

Enabling Grids for E-sciencE

# Flood application on gLite

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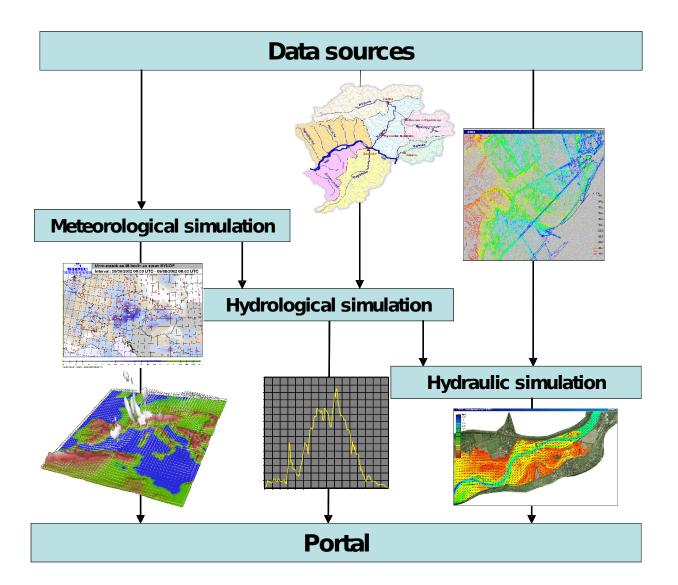
## **GGCC** History of Flood application

- **c**nabling Grids for E-sciencE
- Flood application is continually developed in
  - ANFAS: datA fusioN for Flood Analysis and decision Support, (2000-03) IST-1999-11676
    - Data fusion, hydraulic modeling
    - Cluster computing
    - Remote processing
  - CrossGrid: Development of Grid Environment for Interactive Applications (2002-05) IST-2001-32243
    - More models (meteorology, hydrology)
    - Grid computing
    - Metadata catalog
    - Portal
  - EGEE: Enabling Grids for E-sciencE (2004-2006) INFSO-RI-508833
    - Porting to gLite
    - Working in Earth Science Research Virtual Organization (ESR VO)
  - Kwf-Grid (Knowledge Workflow Grid)
    - Porting to web services
    - Building knowledge system for flood application
- Collaboration with Slovak Hydro-meteorological Institute
- INFSO-RI-508833 and Slovaki Mater Research, lestitute (Werd) December 6-7



