

Towards a grid portal for meteorological problems in Vietnam



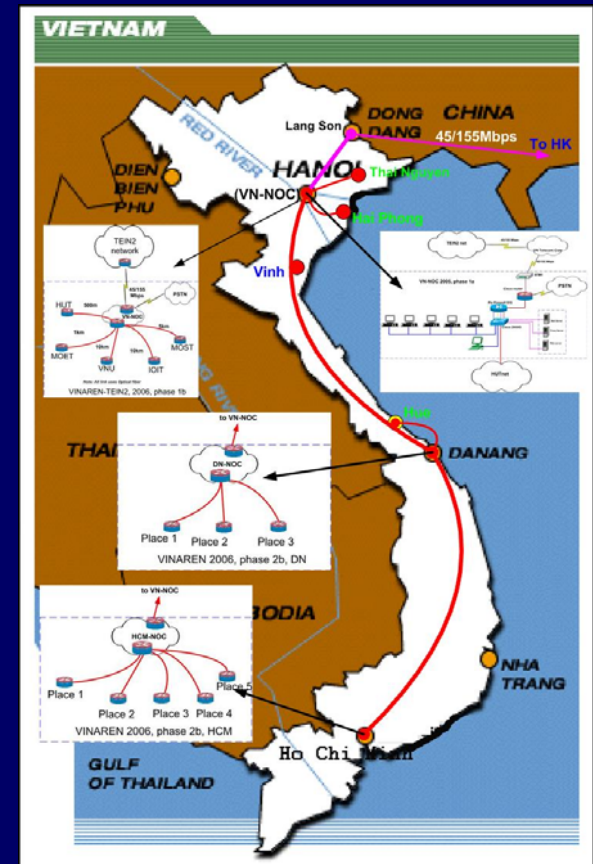
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VNGrid Project

- VNGrid is our first effort in Vietnam to connect several HPC centres in a grid
- Two main objectives
 - Build a cyber-infrastructure based on grid technologies suitable for Vietnam conditions
 - Deploy experimental applications on a grid (in order to promote the application of grid computing in Vietnam)





Towards a data grid for life science

- Needs to bring GC advantages for applications in earth science
 - Each HPC centre participating in the grid should be a provider of data shared to researchers
 - A grid portal is developed to access data on the grid
 - Sharing meteorology data is our first service of the data grid
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Meteorology in Vietnam

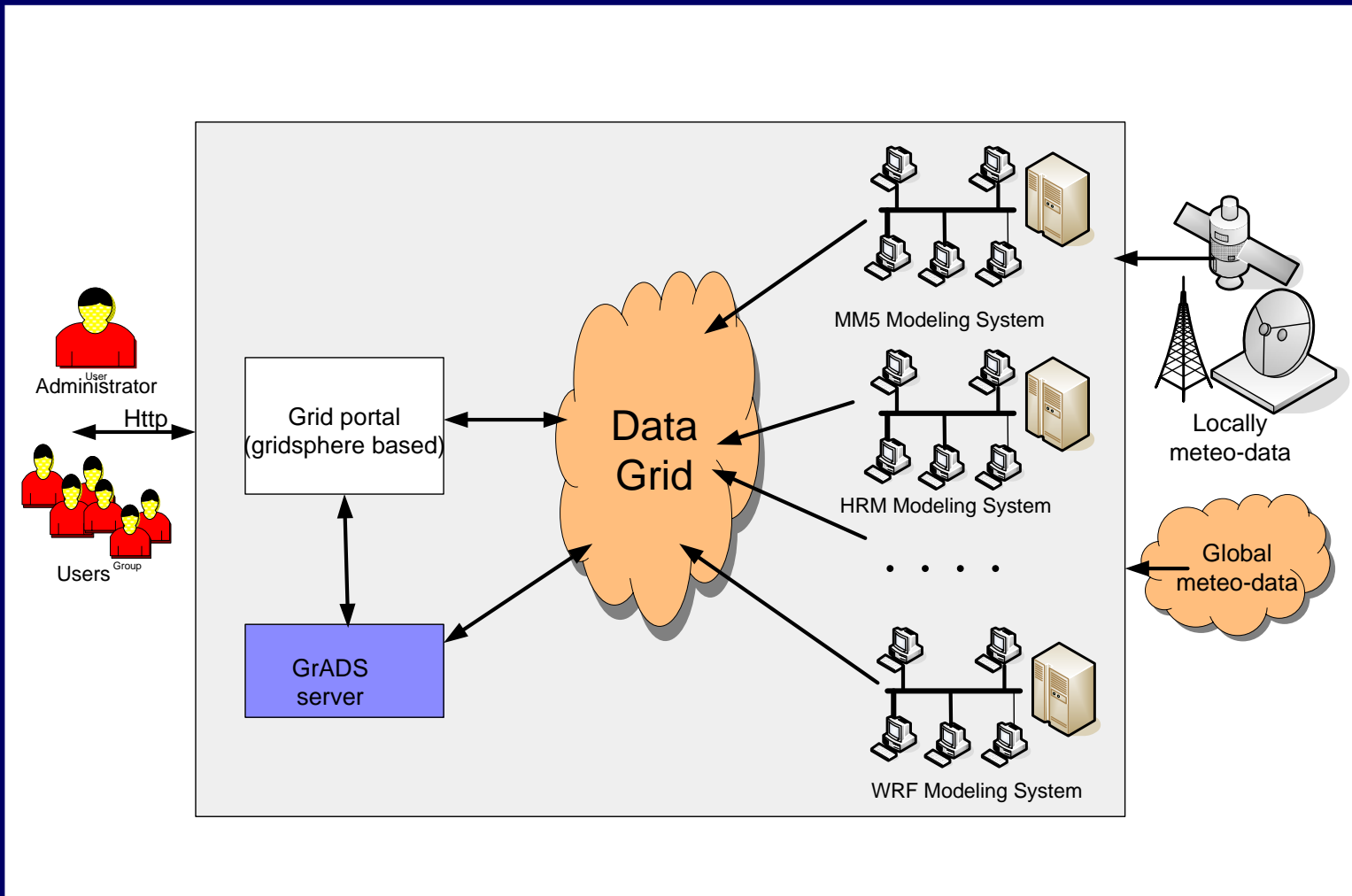
- Weather forecasting plays an important role in the society
 - for agriculture, commerce, catastrophe preventing, etc.
 - There are different institutes in Vietnam working on the meteorology problems but the cooperation is not easy for
 - sharing local observation data
 - sharing hardware and software resources on computing weather forecast data
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A data grid portal for meteorology

