
Insights from a „model operations“ group

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„Model Operations“? What for?

Models = common good of a working group

Model maintenance and technical coordination is needed

Its importance increases with increasing model size

Conflict of interest between work on scientific issues and model maintenance

→ Model Operations group

Tasks / Goals

Increase efficiency in model development

Organizing

Set up commonly used platforms (e.g. Redmine)

Introduce guidelines and standards for code development and documentation

Consulting

Assist model developers in technical questions („help desk“)

Giving advice in numerical optimization issues

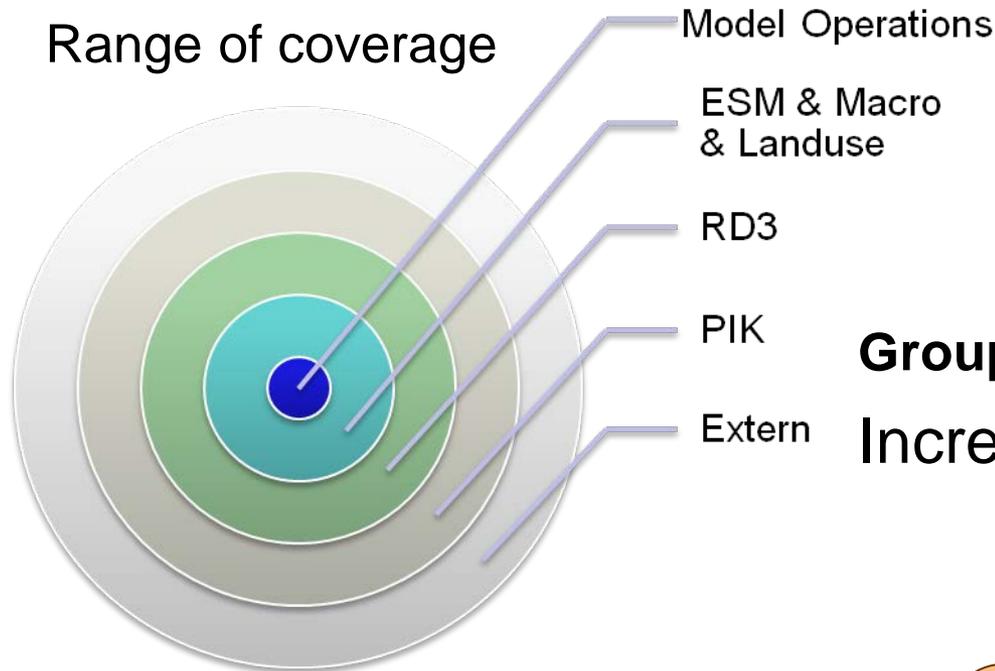
Having an overview about the full spectrum of code development in RD3

Programming

Developing own tools as requested by the working groups

Implement ideas of code optimization/run time reduction

„Model Operations“ in RD3 at PIK



David Anastasis Lavinia Jan

Group Agenda / Research Focus:
Increase Efficiency

**Model efficiency
tools**

- code optimization
- modularization

**Work efficiency
tools**

- standardization
- technical consulting
- management tools

Examples for increasing efficiency

1. Coding Etiquette
2. Subversion Management (SVN)
3. Synchronization of Models
4. Platform for coordination (Redmine)
5. Standard for inter-model communication
6. ...

Example 1: Coding Etiquette

Collection of guidelines for writing Code:

- Item Naming
 - Units
 - Commenting
 - Introduction of mathematical formulas
 - ...
-
- Also: tools for renaming/checking code

Example 1: Coding Etiquette

Old:

```
labbal(t, regi) $ (t.val.ge.p_year_first) ..  
... vari(t, regi, "lab") .  
... =e= .  
... datalab(t, regi) ;
```

New:

```
q_labbal(t, regi) ..  
... v_vari(t, regi, "lab") .  
... =e= .  
... p_datalab(t, regi) ;
```

Example2: Subversion Management (SVN)

- Manages changes to files and directories happening over time
- All previous versions are available, including deleted files
- Collaborating on the same source code is easier

The screenshot shows the TortoiseSVN Log Messages window for the path C:\Documents and Settings\lavinia\My Documents\MEINS...\REMIND_head. The window displays a list of revisions from 4351 to 4370, with revision 4367 selected. The messages describe various bugfixes and improvements to the REMIND model, such as adding shift factors, updating reporting, and cleaning up code.

