The Integration of Grid Technology with OGC Web Services (OWS) in NWGISS for NASA EOS Data

Liping Di, **Aijun Chen**, Wenli Yang and Peisheng Zhao

achen6@gmu.edu; achen@laits.gmu.edu

Lab for Advanced Information Technology and Standards (LAITS)

School of Computational Science

George Mason University (GMU)

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Outline

- Introduction
- Background
- Integration of Grid Technology with OWS
- System Architecture and Data Flow
- Conclusion and Future Work

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Introduction -1/2

- Grid provides an approach for sharing geographically and organizationally dispersed heterogeneous computational resources.
- Globus is the key middleware that provides core Grid capabilities. It facilities the creation of usable Grid.
- NASA Earth Science Enterprise (ESE) is generating a huge volume of remote sensing data in HDF-EOS format for supporting Earth system science and application research.
- OGC Web Service (OWS) is proposed for addressing the lack of interoperability of geospatial data and processing system based on the Web.

Introduction -2/2

- LAITS at GMU developed a OGC-specification compliant software package called the NASA Web GIS Software Suite (NWGISS), which includes WCS, WMS, MPGC etc.
- The Committee on Earth Observation Satellites (CEOS) Working Group on Information Systems and Services (CEOS WGISS) started a CEOS-Grid Testbed in September 2002 to evaluate the feasibility and applicability of Grid technology to the Earth Observation (EO) community.
- So we are contributing to NASA, OGC and CEOS-Grid by integrating OGC technology with Grid technology through the development of Grid-enabled NWGISS.

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Background -1/2

- Globus Project just released Globus 3.0 Beta based on OGSA. But we used Globus 2.2 which includes GRAM, MDS, GSI, GridFTP, MCS, RLS and simple CA etc.
- HDF-EOS is a standard format for NASA EOS data and products. It inherits the portability and multiple data model support of HDF, also adds the three new EOS specific data models – point, swath and grid.
- LAITS' NWGISS significantly increases the accessibility, interoperability and inter-use of HDF-EOS data. It works with all generic HDF-EOS files.

Background -2/2

- Since 1999, OGC has successfully implemented three web-based geospatial interoperability programs: WMT I, WMT II and OWS I. And produced a set of web-based data interoperability specifications as WCS, WMS, WFS, and WRS.
- Currently, CEOS-Grid Testbed consists of five Grid demonstration projects:
  - NOAA Operational Model Archive and Distribution System (NOMADS)
  - USGS EDC's Data Delivery
  - ESA ESRIN Ozone
  - NASA GSFC's Advanced Data Grid
  - NASA EOSDIS Data Pools

