As a result, the service provides standardized data visualization service via OGC WPS. Also, users are able to take advantage of the data visualization, using scientific climate data, via the internet more easily and conveniently.

Keywords

Climate Data Visualization, PyWPS, OGC WPS, Matplotlib

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INTRODUCTION

Background

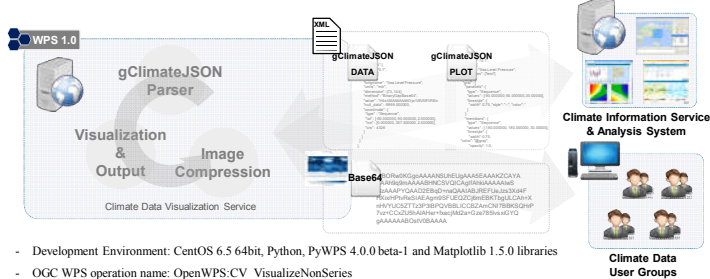
- Scientific climate data plays an increasingly important role in the research on unusual climate events caused by global warming and climate change
- Accordingly, increasing number of studies on climate data visualization
- However, unlike general data without location information, the data should plot with map elements such as projection, contour line, color bar, spatial data (i.e. land, coastline)
- Also, there are not the appropriate libraries that can be used in any environments (e.g. GUI program, web service, server system) and any program languages (e.g., C#, JAVA) to plot the scientific climate data on the map
- In general, script-based open source software (i.e. NCL, GrADS) has been used in the field of climate science
- Therefore, it is necessary to develop the climate data visualization service that can be used in any environments considering a low-bandwidth network environment

Objectives

- To develop OGC WPS-based climate data visualization service that can be used in any environments and any program languages
- To design a lighter climate data exchange format in order to provide to the countries that have a low-bandwidth network environment and a plot option format

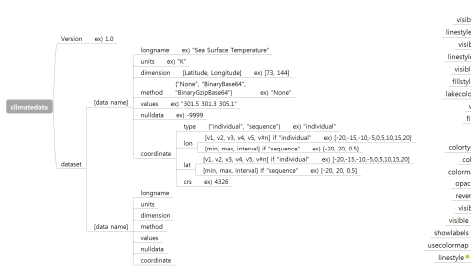
SERVICE DESIGN

- **OGC WPS-based Climate Data Visualization Service**



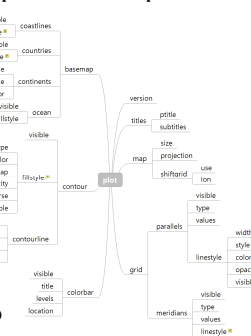
- Development Environment: CentOS 6.5 64bit, Python, PyWPS 4.0.0 beta-1 and Matplotlib 1.5.0 libraries
- OGC WPS operation name: OpenWPS:CV VisualizeNonSeries

- **gClimateJSON**



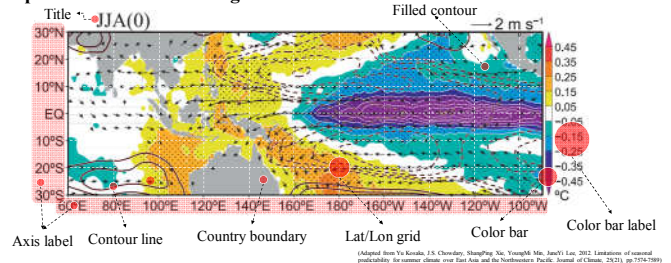
- (1) JSON-based data structure
- (2) Grid data notation by Base64 encoding algorithm (BinaryBae64, BinaryGzipBase64)
- (3) Sequence data (e.g. latitude, longitude) notation (individual, sequence)
- (4) CRS (Coordinate Reference System) attribute

- Plot option based on Matplotlib functions

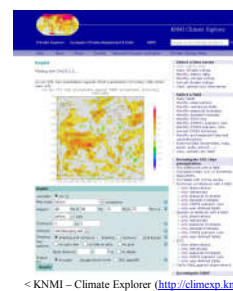


RELATED WORK

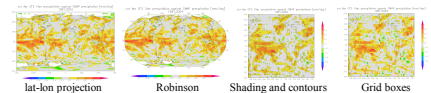
- **Map elements for visualizing climate data**