Revision	Actions	Author	Date	Message
4370		strefler	Donnerstag, 16. Januar 2014 12:38:15	
4369		schultes	Donnerstag, 16. Januar 2014 09:52:23	*gdx-neutral* bugfix and improve r4358.
4368		lavinia	Mittwoch, 15. Januar 2014 18:10:24	*gdx-neutral* reformulation of the discounting in the equation q_globw
4367		dklein	Mittwoch, 15. Januar 2014 17:56:51	*gdx neutral* Added calculation of shift factors, that are used if REMIND
4366		strefler	Mittwoch, 15. Januar 2014 17:15:02	*gdx neutral* set so2tax_scen in exp.inc to zero as standard
4365		strefler	Mittwoch, 15. Januar 2014 17:10:41	*small gdx effect* n2o emissions are no longer associated with PE const
4364		strefler	Mittwoch, 15. Januar 2014 14:40:06	*gdx neutral* prevent reporting of zeros for fixed open burning emissio
4363		strefler	Mittwoch, 15. Januar 2014 13:39:09	*gdx neutral* extended flag so2_outof_opt to bc and oc
4362		strefler	Mittwoch, 15. Januar 2014 12:17:30	*gdx neutral* added flag to exclude so2 from optimization routine. espe
4361		schultes	Mittwoch, 15. Januar 2014 10:27:30	*gdx-neutral* another most stupid bug in the last commits. sorry.
4360		schultes	Dienstag, 14. Januar 2014 14:53:35	*gdx-neutral* Bugfix to last commit
4359		schultes	Dienstag, 14. Januar 2014 11:10:49	*gdx-renaming* update to last commit, some renaming and simplification
4358		schultes	Dienstag, 14. Januar 2014 07:52:13	*gdx-renaming* update the procedure by which Negishi weights are ex
4357		lavinia	Montag, 13. Januar 2014 17:26:27	*gdx-neutral* deleted redundant bound
4356		leimbach	Montag, 13. Januar 2014 16:17:56	*gdx neutral* additional parts of Nash climate policy implementation (re
4355		pehl	Montag, 13. Januar 2014 14:45:29	gdx-neutral updated calculation of production function derivatives
4354		lavinia	Freitag, 10. Januar 2014 14:24:39	*gdx-neutral* formulated q_rencnst2 as bound instead of equation
4353		lavinia	Freitag, 10. Januar 2014 11:35:03	*gdx-neutral* bugfix of commit 4350
4352		strefler	Donnerstag, 9. Januar 2014 17:59:20	*gdx neutral* cleaned code such that gtree compiles again
4351		lavinia	Donnerstag, 9. Januar 2014 17:30:01	*gdx-neutral* renamed o10_emicaolob into om_emicaolob. updated

The selected message for revision 4367 is expanded to show the following text:

```
*gdx neutral* Added calculation of shift factors, that are used if REMIND runs in coupled mode with MAgPIE
- coupled mode has to be activated by setting cfg$gms$cm_MAgPIE_coupling to 1.
- based on exogenously given bioenergy production, bioenergy prices and bioenergy costs (from a MAgPIE reporting
that has to be provided) REMIND calculates shift factors that shift the supply curves of the MAgPIE emulator
according to the difference between actual MAgPIE and emulator results.
- the exogenous values are obtained from a MAgPIE reporting mif file and written in REMIND input files
- to perform this step the the R function start_report_run has to be called before starting REMIND
```