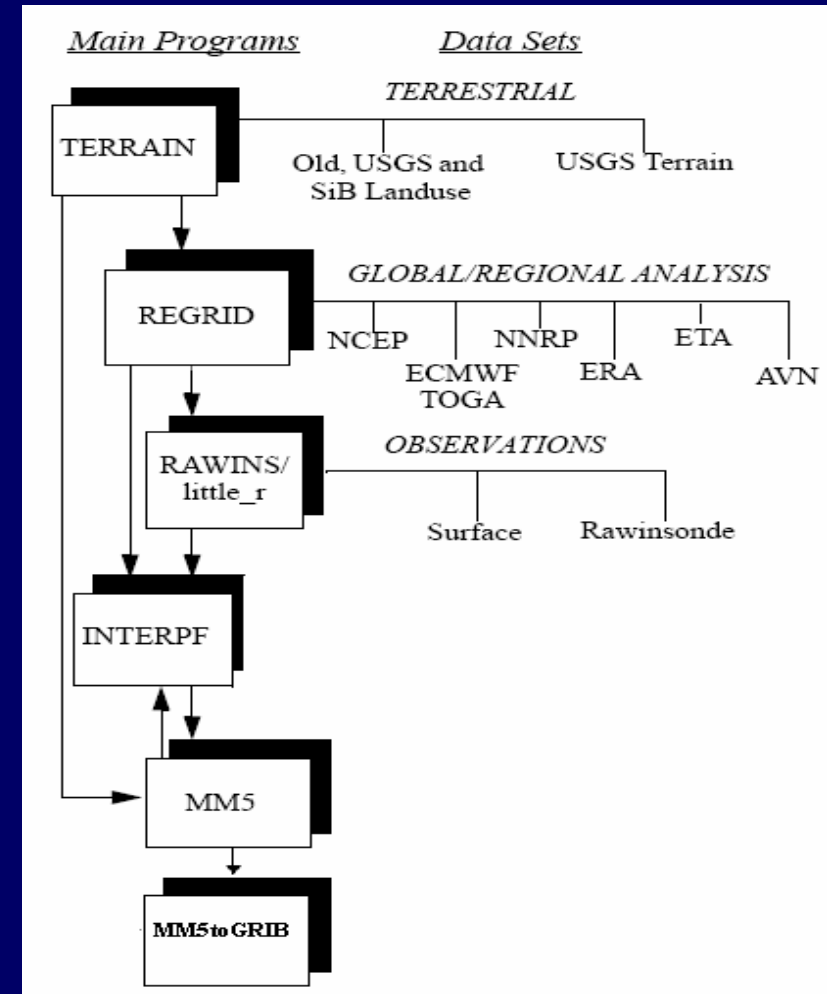
- Building a data grid for sharing meteorology data is a suitable solution in Vietnam because of
 - Exploiting resources from different HPC centers
 - Providing a central and easy access point to all meteorology data via a grid portal
 - Offering a reliable mean for storing meteorology data
 - Reducing cost of maintaining data in each meteorology centre
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System architecture




