CIGI Virtual Organization
An Overview

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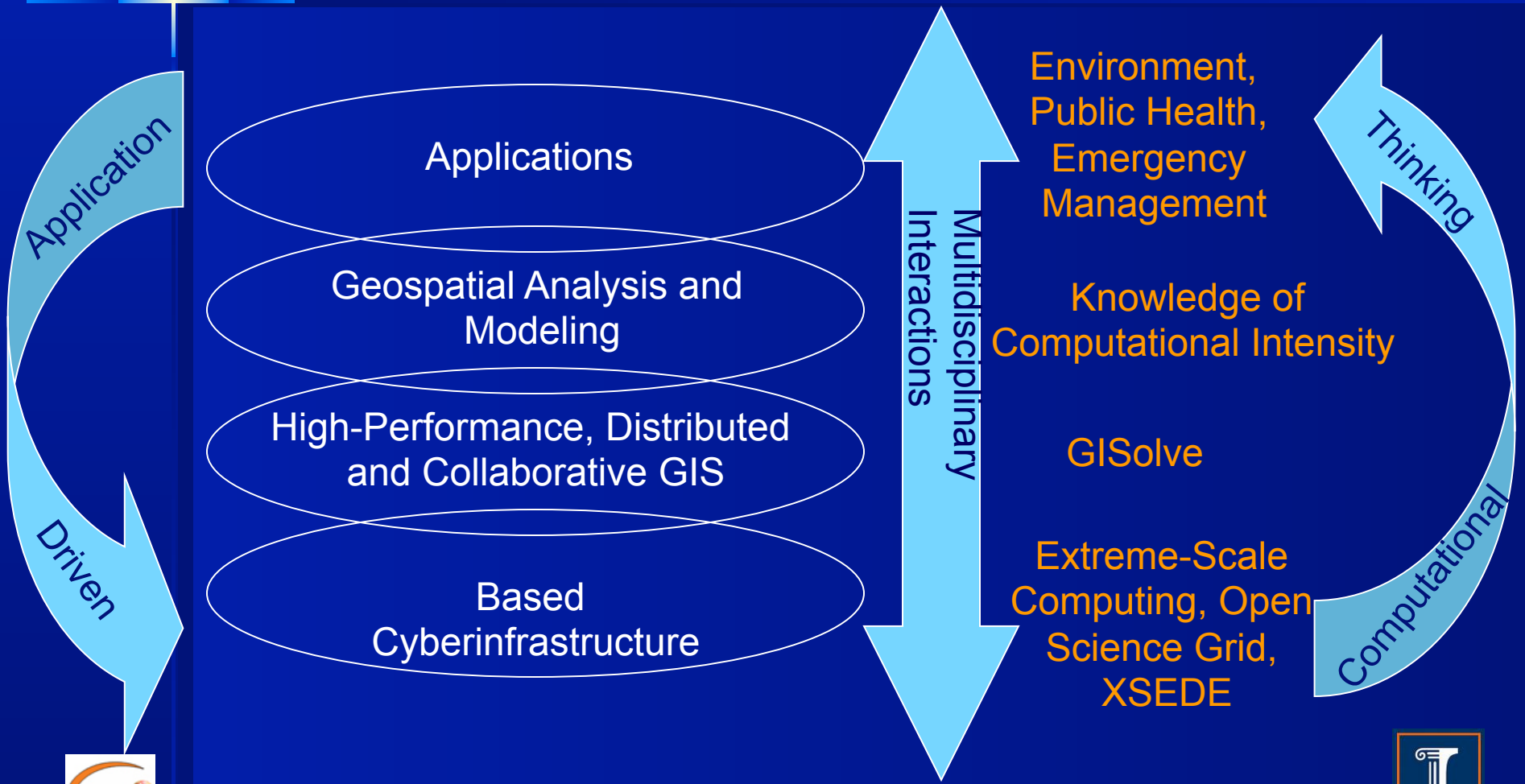
CIGI VO – Research Areas



CIGI – Project Examples

- CyberGIS
- Ecological Compliance Assessment Tool (EcoCAT)
- GISolve
- Malaria Mapping
- Spatial Clustering Detection
- Spatially Explicit Agent-based Modeling
- Spatial-Temporal Data Synthesis
- SimpleGrid
- See http://www.cigi.illinois.edu/doku.php/projects/index for more information

CIGI – Facts

- Over 30 people involved
  - From over 10 disciplines
- Publications in FY11
  - ~8 papers published
  - ~10 under preparation or review
- Over 400 users of the CyberGIS gateway

Resources on OSG

- CIGI-ITB is part of integration test bed
- Our international partners at the Computer Network Information Center (CNIC), Chinese Academy of Sciences also joined OSG and provide resources
  - http://english.cnic.cn/#