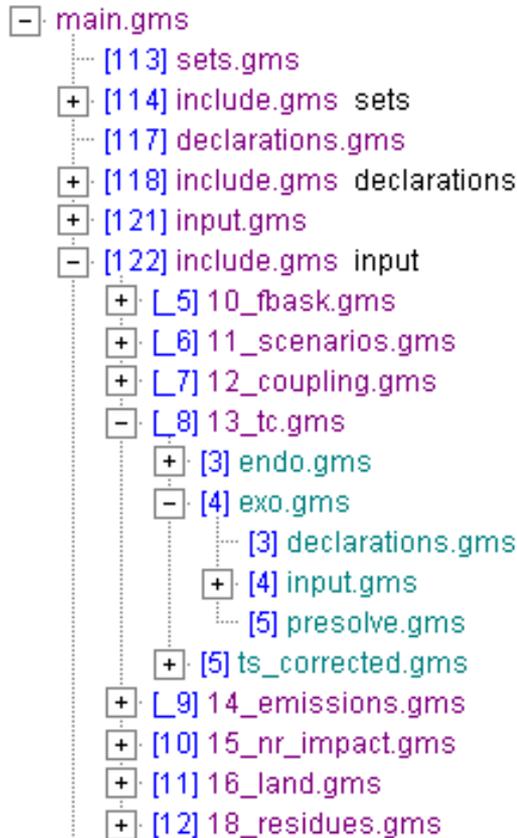
Below the log messages, a table shows the paths of files that were modified or deleted in the selected revision:

Path	Action	Copy from path	Revision
/trunk/config/default.cfg	Modified		
/trunk/core/datainput.gms	Modified		
/trunk/core/reporting.gms	Modified		
/trunk/main.gms	Modified		
/trunk/modules/30_biomass/magpie/datainput.gms	Modified		
/trunk/modules/30_biomass/magpie/declarations.gms	Modified		
/trunk/modules/30_biomass/magpie/equations.gms	Modified		
/trunk/modules/30_biomass/magpie/reporting.gms	Deleted		

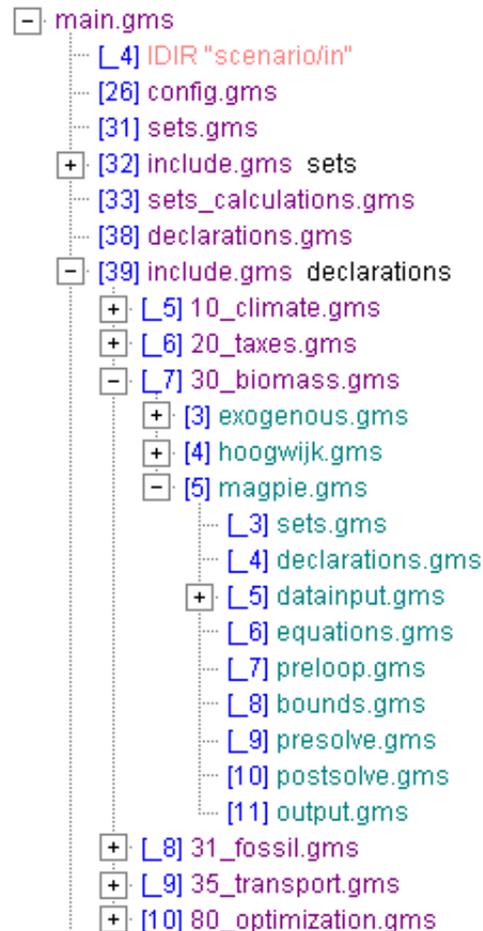
At the bottom of the window, there are controls for showing 100 revisions, with options to show only affected paths, stop on copy/rename, and include merged revisions. Buttons for 'Show All', 'Next 100', 'Refresh', 'Statistics', 'Help', and 'OK' are also present.