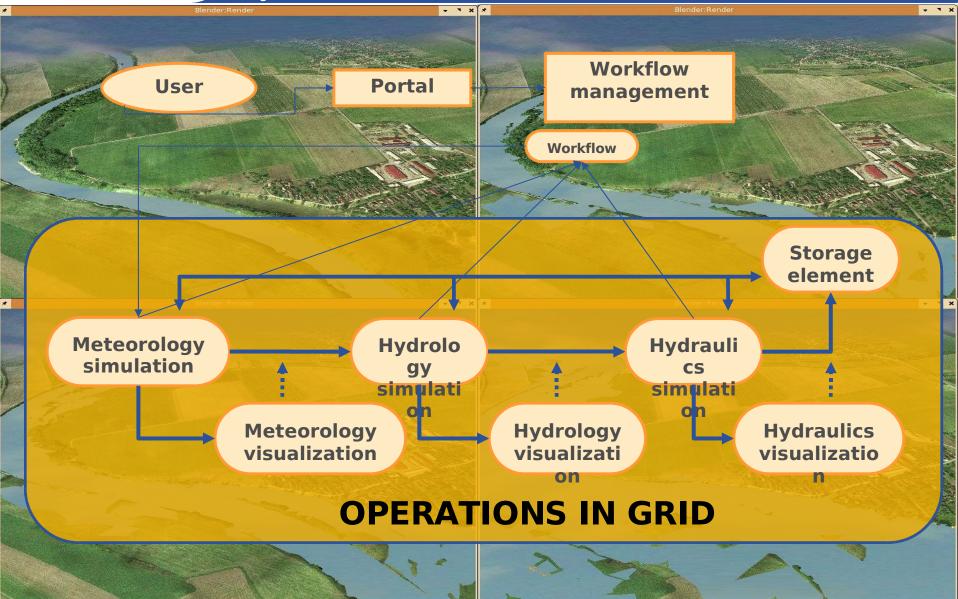
#### Flood forecasting problem

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### **Simplified scenario**

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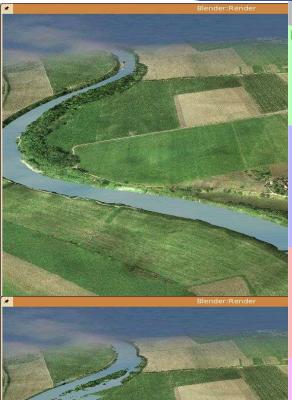


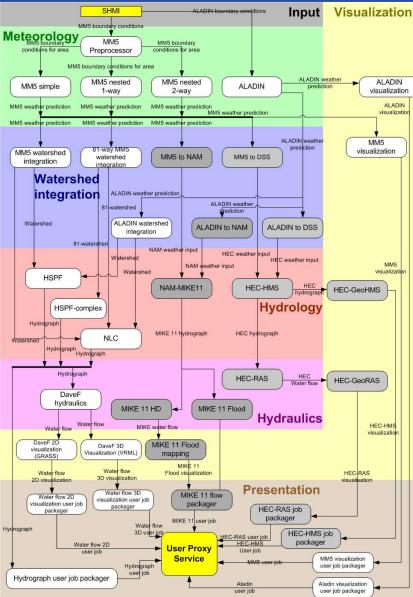
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#### **Full scenario**

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#### For critical situations

- Needs to run many scenarios at the same time (worstcase scenarios for risk analysis)
- Needs to have results as accurate as possible (higher resolutions for simulations -> higher computational power)
- Needs to have results as soon as possible (every minute is important)
- ⇒Needs grid computational power

#### • For collaborations:

- Different user groups: meteorology, hydrology, hydraulics, river authorities, crisis team, ...
- Different countries: for international rivers like Danube
- Sharing resources: data, computational powers, expertise, ...

INFSO-RI-508833 Grid is the fleet prover of the fleet of



#### Portal is accessible from anywhere:

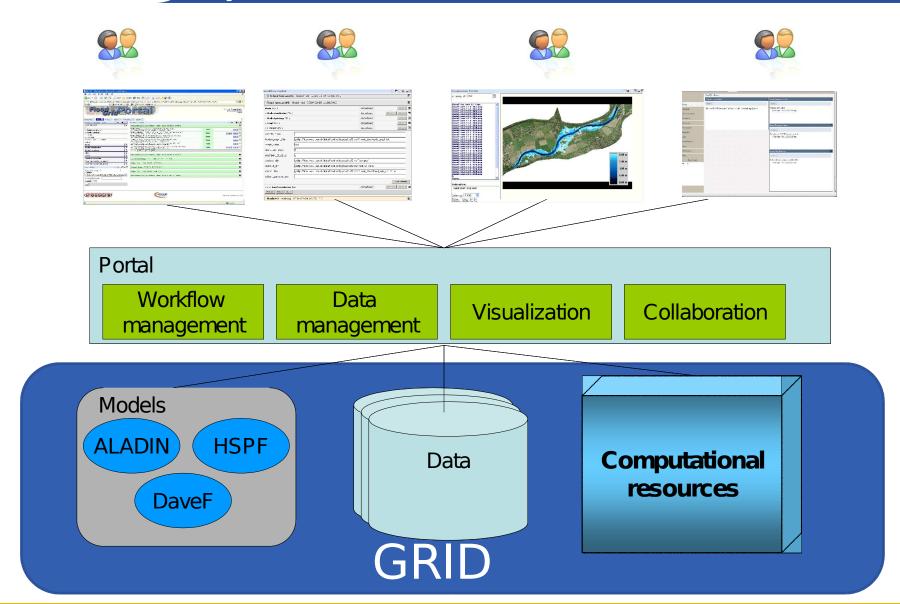
- Needs only network connection and web browsers
- Users can use portal also from mobile devices (very important for field work)
- Portal is the "meeting point" for users:
  - Users need to collaborate on flood forecasting

