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Managing Large Scale data for Regional Earth System Models

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North-East Region of U.S.A

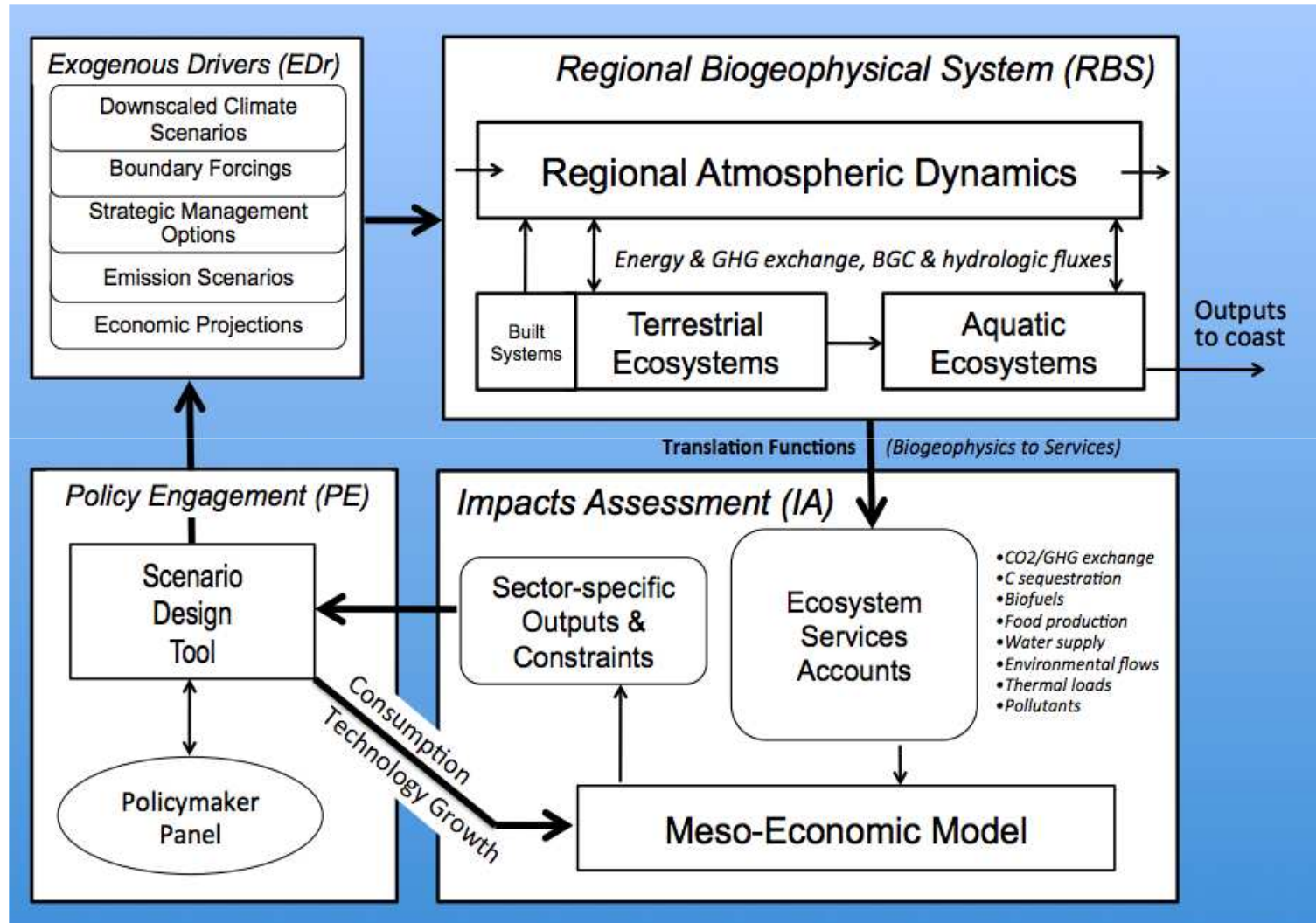
Early settlement,
deforestation and
land clearing;

Industrialization,
urbanization and
mega-city growth;