CyberGIS (www.cybergis.org)

- A collaborative software framework encompassing many research fields
  - Assessment of climate change impact
  - Emergency management
- Seamless integration of cyberinfrastructure, GIS, and spatial analysis and modeling
  - Capable of handling huge volumes of data, complex analysis and visualization required for many challenging applications
  - Empower high-performance and collaborative geospatial problem solving
- Gain fundamental understanding of scalable and sustainable geospatial software ecosystems
- NSF Software Infrastructure for Sustained Innovation (SI2) Program
  - 5-year, $4.4 million

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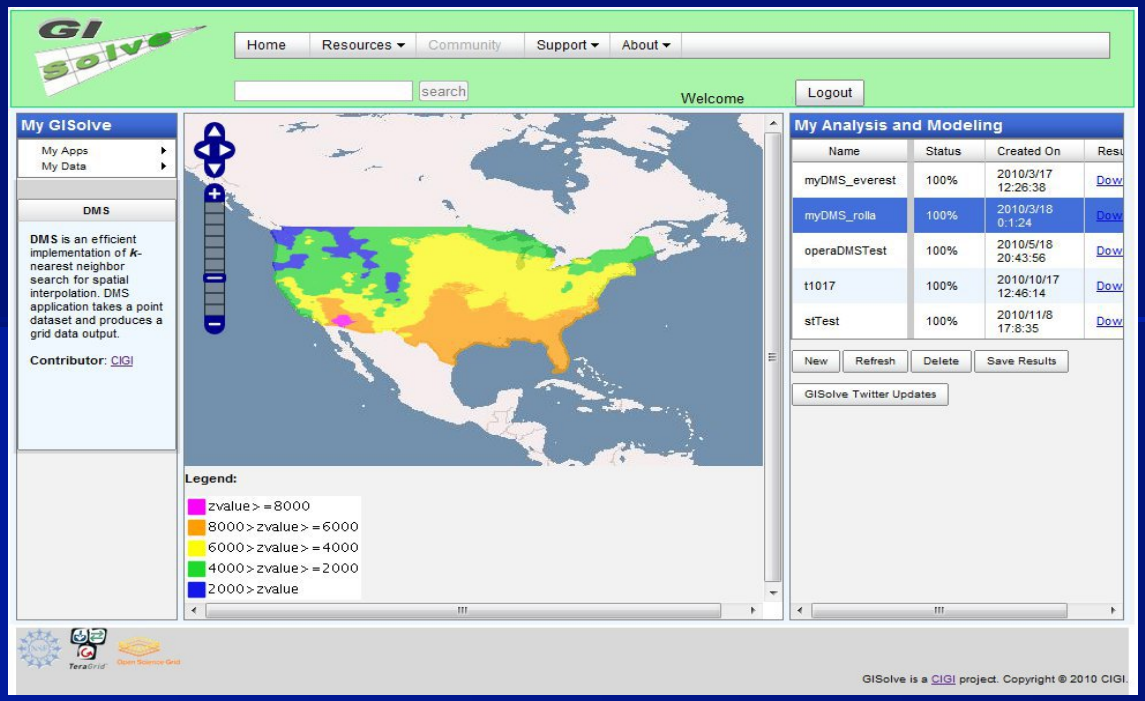
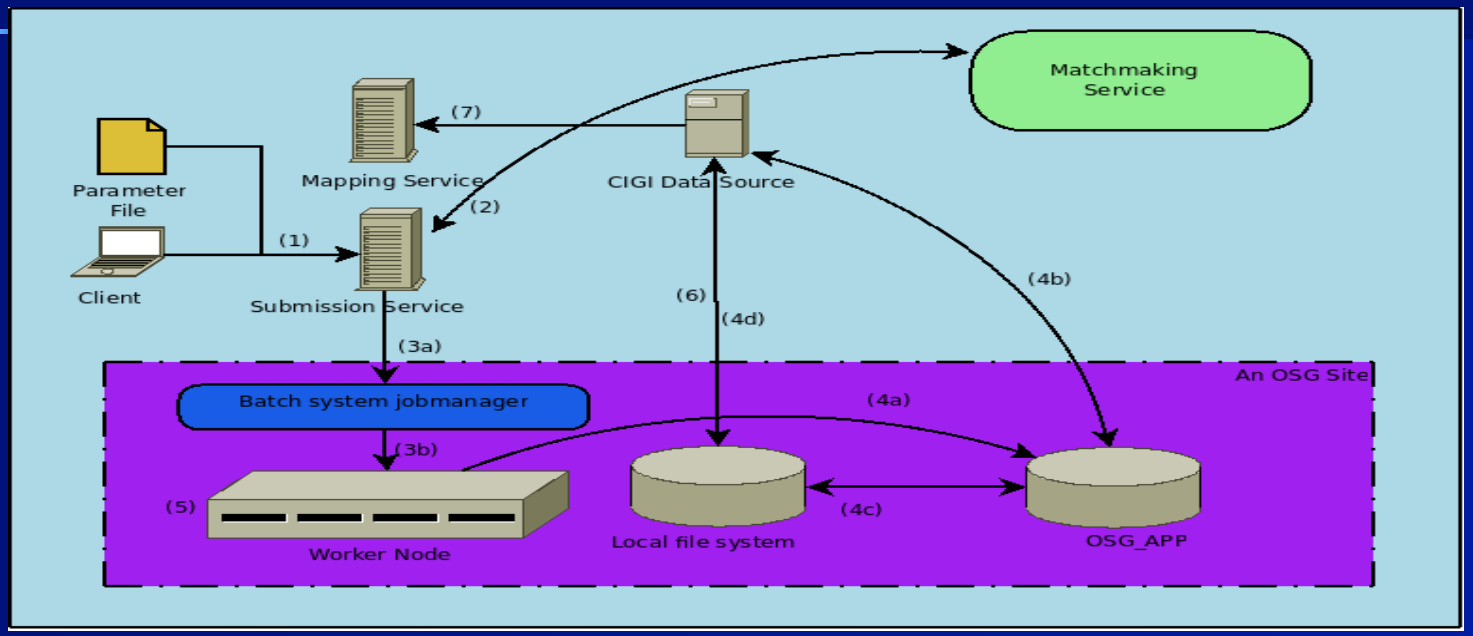
GISolve



