The OpenDA Association

Annual Report 2010

Annual report of the OpenDA Association

Version	Date	Author	Description	Review
0.1	January 4, 2011	MR	Concept	NV
0.2	January 6, 2011	MR	Comments by NV, added financial report	MV, AH, HG, SH, EL
0.3	January 20, 2011	NV	Added feedback from JHS and EL	MV, AH, HG, SH, EL
0.4	March 11, 2011	NV	Added feedback from JHS+comments stated at annual meeting	
0.5	April 26, 2011	NV	Added feedback from AH	
0.6	May 16, 2011	NV	Added feedback from MV+SH	

1. Introduction

According to its charter, the OpenDA Association has the purpose to organize the product management, coordinate product development, and promote the OpenDA software toolbox for model calibration and data assimilation. This report gives an overview of the events and activities in 2010, gives the current status and provides an outlook on next year.

2. Overview of 2010

The past year has been a momentous year for OpenDA, with the start of the association itself, the first release of the software as Open Source, and a lot of projects in which OpenDA is applied.

2.1. Product management

On January 15th the management team of Deltares agreed to start the OpenDA association together with VORtech and the EWI faculty of Delft University of Technology. Also it agreed to release its own DATools developments as part of the OpenDA software. This was an essential step towards the integration of the DATools and COSTA developments into OpenDA.

The product management in 2010 has been organized in a rather ad-hoc way, driven mainly by the wish (formulated by Herman Gerritsen from Deltares) for a formal release of OpenDA version 1.0 in May. Given the strong commitment from all those involved, this informal setting turned out to function well. In fact the management of the product was organized on two levels: a technical level and a management level.

On the technical level decisions regarding the contents of this first release of OpenDA were made in a close cooperation between people from Deltares (in particular Martin Verlaan and Stef Hummel) and from VORtech (Nils van Velzen and Erwin Loots)**.**

On the management level, there has been a close cooperation between Karel Heynert (Deltares), Arnold Heemink (TU-Delft) and Mark Roest (VORtech) to organize the start of the OpenDA association, to provide the context for the technical people and to coordinate the promotion. This forum (with Karel being replaced by Martin) continued to form the first board of the OpenDA association. The board of the association convened on two occasions: on June 20th and on December 21st/23rd. In the latter meeting, the board of the association evaluated the experiences of the first year and determined the plans for the next year.

Simone de Kleermaeker from Deltares did the coordination of all activities on both the technical and the management levels.

After the release of version 1.0 no further releases were done, although the development continued, mainly through the use of OpenDA in various application at Deltares. A version management system has been set up to enable the management of the software. Also, a sourceforge account has been created from which new releases can be downloaded.

2.2. Product development

In the first few months of 2010, Deltares and VORtech have made a significant effort for realizing the first official version of OpenDA (version 1.0). This involved the full integration of DATools and COSTA, deletion of parts that had become superfluous, addition of several essential features and, perhaps most significantly, extensive documentation. In particular, the following developments have taken place:

- Improved error handling: errors and messages generated inside the native part (C,C++ and Fortran) of OpenDA are connected to the message handlers of the Java layer of OpenDA;

- Export to NetCDF: writing of treevectors are (because of performance) completely handled by the native part of OpenDA. Within the Java layer, the NetcdfResultWriter has been introduced for this purpose. Conversely, the tree-structure can be reconstructed when reading such a created netcdf-file.

- Reorganization of the Observer and the Resultwriter. This work is only partially done. There is still quite some work to be done.

- Parallel computing; the parallel computing functionality for native model implementations, as previously available in COSTA, is now available as well in OpenDA.

With respect to wrappers:

- Coupling to FEWS. The Coupling of OpenDA to FEWS was only an initial version. It will be improved this year.

- Coupling to SWAN; Coupling to SWAN is developed under the framework of black-box wrapping. Since the black-box wrapper is already available in OpenDA, the required work is simply the development of a number of exchangeItems for reading and writing SWAN input or output files. The wrapper has been tested using a twin experiment, with a tiny SWAN model and the EnKF algorithm. The test indicates a promising result.