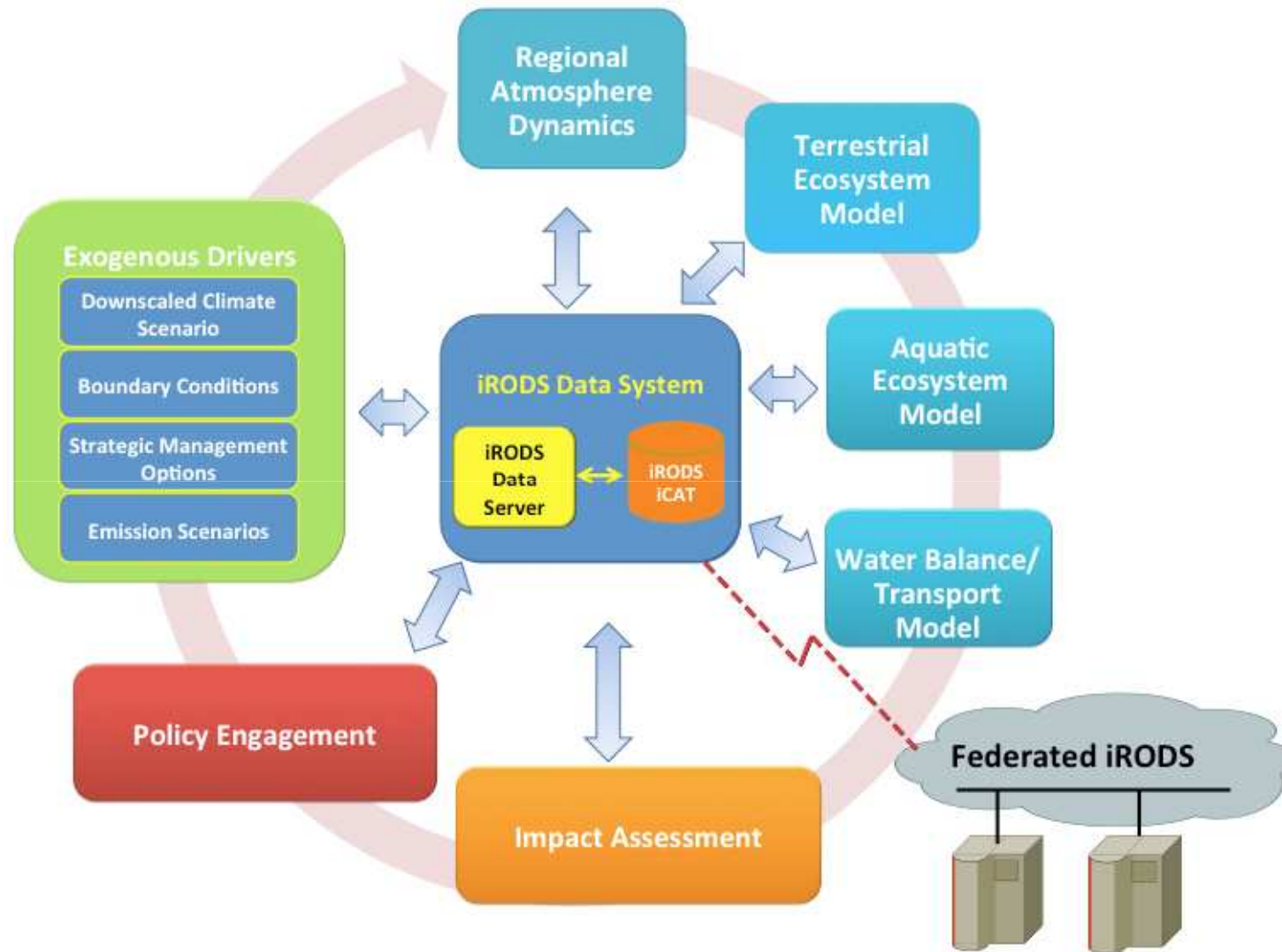
Post-industrialization



NE Regional Earth System Models



iRODS-Enabled NE RESM



2/26/12



NE-RESM Experiments

Experiments are defined within iRODS by four steps

- 1 Collect input data files
2. Function dependencies among variables between modules (data transformations)
3. Check consistency and validate of models output
4. Design scenarios for different runs