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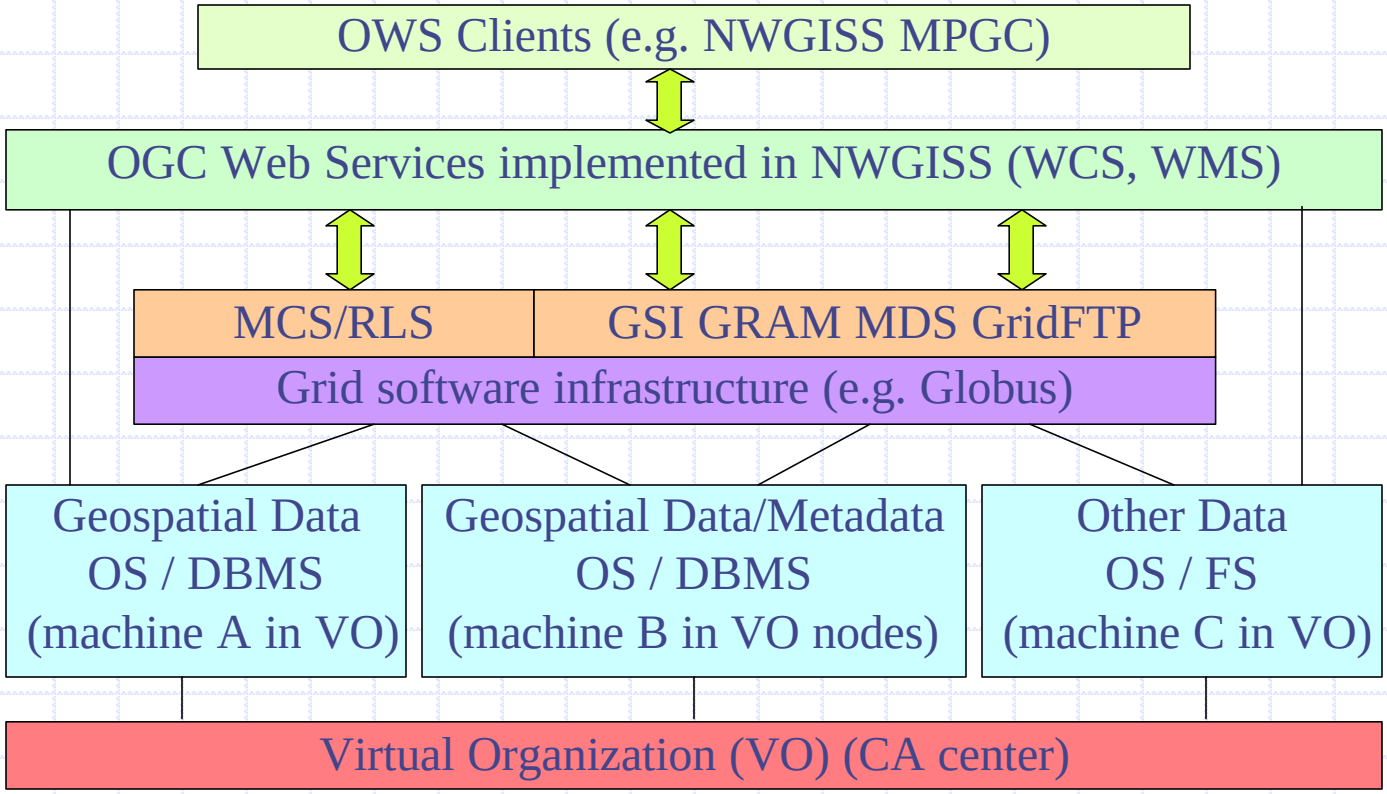
Integration of Grid technology with OWS



Integrating Grid technology with OWS I

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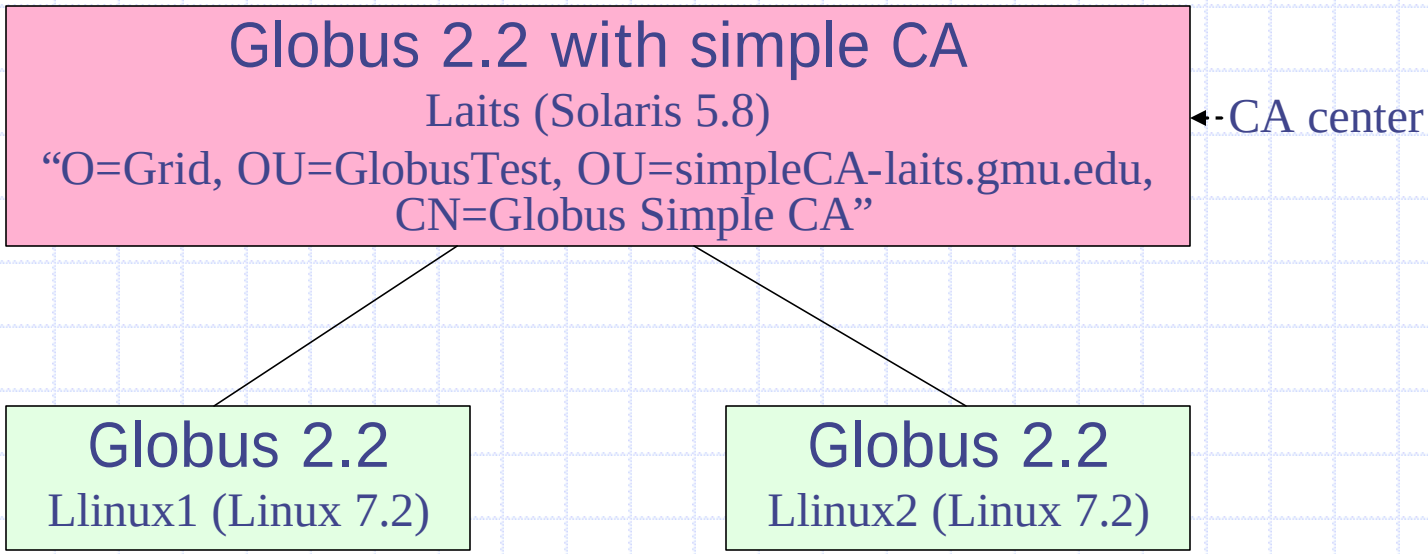
System Architecture and Data Flow -1/3