#### Portal hides complexity of Grid computing:

- The main users of the portal may be experts in meteorology, hydrology, ... but not in Grid computing
- Portal increases the security
  - Some data and information from flood forecasting are sensitive
  - Portal has additional security level
  - Users cannot run other code than the portal allows

#### **FloodGrid Portal**

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- Manages and executes jobs with data dependences
- Cooperates with gLite resource broker to find suitable computing element for running simulation
- Monitors status of jobs
- Abilities to use predefined workflow templates, spawning running workflow, modifying parameters of jobs



#### **Workflow management**

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Workflow Portlet 🖉 🗟 🖉 🔤 🗖			
(T)Flood forecast#3	L Undefined 2004-02-25 11:06:16.0		Ø
Flood forecast#2	Indefined 2004-02-25 11:06:54.0		
Aladin (ID: )		Undefined	Output 🛛
Aladin visualization (ID: )		Undefined	Pictures Output 🔽
• Aladin hydrology (ID: )		Undefined	Output 🛛
••Hspf (ID: )		Undefined	Output 🔽
••• Davef (ID: )		Undefined	Output
create_time			
hydrograph_file	gsiftp://flood-vo.ui.sav.sk/data/flood-vo/hydraulics/DaveF/input_data/hydrograph.txt		
start_date	last		
duration_days	1		
number_of_cpus	3		
scripts_dir	gsiftp://flood-vo.ui.sav.sk/data/flood-vo/hydraulics/DaveF/scripts/		
output_dir	gsiftp://flood-vo.ui.sav.sk/data/flood-vo/hydraulics/DaveF/output_data/		
mesh_file	gsiftp://flood-vo.ui.sav.sk/data/flood-vo/hydraulics/DaveF/input_data/davef_vah_river.2dm		
other_parameters			
			load defaults
••••Davef visualization (ID: )		Undefined	Pictures Output
Submit Clone Save			
Aladin#3 Waiting 2004-02-24 10:55:15.0			



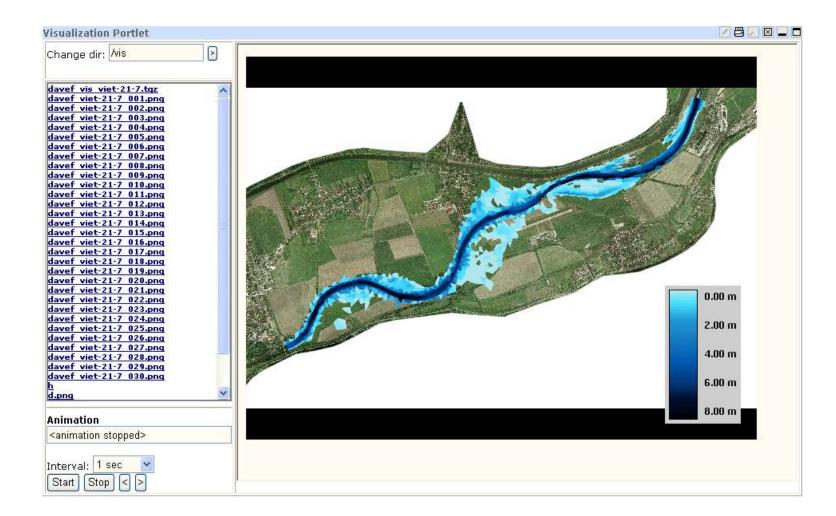
- Many kinds of data in FloodGrid
  - Meteorological, hydrological, hydraulic
  - Generated by simulations or obtained from sensors
  - Permanent or periodically updated
  - Publicly available or with restricted access
- Using metadata catalog for describing data
- Data are stored in storage elements and are accessed via Grid protocols
- Operation: query, adding, modification, deleting



- Multiple visualization modes according to models and visualization tools
  - Texts
  - Pictures
  - Animations
  - Virtual reality



#### Visualization





#### Visualization in Virtual Reality

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#### In cooperation with GUP, Joh. Kepler