Example 3: Synchronization of Models

MAgPIE



REMIND



Modularization:

- Clear definition of interfaces between modules and core
- Possibility to work at new realization of a module without interference of existing realizations

- Common structure
- Common tools

Example 4: Platform for coordination (Redmine)

Model Operations Wiki:

- Tutorials
- Issues
- Support Forum



Home My page Projects Administration Help

Model Operations

Overview Activity Issues New issue News Wiki

Forums

Forum

Thoughts & Comments

A place for general discussions related to Model Operations

Questions / Problems

Here you can ask your questions or discuss your problems in model development

Home My page Projects Administration Help

Model Operations

Overview Activity Issues New issue News Wiki

Wiki

- Model Operations Team
 - Profile
 - Projects
- Reports
 - Meeting Steven Dirkse GAMS 23-08-2012
- Standards
 - Coding Etiquette
 - Model Intercomparison File Format
- Tutorials
 - Archive data
 - How to kill a GAMS run on console
 - How to rename variables in a GDY
 - Installation Help
 - Installed macros
 - Needed Programs
 - PhD how to
 - PIK's Filesystems and Servers
 - Redmine access from outside PIK
 - Redmine project help

Example 5: Standard for inter-model communication

Model Inter-comparison File format (.mif):

- Tool developed for model communication
- Provides a standard for model input and output
- Helpful for inter-model comparison and coupling models