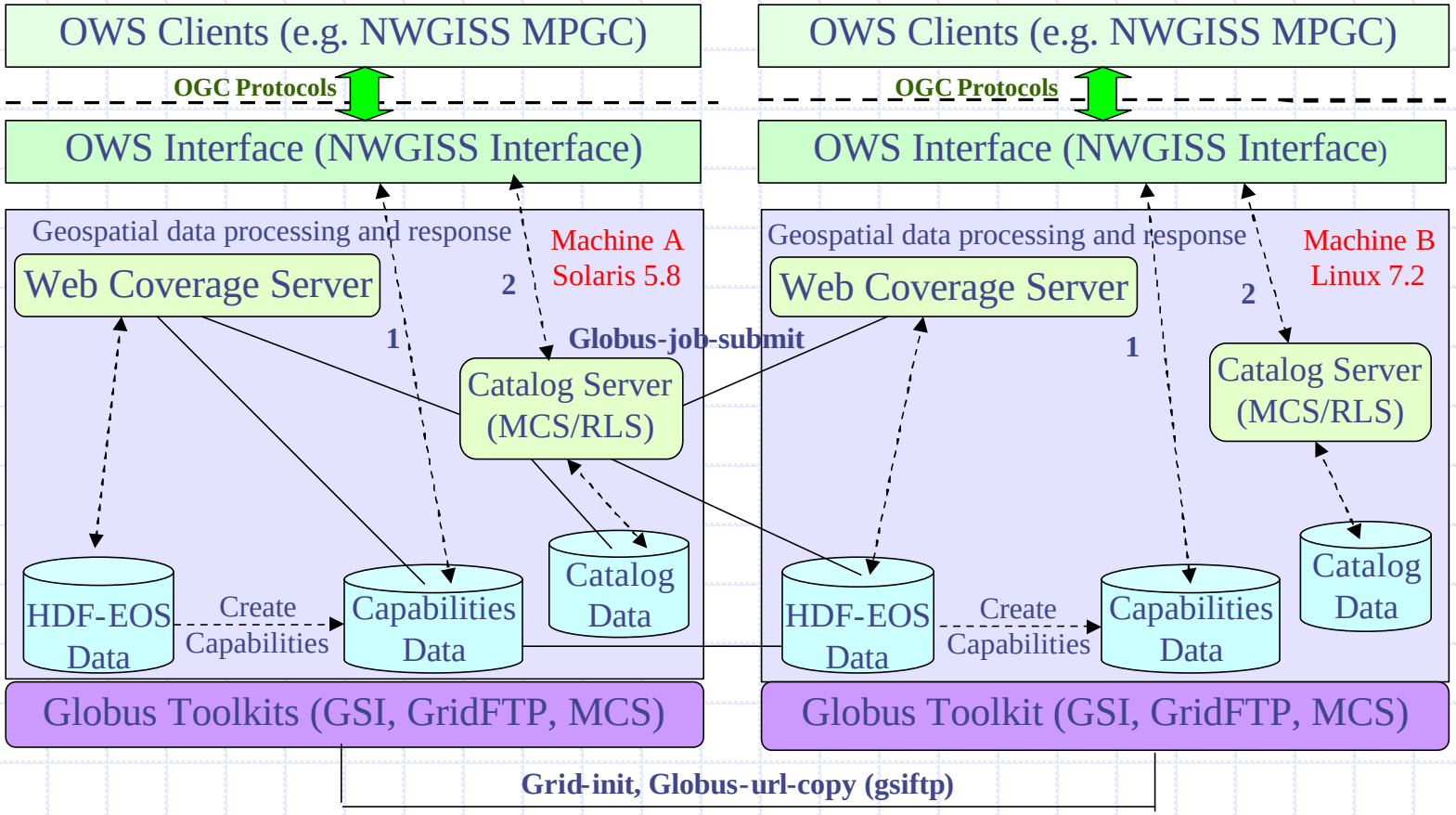


LAITS' Host, User and Service certificates:

"O=Grid, OU=GlobusTest, OU=simpleCA-laits.gmu.edu, CN=host/laits.gmu.edu",
"O=Grid, OU=GlobusTest, OU=simpleCA-laits.gmu.edu, OU=laits.gmu.edu, CN=Aijun Chen"
"O=Grid, OU=GlobusTest, OU=simpleCA-laits.gmu.edu, CN=ldap/laits.gmu.edu"

Laits' Virtual Organization and Certificate Authorization center

System Architecture and Data Flow -2/3

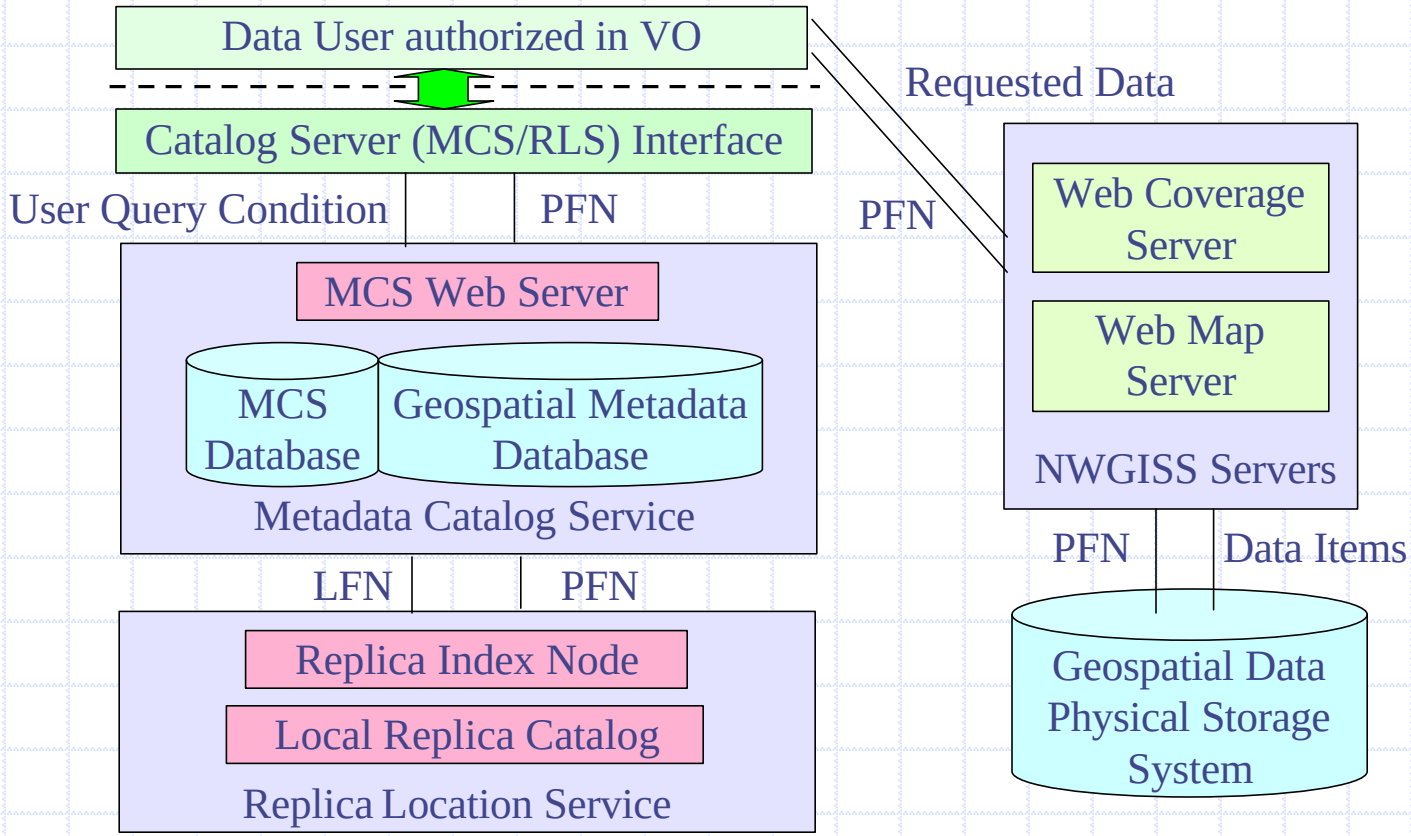


Broken lines show internal requests of NWGISS

Solid lines show requests related to Globus.