Weather forecast modeling

- Many models can be used for weather forecasting: MM5, HRM, WRF, etc.
- They can be deployed to be run on a cluster in order to improve the performance



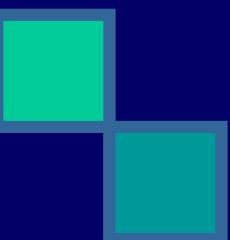



Deployment of MM5 model

- We have successfully deployed the MM5 model in a cluster to provide automatically 3 datasets each day
 - Periodically download global meteorology data from the AVN site
 - Combine with local observation data on modeling
 - Easily configure the modeling process via a configuration file
 - Fault tolerance should be implemented to make the service more reliable
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Data grid services


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- Data grid plays the role of a virtual container for storing data that can be accessed easily later
 - Basic services should be provided in a data grid
 - Replicating data in several nodes
 - Searching data based on metadata
 - Transferring data between nodes
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Deployment of data grid in GT4

- Install the following GT4 components:
 - GridFTP : A service for transferring data in the grid environment
 - RFT (Reliable File Transfer): Wrapping up GridFTP for secure transferring
 - RLS (Replica Location Service): Managing data replications
 - DRS (Data Replication Service): High level service using RFT and RLS to replicate data
 - MCS (Metadata Catalog Service) : Managing metadata and providing data search service based on metadata

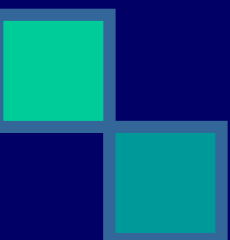



Technical issues

- How to prevent the bottle-neck failure of the single access point for MCS ?
 - A mirrored MCS server should be used automatically to replace the one is down
 - How to select a server for storing and/or replicating data provided by a data producer ?
 - Need a monitoring service to determine the capacity of each node in the grid
 - Easily reconfigure the topology of the grid when adding/removing a node.
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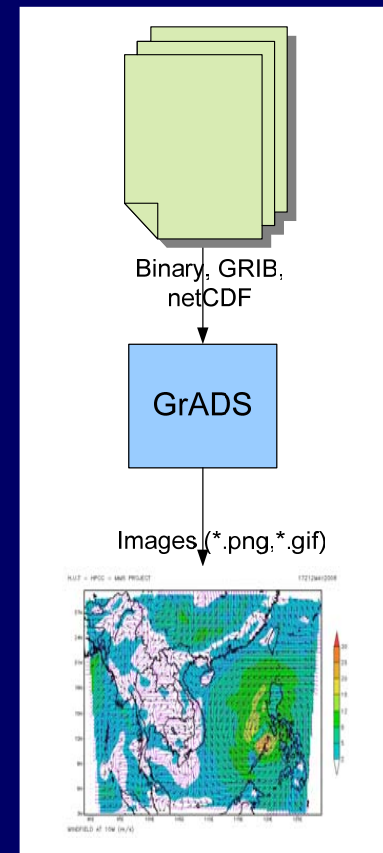


Upload meteorology data

- Datasets computed from modeling (GRIB, NetCDF files) have to be automatically stored to the data grid with associated metadata
 - The metadata are extracted from the datasets themselves and associated with some additional information such as date, publisher, model, etc.
 - Tools for analyzing and extracting metadata:
 - WGRIB (for GRIB files)
 - NCDUMP (for NetCDF files)
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GrADS (Grid Analysis and Display System)