Couple modeling groups in NE-RESM

CALVAL: Calibration/Validation data group

WRF: Weather Research & Forecasting

TEM: Terrestrial Ecosystem Model

AEM: Aquatic Ecosystem model

WBM: Water Balance/Transport Model

ECON: Meso-scale Economic Model

Energy: Energy Sector Economic Model



iRODS Web Browser

Sign on to iRods

Account Information

Host/IP : irods.cc
Port : 1247
Username: wbm
Password:
Zone: CCNYZone

[<<< Local Files](#)

[Refresh](#)

iDrop - iRODS Cloud Browser

Search: by name [iRODS Info >>>>](#)

iRODS Tree View [Search](#)

[Refresh](#)

File System	size	last modified
CCNYZone		Feb 16, 2012
home		Feb 15, 2012
EaSM		Feb 15, 2012
Exogenous		Feb 16, 2012
Media		Feb 16, 2012
aem		Feb 16, 2012
bernice		Feb 19, 2012
calval		Feb 16, 2012
econ		Feb 16, 2012
energy		Feb 16, 2012
irods		Feb 15, 2012
pingyang		Feb 16, 2012
policy		Feb 16, 2012
tem		Feb 16, 2012

Synchronization complete

Transfer Type: SYNCH Files: 0 / 0 Bytes (kb):0 / 0

Current File: /Users/admin/Desktop/iRODS Server

User: irods

[Manage](#) [Pause](#)

[Sign Out](#)

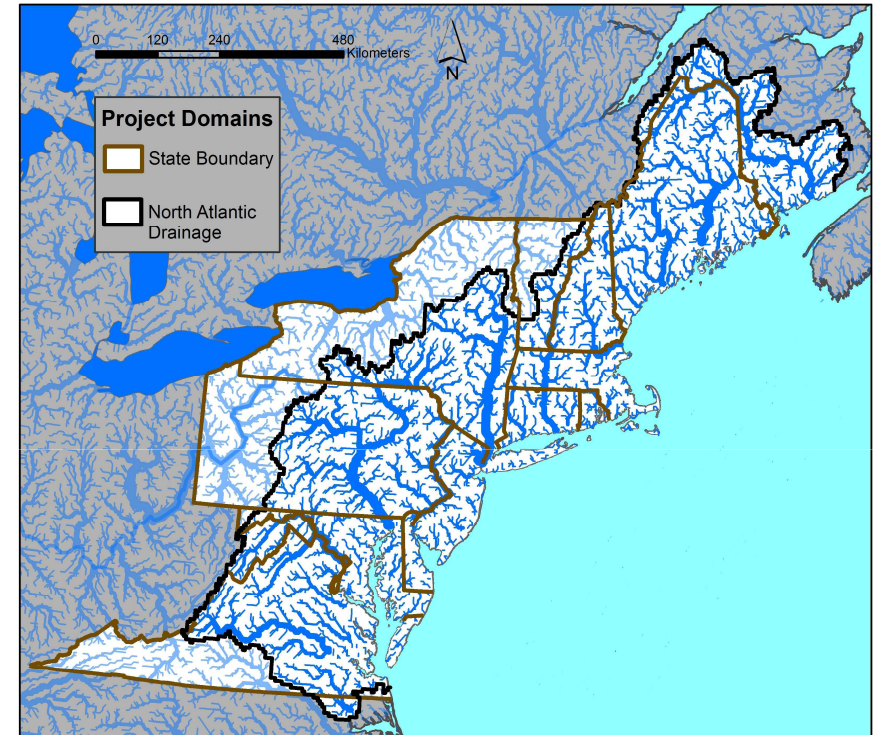
By Name
Modified
3:03 pr
0:47 pr
8:47 pr
4:58 pr
4:58 pr
4:58 pr
4:58 pr
4:58 pr
4:57 pr
4:57 pr
4:54 pr
5:30 pr
1:25 pr