- Coupling to Delft3D; On a separate development branch of Delft3D, the Delft3D-Flow dll can be created. This dll can be connected to the OpenDA Delft3D wrapper. Using this, ensemble Kalman simulations for commercial projects are routinely performed. The wrapper enables the user to impose noise on wind forces and on all existing boundary types.

- Coupling to Waqua: the implementation for calibration was finished and is now operational and used in projects. Quite some work went into the Kalman filtering/native part. It should become operational in 2011.

2.3. Promotion

The release of version 1.0 in May has been used as a focal point for activities regarding promotion of OpenDA. A website was created on which all information about OpenDA can be found (www.openda.org).

A special session has been organized in the JONSMOD2010 conference to announce and celebrate the release of OpenDA 1.0. Five presentations related to OpenDA were in this special session to highlight the experience that has already been obtained with the software and its immediate precursors.

To attract attention for OpenDA, a press release was issued that led to publications in the online versions of the Dutch journal Automatiseringsgids, Scientific Computing and the EARSC network. In addition, OpenDA has been presented at several conferences (HIC2010, EGU2010) and workshops (JONSMOD2010, Floodcontrol, DA workshop) and papers have been submitted for journals (Computers & Geosciences, Ocean Dynamics) and conferences (EWRI, IAHR, MTEC). Finally, leaflets have been created that highlight the power of OpenDA for several applications. These are available in print (for conferences) and on the website.

Also within Deltares, OpenDA has been strongly promoted, leading to a significant uptake of the toolbox in numerous applications (see appendix). A significant development in 2010 is that the development team of the Flood Early Warning System (FEWS) decided to accept the OpenDA interface for communicating with hydrological models. As FEWS is installed at numerous places all over the world, this implies a significant increase in the installed base of OpenDA. A further important development was the use of OpenDA in the cooperation between Deltares and Singapore.

The partners of the openDA association are also involved in the Sangoma FP7 proposal, which aims at the development of common data-assimilation tools on a European level. Here there might be new possibilities to jointly develop towards common tools.

3. Current Status

Currently, by the end of 2010, we have a firm basis for further development. The cooperation between the partners in the association is strong, there is a comprehensive first release of the software and quality of the software is quickly improving through the use in numerous applications.

3.1. Product management

The product management is actually done by the people who use the OpenDA software to construct data-assimilation functionality for applications (which is natural for an Open Source product). These people run into problems that must be solved and challenges that must be met. The software thus evolves organically and autonomously.

However, the board of the OpenDA association concludes that this does not necessarily produce a stable and reliable product. For example, errors that have not been corrected by one developer are rarely corrected by another developer unless the error is actually in the way. Eventually, this causes parts in the version management database to go untested. This calls for a stronger enforcement of quality assurance. The board makes it a priority to organize procedures that will guarantee the product quality before it becomes a problem.

At this stage, there is a strong discrepancy between the publicly available release 1.0 (build 1630) and the version that is available for the internal developers (build 1976). Thus, many errors have been corrected that are still in the public version. This is obviously something that must be mended by building a new release soon.

3.2. Product development

As stated above, the product development is an ongoing process, driven by the needs that come from using the software.

The methods that are currently available in OpenDA function well, but there is a clear need for implementing other methods. At TU-Delft, there are very interesting developments (in particular the POD work of Umer Altaf) that would be highly welcome within OpenDA.

It turns out that the uptake of OpenDA is somewhat hampered by the fact that starting with OpenDA is often found to be problematic. Obvious improvements are the creation of a complete example that leads the novice step by step through the first stages of using OpenDA. In addition, the installation and documentation can be further improved.

3.3. Promotion

At this moment there are about 15 applications that make use of OpenDA (an overview is in the appendix). Most of these come from the hydrological sector. Other sectors with notable OpenDA use are atmospheric chemistry (LOTOS-EUROS and CHIMERE) and geosciences (MSettle, SIMGRO, MODFLOW, MStab). The results obtained with data-assimilation for these applications are promising if not outright impressive.