System architecture and simplified data flow (request from machine A to machine B)

System Architecture and Data Flow -3/3



LFN: Logical File Name; PFN: Physical File Name

Integration mechanism of Globus MCS with geospatial metadata

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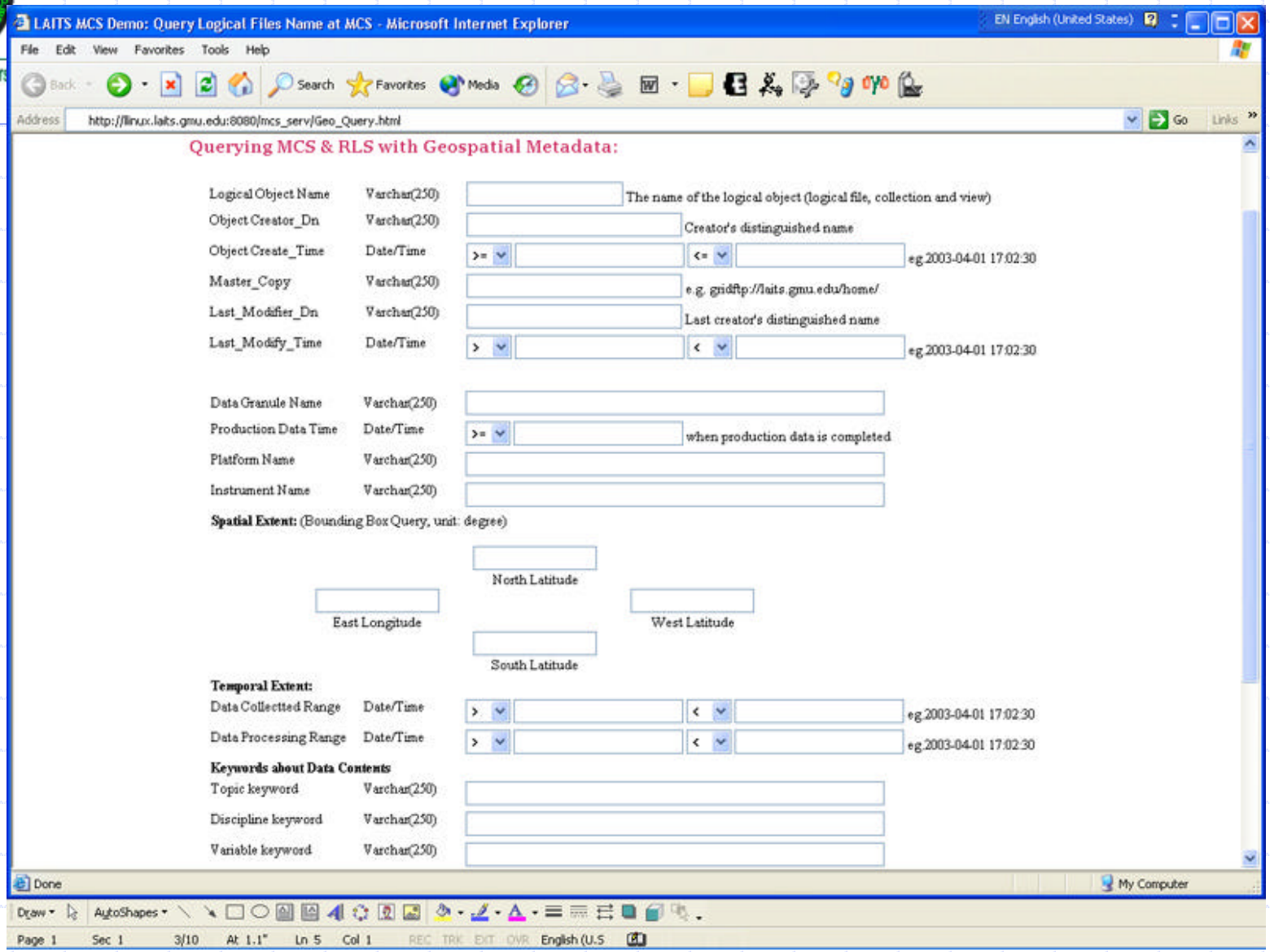
Conclusion

- Extended the applications of Grid technology to the EO community.
- Made OGC technology Grid enabled.
- Finally, we provides the user community a standard, secure, disciplinary specific access to a huge volume of geospatial data managed by Grid while shielding the details of Grid infrastructure underneath.