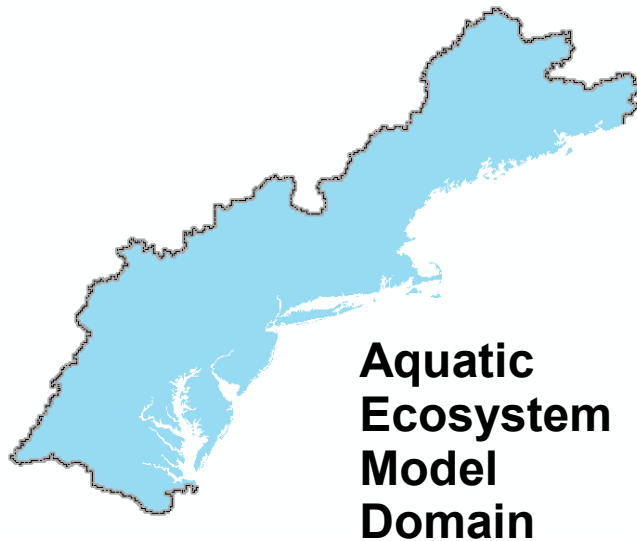
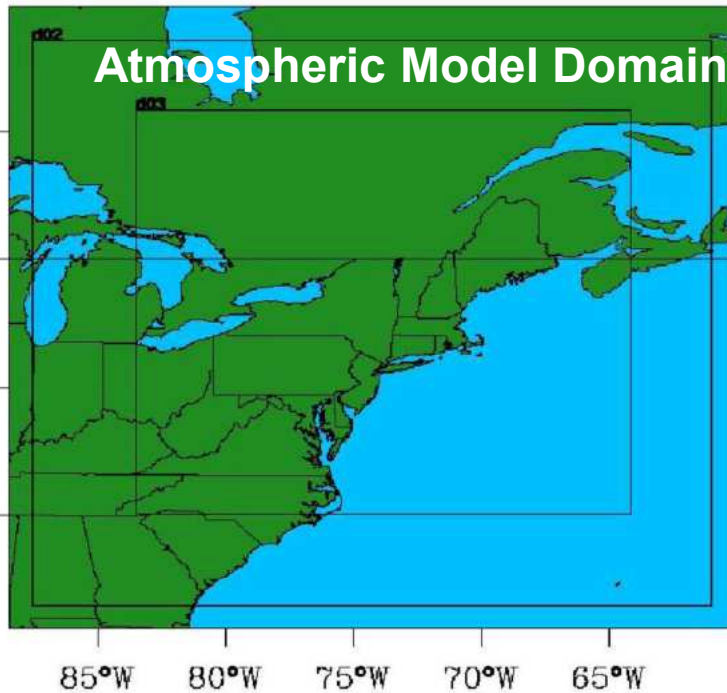
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Coupling Earth System Models Task 1: Domain Determination

- Energy Sector Model:
 - US Census Regions
- Mesoeconomic Model:
 - States
- Atmospheric Dynamics:
 - Nested grids of different resolution
 - Lambert-Conformal Projection
- Aquatic Ecosystem Model:
 - North Atlantic Hydrologic Catchment
 - Geographic Coordinate System (unprojected)
- Products for Policymakers
 - 12 states (ME, NH, RI, VT, NY, MA, CT, NJ, DE, PA, MD, VA) and Washington DC





MARKAL Energy Sector Model Domain

*3 of the 9
US Census
Divisions*



iRODS used to:

- Archive WRF results outside common domain
- Convert Atmospheric Model Outputs from Lambert-Conformal Projection to Geographic Coordinates for Aquatic Ecosystem Model
- Translate between extended domain of MARKAL model (census regions)]

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Coupling Earth System Models Task2: Data Transformation:

- Data formats are different
 - Grid, GIS Vector, NetCDF, HDF5...
- Data in different projections
 - Lambert-Conformal, Longitude/Latitude
- Data Volume is huge
 - 20TB each run...
- Model uncertainty and validation
 - Monte Carlo, Kriging...



Coupling Earth System Models Task 3: Interfaces Design:

Group B
Column Player

Group A
Row
Player

	Work	Shirk
Work	(1,1)	(0,2)
Shirk	(2,0)	(0,0)

Rules and Micro-Services

Extension for Coupled Earth System Modeling

```
myTestRule{  
  
  writeLine("stdout","Global_BASE_PowerOutputTotal  
data ready and waiting");  
    msiSendStdoutAsEmail(*Mailto, "Sending  
email");  
}  
INPUT *Mailto="flengyel@ccny.cuny.edu"  
OUTPUT ruleExecOut
```

Discussion?



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