There is a strong feeling that OpenDA is now well-known in the Netherlands and also internationally in the hydrological sector (where Deltares has a leading position). Therefore, the focus of the

promotion must now be directed at getting people outside the original institutes to actually use OpenDA. The Dutch data-assimilation community is an obvious starting point for this. Besides, international partners of Deltares will be stimulated to use and co-develop OpenDA.

4. Outlook

4.1. Product management

The main goals for 2011 are:

- Produce a new, stable and well-tested release including all the bugfixes up until now and also including a complete example with corresponding documentation. Make sure that the release runs out of the box on all common platforms, and if needed, include versions of third party software that are needed.

- Institutionalize the quality control e.g. by nightly builds and not accepting any software that does not successfully perform all the tests.

4.2. Product development

The main goals for 2011 regarding product development are:

- Significantly simplify the first steps for new OpenDA users.

- Mac version of OpenDA

- Extend the number of implementations of data-assimilation algorithms.

- Extended support for parallel computing. The usage and configuration of parallel runs should be very easy for end users. Functionalities of the MPI-2 standard are and will be implemented in OpenDA in order to extend parallel support, and simplify usage.

- Better support for noise modeling and meta data.

4.3. Promotion

The main goals for 2011 regarding promotion are:

- Get at least two extra members in the association

- Development of OpenDA course. This course will be given to students at TUD, and the 2nd Summer School on Data Assimilation and its application in engineering.

- Presentations at scientific conferences and workshops among others including the 2nd Summer School on Data Assimilation and its application in engineering and the 9th International Workshop on Adjoint Applications in Dynamic Meteorology.

- Get at least four OpenDA users beyond the current partners by starting cooperations with interested parties and by actively stimulating the use of OpenDA in the Dutch Data Assimilation Community.

5. Financial report

Balance sheet as of December 31, 2010

Assets	December 31, 2010		Liabilities & Equity	December 31, 2010	
	€	€		€	€
Fixed assets		-	**Equity**		4851
Current assets			**Current Liabilities**		
Cash & bank balances [1]	5.755		Accounts payable		904
		5.755			5.755

Income statement for the year ended on December 31, 2010

	Debit	credit
	€	€
Revenues		
Gross revenues [2]		6750
Expenses		
Legal and professional services [3]	1864	
Bank fees	35	
Total expenses		1899
Net income		4851

Notes on the accounts

1. Bank account 1138.79.792.

2. Contribution of three partners for the period April-December 2010, based on an annual contribution of € 3000.

3. Services of the notary for the founding of the OpenDA association.

6. Appendix: models connected to OpenDA

Model	wrapper for cal.	wrapper for filtering	model available in FEWS?	cal. and filtering in FEWS?	OpenDA Leaflet?
SOBEK-RE	black box	through DATools	Yes	through DATools	
SOBEK Rural	black box	--	Yes	No	
WAQUA (SIMONA)	black box	dll is (bijna) afgerond	Yes through openDA	Planned for 2011 (RB)	Yes (DCSMv6) (cal).
D3D-FLOW	black box	dll wrapper	direct FLOW coupling with FEWS (through file exchange) through openDA? (still needs to be tested)		Yes (cal. SRM) Yes (cal. Friese Zeegat)
D3D-WAQ			direct WAQ coupling with FEWS (through file exchange)		
HBV		DATools coupling	Yes		
MCRM	Yes, through calibration module FEWS	-	yes through FEWS calibration module; is now being tested to be moved to openDA		
PCRaster	-	-	Yes through openDA		
WANDA	Almost done		?		
SWAN	Yes; as CI		Under construction; through OpenDA (JR)		Yes (cal W-Zee)
SIMGRO		Blackbox wrapper through file exchange	Yes (through openDA?)		
MODFLOW		dedicated black box wrapper with file exchange	Yes (through openDA?)		
MSETTLE	Dll wrapper not completely tested	Dll wrapper ready but untested with new OpenDA	No		
Dijkafschuiving			No		
MStab (stabiliteit)	Project plan	Project plan	No		