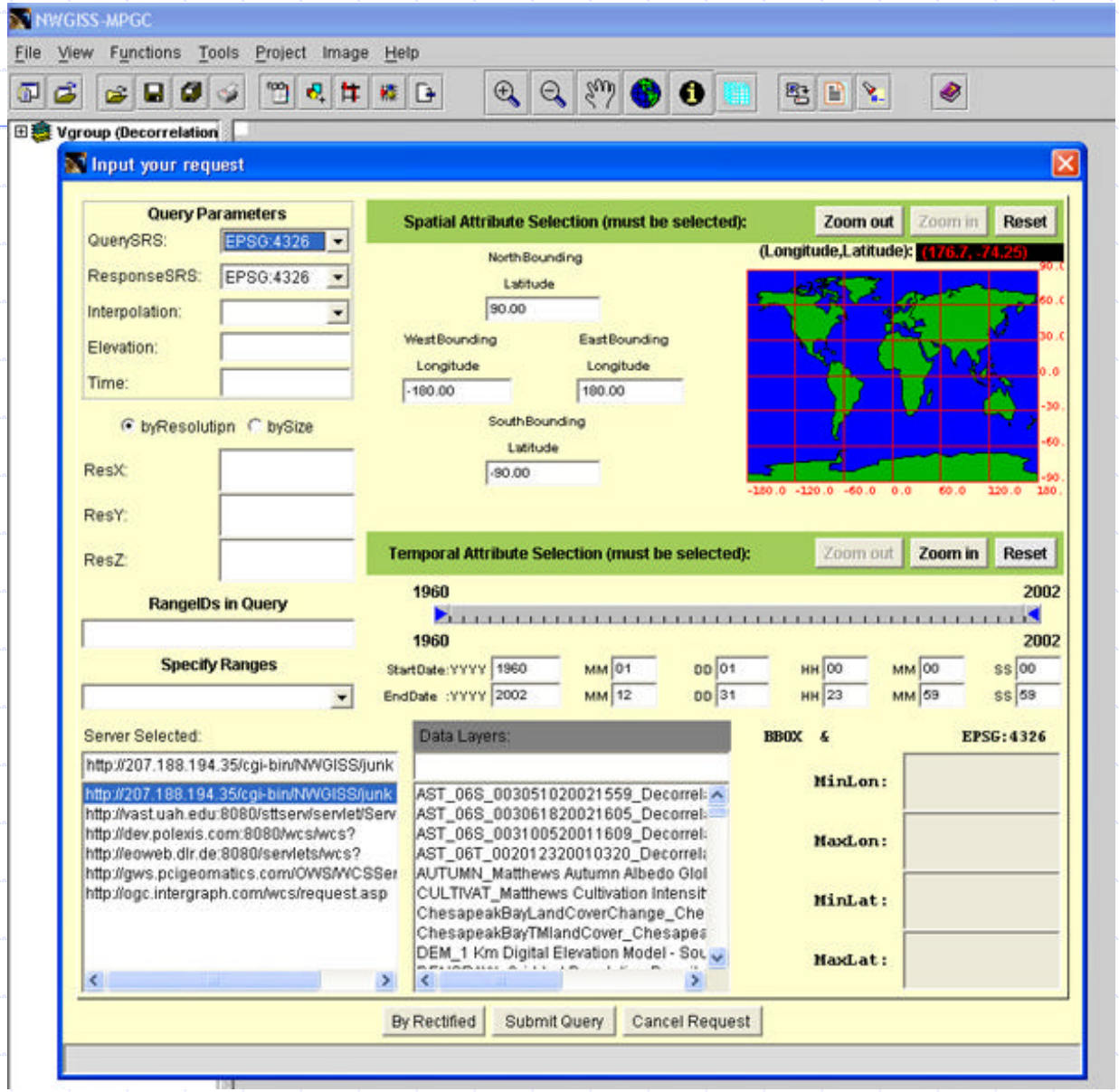
Future Work

- Integration of OGC Web Registry Service (WRS) and Grid catalog systems for providing geospatial-specific OGC-compliable and Grid-enabled catalog services.
- Enabling the virtual geospatial data services.

Simple Interface -1/2



Simple Interface -2/2



George Mason University

Thank You for your attention !

Any Questions ?

achen6@gmu.edu