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	Model	Scenario	Region	Variable	Unit	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060	
600	REMIND	performa	EUR	Cap Electricity Gas w	GW	1.37E+02	1.57E+02	1.65E+02	1.89E+02	2.31E+02	2.77E+02	3.14E+02	3.43E+02	3.66E+02	3.85E+02	3.91E+02	3.70E+02	2.7
601	REMIND	performa	EUR	Cap Electricity Gas w	GW	0.00E+00	0.0											
602	REMIND	performa	EUR	Cap Electricity Gas C	GW	0.00E+00	0.0											
603	REMIND	performa	EUR	Cap Electricity Gas C	GW	6.01E+01	8.11E+01	9.97E+01	1.35E+02	1.88E+02	2.46E+02	2.93E+02	3.32E+02	3.63E+02	3.85E+02	3.91E+02	3.70E+02	2.7
604	REMIND	performa	EUR	Cap Electricity Geothi	GW	9.86E-01	1.47E+00	1.45E+00	1.53E+00	1.81E+00	2.18E+00	2.51E+00	2.90E+00	3.57E+00	3.95E+00	3.95E+00	3.95E+00	3.9
605	REMIND	performa	EUR	Cap Electricity Nucle	GW	1.45E+02	1.40E+02	1.30E+02	1.21E+02	1.12E+02	9.74E+01	8.53E+01	7.69E+01	6.74E+01	5.73E+01	4.70E+01	3.64E+01	1.5
606	REMIND	performa	EUR	Cap Electricity Oil w	GW	2.70E+01	2.23E+01	1.62E+01	1.06E+01	6.13E+00	2.36E+00	1.00E-02	1.00E-02	1.00E-02	1.00E-02	1.12E-02	1.00E-02	1.0
607	REMIND	performa	EUR	Cap Electricity Solar	GW	9.05E-01	3.04E+01	5.95E+01	5.89E+01	5.71E+01	5.28E+01	4.42E+01	2.93E+01	6.13E+00	3.63E+01	3.92E+01	3.82E+01	4.1
608	REMIND	performa	EUR	Cap Electricity Solar	GW	0.00E+00	4.90E-01	9.79E-01	9.71E-01	9.43E-01	8.74E-01	7.36E-01	4.92E-01	1.40E-01	8.54E-02	9.23E-02	8.99E-02	1.0
609	REMIND	performa	EUR	Cap Electricity Solar	GW	9.05E-01	3.00E+01	5.85E+01	5.80E+01	5.62E+01	5.19E+01	4.34E+01	2.88E+01	5.99E+00	2.78E-01	3.00E-01	2.93E-01	3.1
610	REMIND	performa	EUR	Cap Electricity Hydro	GW	8.62E+01	8.69E+01	8.25E+01	7.73E+01	7.20E+01	6.69E+01	6.29E+01	6.07E+01	6.14E+01	6.60E+01	7.55E+01	8.99E+01	1.3
611	REMIND	performa	EUR	Cap Electricity Wind	GW	2.76E+01	7.65E+01	1.14E+02	1.17E+02	1.16E+02	1.07E+02	9.04E+01	7.51E+01	9.66E+01	1.15E+02	1.29E+02	1.50E+02	2.3
612	REMIND	performa	EUR	Idle Cap Electricity C	GW	0.00E+00	0.0											
613	REMIND	performa	EUR	Idle Cap Electricity G	GW	0.00E+00	0.0											
614	REMIND	performa	EUR	Idle Cap Electricity O	GW	0.00E+00	0.0											
615	REMIND	performa	EUR	Total Cap Electricity C	GW	1.59E+02	1.54E+02	1.34E+02	1.14E+02	9.41E+01	7.49E+01	5.63E+01	3.96E+01	2.71E+01	2.29E+01	3.49E+01	6.58E+01	1.6
616	REMIND	performa	EUR	Total Cap Electricity C	GW	1.37E+02	1.57E+02	1.65E+02	1.89E+02	2.31E+02	2.77E+02	3.14E+02	3.43E+02	3.66E+02	3.85E+02	3.91E+02	3.70E+02	2.7
617	REMIND	performa	EUR	Consumption	billion US	7.15E+03	7.20E+03	9.37E+03	1.13E+04	1.34E+04	1.56E+04	1.80E+04	2.07E+04	2.35E+04	2.66E+04	3.01E+04	3.32E+04	3.8
618	REMIND	performa	EUR	Emi Allowances	Mt CO2-e	4.43E+03	4.40E+03	4.07E+03	3.98E+03	4.03E+03	4.04E+03	4.09E+03	4.13E+03	4.18E+03	4.26E+03	4.33E+03	4.5	
619	REMIND	performa	EUR	Emi CH4	Mt CH4/y	2.69E+01	2.57E+01	2.57E+01	2.56E+01	2.56E+01	2.58E+01	2.62E+01	2.69E+01	2.81E+01	2.87E+01	2.96E+01	2.90E+01	3.0
620	REMIND	performa	EUR	Emi CH4 Energy Supp	Mt CH4/y	7.24E+00	6.01E+00	5.46E+00	4.99E+00	4.78E+00	4.92E+00	5.31E+00	5.87E+00	6.69E+00	7.60E+00	8.33E+00	8.57E+00	1.1
621	REMIND	performa	EUR	Emi CH4 Land Use	Mt CH4/y	1.23E+01	1.21E+01	1.20E+01	1.19E+01	1.18E+01	1.15E+01	1.13E+01	1.13E+01	1.14E+01	1.12E+01	1.10E+01	1.05E+01	9.4
622	REMIND	performa	EUR	Emi CH4 Other	Mt CH4/y	0.00E+00	0.0											
623	REMIND	performa	EUR	Emi CH4 Waste	Mt CH4/y	7.39E+00	7.62E+00	8.25E+00	8.72E+00	9.07E+00	9.31E+00	9.57E+00	9.69E+00	1.00E+01	9.90E+00	1.03E+01	9.87E+00	1.0
624	REMIND	performa	EUR	Emi CO2	Mt CO2/y	4.52E+03	4.50E+03	4.17E+03	4.08E+03	4.14E+03	4.15E+03	4.15E+03	4.20E+03	4.23E+03	4.28E+03	4.36E+03	4.44E+03	4.6
625	REMIND	performa	EUR	Emi CO2 Carbon Capt	Mt CO2/y	0.00E+00	0.0											

Thank you for your attention !

Questions are welcome