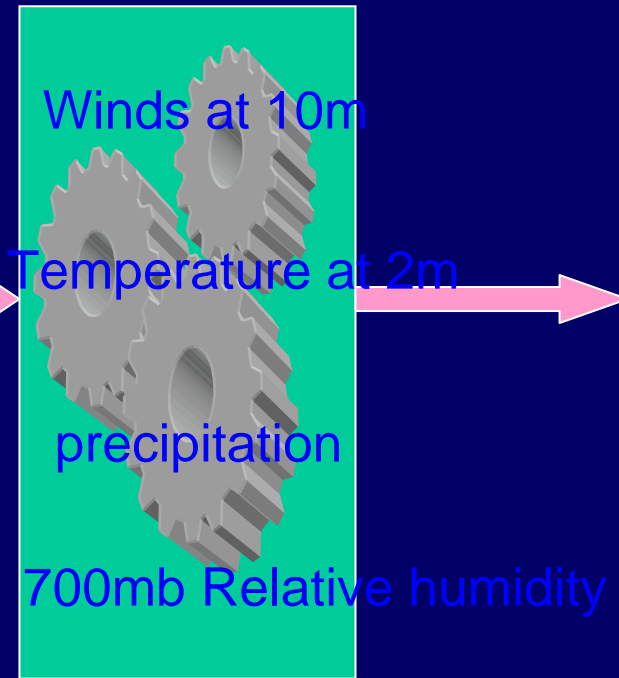
- An interactive desktop tool providing easy access, manipulation and visualization of earth science data.
- Using a 4-Dimensional data environment: longitude, latitude, vertical level, and time.
- Providing a programmable interface (scripting language) to support the development of more sophisticated visual applications.



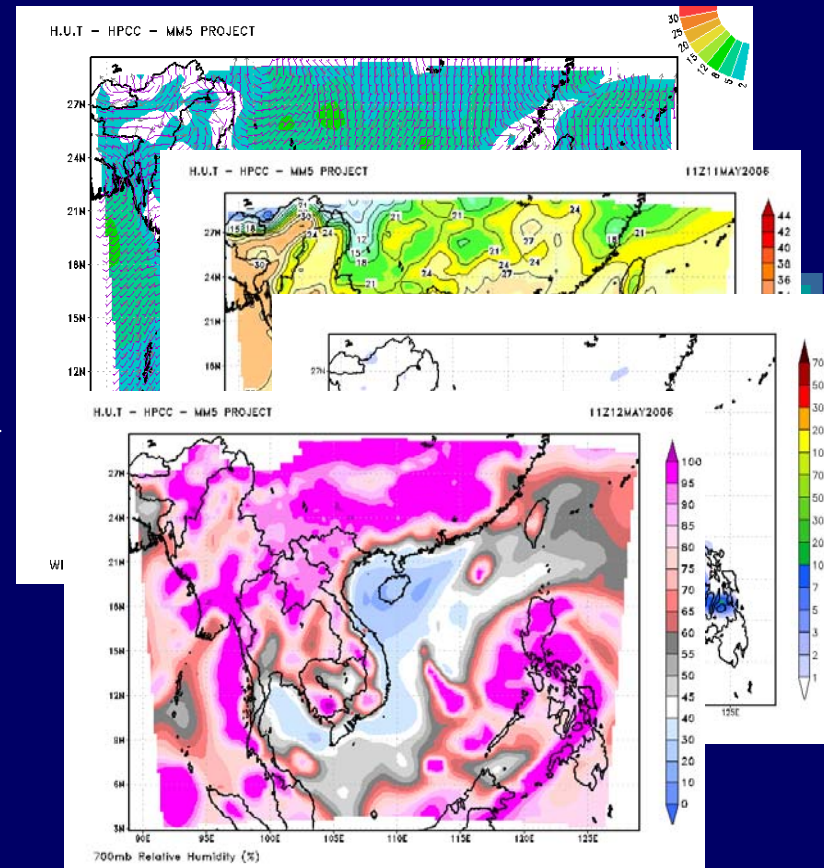
Deployment of GrADS

- Run GrADS as a server to provide daily images for weather forecasting

Daily
Grib
file

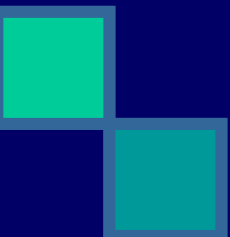



GrADS service






Deployment of GrADS (cont.)