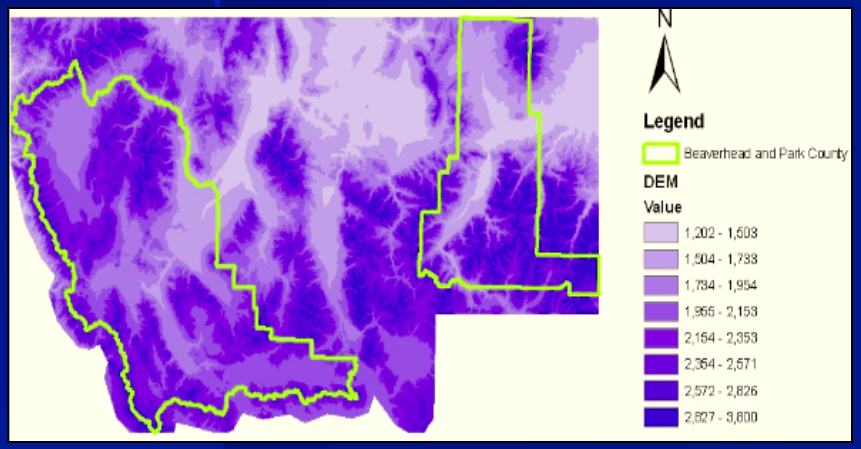
- Geospatial middleware engine of CyberGIS
- Empowers a science gateway that bridges cyberinfrastructure and GIScience communities
  - Provides gateway users access to both OSG and TeraGrid/XSEDE resources
    - Investigated interoperability between the two CI environments (published a paper in TG'11)
- Supports large-scale spatial analysis and modeling methods (e.g. Bayesian geostatistical modeling, detection of local spatial clustering, spatial interpolation, and agent-based modeling)

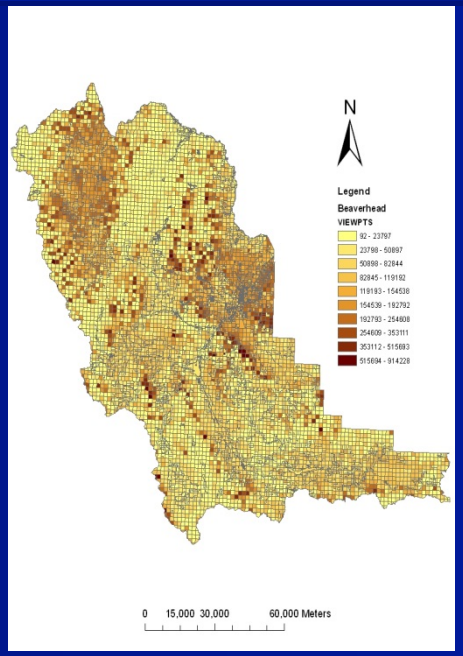
CIGI-OSG Application Framework
Conducting Spatial Analysis on OSG Resources