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- **Different users groups (experts in** meteorology, hydrology, hydraulics, crisis team, river authorities) need to collaborate on flood application
- Portal provides different means of communication among users: chats, mailing lists, discussion groups, file sharing
- Collaboration via other shared tools of portal



#### Collaboration

Apr 16, 2004 08:54 am My Workspace FloodGrid Resources Home Revise... Select all New... Delete Cut Copy Replace... Schedule Location: 🛱 FloodGrid 🗓 Announcements Resources Created By Title 🛎 Size Last Modified Discussion FloodGrid Current state i) 691 KB Apr 01, 2004 01:43 pm Chat Administrator FloodGrid 1 Flood portal 1 KB Apr 01, 2004 01:44 pm News Administrator FloodGrid i] 🔲 🔮 Globus home page Workflow 1 KB Apr 01, 2004 01:59 pm Administrator FloodGrid 1 Today's news Apr 01, 2004 01:45 pm 1 KB Administrator Logout Customize **Users Present** FloodGrid Admin < . >

| CrossGrid main site | CrossGrid testbed | II SAS | OGCE |





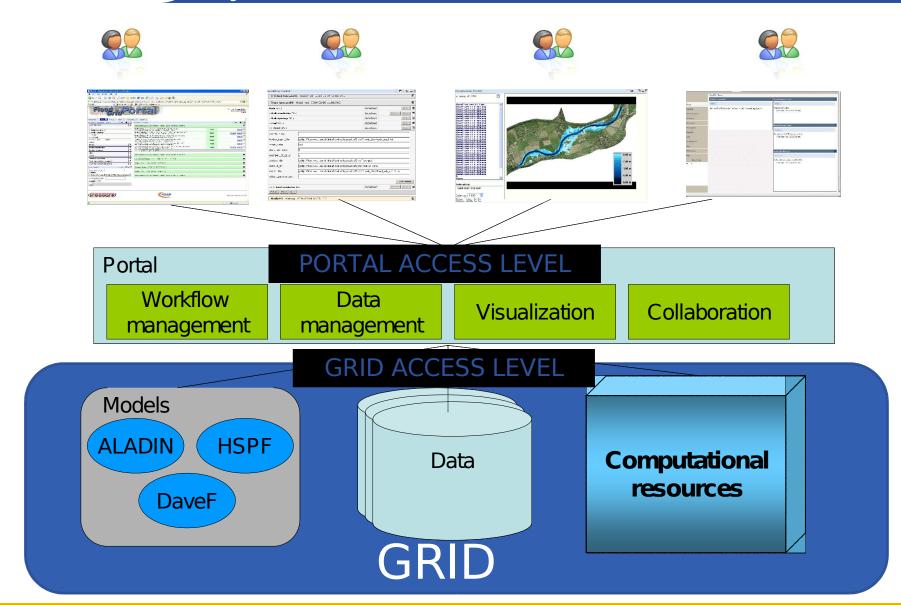
- Two level of securities: Portal level and Grid level
- Portal level:
  - Secure HTTP access
  - Authentication by user names/passwords
  - Access controls for every tools/resources at portal (individually or by groups)
  - Only for accessing tools/resources located on portal. For accessing physical data, models or computing resource, Grid certificates are needed

#### • Grid level:

- Authentication by Grid certificates
- Using Grid communication protocols

Security

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# Live demonstration on GILDA

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**GGCC** Flood application and gLite

- Requirement: Different user groups (experts, river authorities, crisis team, public) have different access rights to resources
  - In LCG, all users in a virtual organization have the same right, they need to trust each other
  - That can be considered as security hole: any person in VO can read/modify/delete shared data of whole VO
  - This problem was partially solved using access control in portal

#### gLite provides solutions for this problem

- VOMS with different access rights for different user groups
- ACL (Access Control List) support for data management

#### • Job submission has been ported to gLite

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- Flood forecasting can save many lives and money
- Grid computing is needed:
  - For faster simulations
  - For more accurate results
  - For connecting people and resources together
- gLite provides new features for improving security of flood applications

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#### Future work: Flood application for international river