- **Case of Web-based Climate Information Service (KNMI – Climate Explorer)**

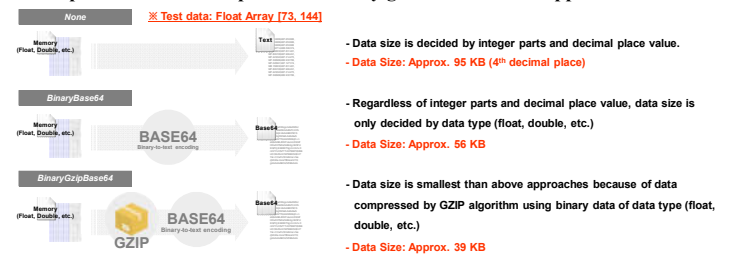


- **Supports various map-based visualization options**
 - Various map projections
lat-lon, North polar stereographic, South polar stereographic, Robinson
 - Shading
shading and contours, shading, contours, grid boxes
 - Contour color
blue-grey-red, red-grey-blue, grey-red, grey-blue, red-grey, etc.
 - No color bar, no title on plot, no grid, and no labels options



RESULTS

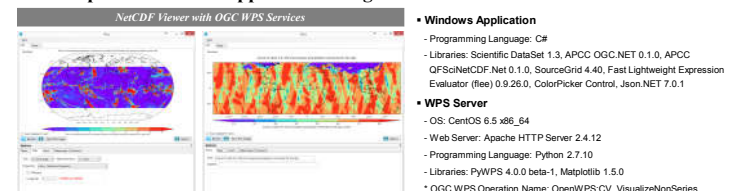
- **Comparison of data compression rates by grid data notation approaches**



- **Result of OGC WPS-based visualization service**



- **Example of Windows Application using OGC WPS-based visualization service**



CONCLUSION & REMARKS

- ❖ OGC WPS-based climate data visualization service was implemented using PyWPS and Matplotlib libraries for users (e.g. program developers) who are unfamiliar with climate data visualization
- ❖ The gClimateJSON exchange format with three grid data notation approaches (None, BinaryBase64, BinaryGzipBase64) was designed and suggested using BASE64 encoding and GZIP compression algorithm
- ❖ The suggested BinaryGzipBase64 notation approach was reduced by about 40 percent than None (written in pure text) approach
- ❖ The service can be provided on a low-bandwidth environment faster
- ❖ Also, users are able to take advantage of the data visualization, using scientific climate data, via the internet more easily and conveniently, making the service accessible to a larger range of users



Poster Session

In addition to scientific papers the Scientific Track Committee also reviewed posters for the scientific poster session. Submission is closed now.

GIS.lab: Hydrological modeling on the Web

Landa

OSPER — a real-time environmental sensor platform

Kryvych, Fiddes, Calbimonte, Fierz, et al.

Development of OGC WPS-based Climate Data Visualization Service Using PyWPS and Matplotlib

Lee

Classification of land use/cover change in the Kanto region, Japan using FOSS4G and Open Data

Iwasaki, Sprague, Sprague, Onohara, et al.

Shapefile Projectionfinder

Egger

GeoTools extension for 3D Geometry

Kim, Kim, Ryoo, Seo, Li



Seongkyu Lee <apcc.geoslegend@gmail.com>

[FOSS4G2016AT] Belated Early Bird Registration for "Development of OGC ..."

1 개의 메일

Franz-Josef Behr <franz-josef.behr@gis-management.de>

2016년 6월 6일 오전 2:27

받는사람: Seongkyu Lee <geoslegend@apcc21.org>

Dear Seongkyu Lee,

I uploaded you poster, thanks!

Perhaps you will receive some remarks later.

However congratulations: **Your submission was accepted for poster presentation.**

In case you did not yet register for the conference: You as the authors of the Academic Track have the option still to register as "Early Bird". However due to technical restrictions you have to follow the following steps:

- 1) Register at <https://www.bonn-conferences.de/foss4g2016/en/>, but do not book any package.
- 2) Send a message to info@foss4g2016.org indicating your topic and your submission id AND the packages you would like to book and indicating that you are an author of an academic submission.
- 3) Your registration will be booked as "Early Bird Registration" by the local organizing committee.
- 4) An invoice will be sent to you.
- 5) Pay by bank transfer. Fees have to be covered by you.
- 6) After your payment was received, your registration and payment will be registered in the system.

We are looking forward to meeting you personally in Bonn!

Best regards - Franz-Josef

FOSS4G 2016 Academic Track FOSS4G 2016 Academic Track
<http://2016.foss4g.opencts.org/ocs/index.php/at2016foss4g/FOSS4G2016AT/index>