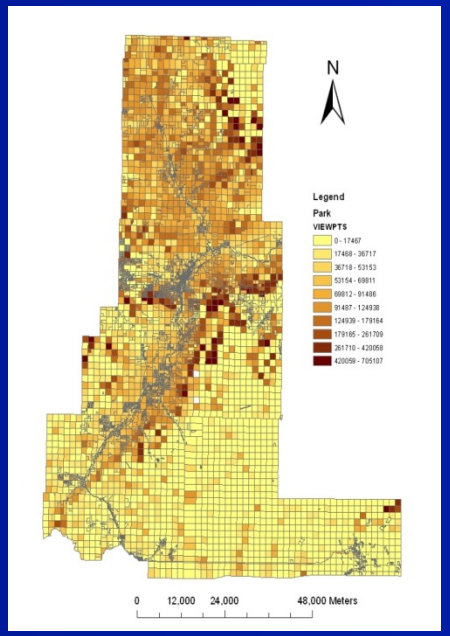


- Used OSG resources to resolve the computational intensity associated with large-scale spatially-explicit agent-based models and large scale viewshed analysis
- Our approach can be applied to enhance understanding of the complexity of coupled human and natural systems

Viewshed Analysis Examples







Computing the visibility of cells on large terrains
Figure shows calculation on two counties (Beaverhead, Park) in Montana

Resource Usage

- The CyberGIS gateway has over 400 users and is steadily growing
- We have been heavily using CIGI resources on OSG
  - Our ITB instance has been heavily used for testing and development
- Four categories of gateway applications
  - Education
  - Traditional high performance computing applications
  - Parameter sweeping applications
  - Ensembles of modestly parallel applications

OSG Usage Plans

- Opportunistic resources from OSG suitable for parameter sweeping applications and modestly parallel applications
  - We have a HTC application conducting 'agent-based modeling simulations' through the gateway
  - We are investigating the use of High Throughput Parallel Computing (HTPC) capabilities for multiple applications
- Over the next year, our plan is to scale up opportunistic usage by orders of magnitude mainly driven by usage coming through the gateway

Ongoing R&D

- A diverse set of geospatial scientific applications
- Development of the CyberGIS Toolkit and Gateway
- Enhancements of data, analysis and visualization services in GISolve
- Spatially-explicit agent-based modeling
- Data intensive problem solving using general purpose graphical processing units (GPGPU)
- Computational intensity map

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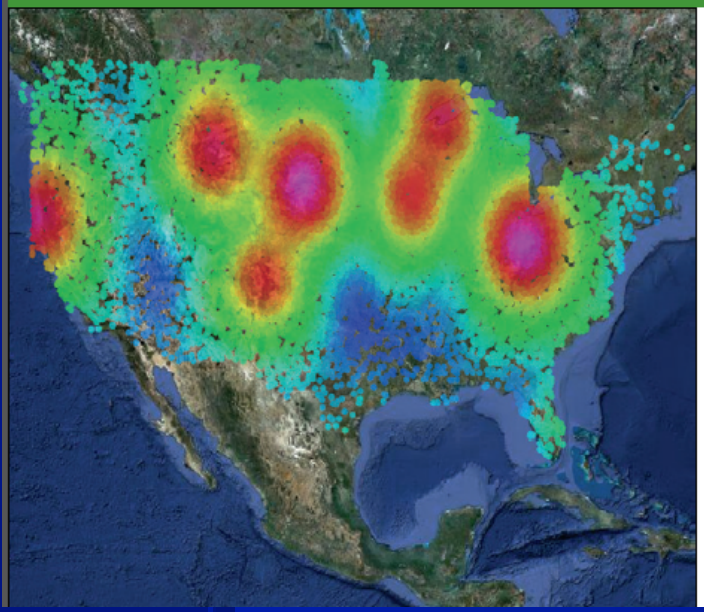

Cover image: Pictured is a simulated spatial distribution of disease risks, overlaid onto a base map of North America, retrieved March 11, 2011, from Google Maps. Pink and red colors indicate simulated hotspots of high disease risk clustering. The image was created using exploratory spatial analytic software services that utilize networked computers provided by the National Science Foundation TeraGrid and the Open Science Grid to support interactive and data-intensive research. In the introduction to this PNAS Special Feature, Dawn J. Wright and Shaowen Wang discuss how spatial cyberinfrastructure facilitates scientific discoveries through streamlined collaboration and computation and make predictions for its impact on the future. See the article by Wright and Wang on pages 5488–5491. Image courtesy of Shaowen Wang and Yan Liu (University of Illinois at Urbana-Champaign, Urbana, IL).

From the Cover

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