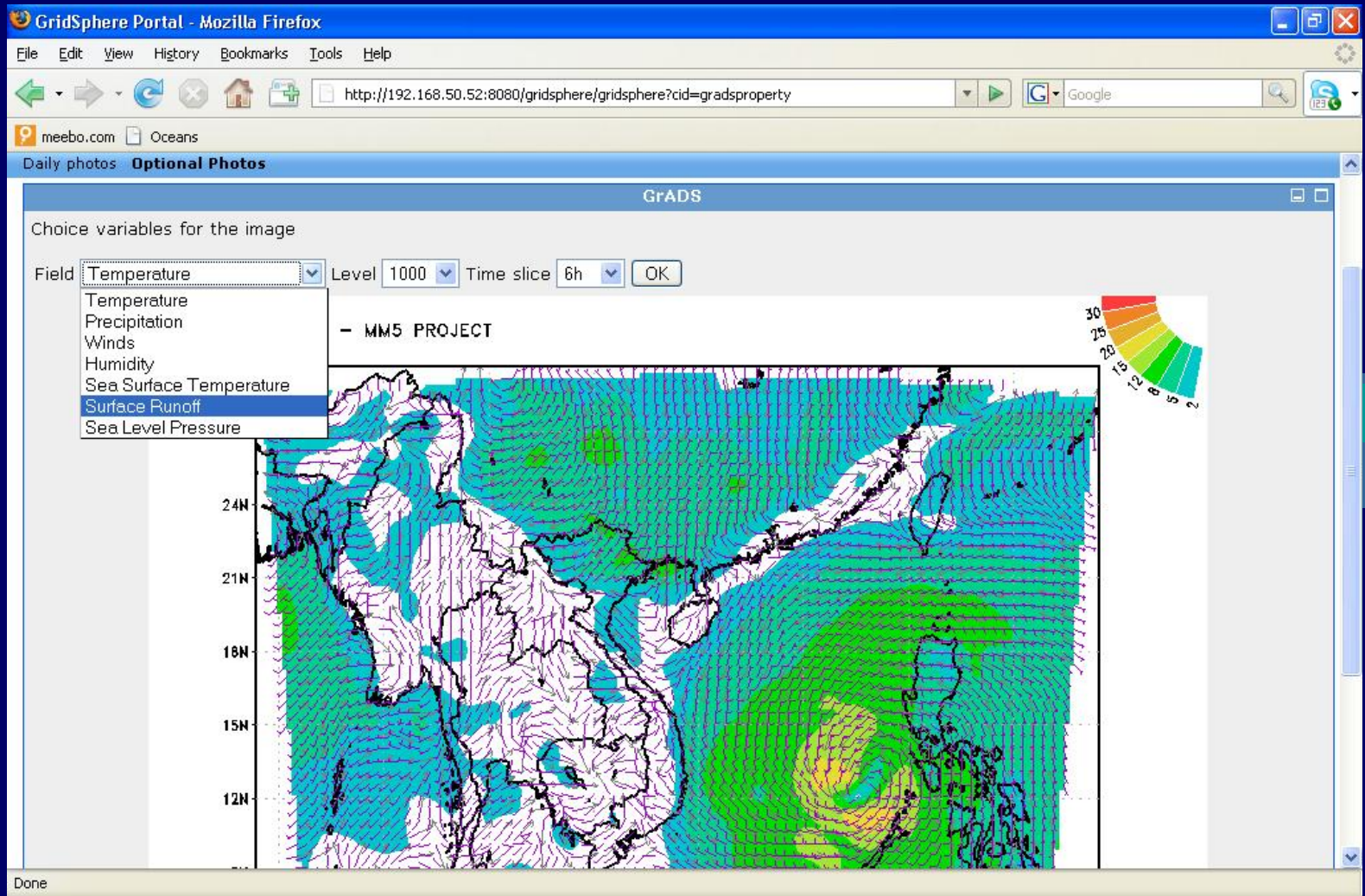
- An on-demand service receives user's requests to create a graphic visualization for a given grib file
 - Input: user request parameters
 - field: temperature, winds, dew point,...
 - level: 1000mb, 950mb, 925mb,...
 - time slice: 0h, 6h, 12h, 18h,...
 - Output: images (*.gif)
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Building Grid Portal


- Grid portal is a gateway to access easily to the data grid
 - The Gridsphere framework is used to develop the portal as a composition of portlets
 - 5 portlets to be developed
 - **Information Portlet** shows the newest information of whether forecasting in form of images
 - **Search Portlet** provides an interface for querying meteorology data in the data grid
 - **GrADS Portlet** displays meteorology data using graphically
 - **User management Portlet** manages user accounts
 - **System management Portlet** setups and configures operational parameters of the data grid
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Prototype





Discussion

- We share the same idea of building a meteorology portal much like the Korean Meteo-DataGrid in K*Grid project
 - But following different approaches
 - K*Grid: Try to integrate data servers using LAS (Live Access Server). Agent-based searching is provided through multiple data servers
 - VNGrid: Exploit the data grid services of GT4 for setting up a virtual database
 - The next generation of data grid that provides seamless, reliable, secure and inexpensive access to resources will be Semantic Grid
 - Data grid + Semantic Web
 - Semantic Web technologies should be exploited to facilitate geographically distributed meteorological scientists to resolve complex scientific problems corporately
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Thanks For Your Attentions