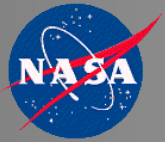


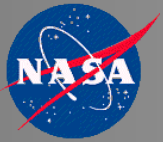
NASA Earth Science Data Systems (ESDS) Software Reuse Working Group

Presented by:
Robert Wolfe (NASA GSFC), Chair

ESIP Federation 2008 Summer Meeting
July 17, 2007



-
- Drive down the cost and time of system/software development and reduce or eliminate unnecessary duplication of effort.
 - Increase flexibility and responsiveness relative to Earth science community needs and technological opportunities.
 - Increase effective and accountable community participation.
 - Increase productivity and improve quality through reuse.
 - Increase the number of available reusable assets.



Reuse WG Activities

Reuse Implementation Projects

Efforts that result in the publication or use of a reusable component

Support/Enablement Activities

Efforts that provide tools and mechanisms to enable reuse

Outreach and Education Activities

Efforts that increase community awareness and understanding of benefits, best practices, etc.

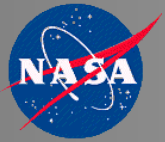
Policy Change Activities

Efforts to reduce policy barriers to reuse

Reuse Incentive Activities

Awards and structural changes that directly or indirectly encourage reuse

- Examples of work in some of these areas include:
 - Recommending that NASA create a **Reuse Enablement System** (repository) for Earth science reusable software assets; development of **Reuse Readiness Levels**
 - Creating a **web site to promote and provide information about reuse**
 - Providing NASA with **policy recommendations to encourage reuse**
 - Developing a **reuse peer-recognition award**



- A survey on the reuse practices of the Earth science community was conducted in 2004 and repeated in 2005 with OMB approval and a wider audience.

- Both surveys show the same basic results:

- Developers need to be able to easily locate and evaluate available reusable artifacts.

- Top three motivations for reuse → match the WG goals:

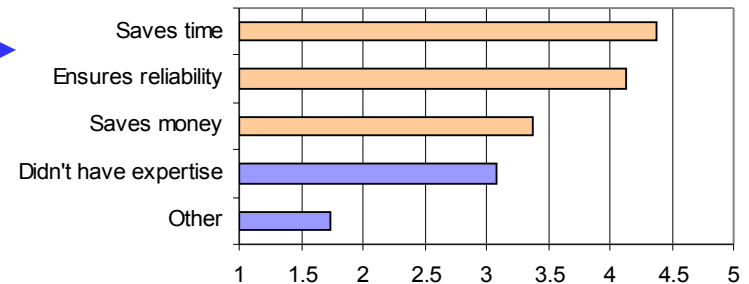
- Saving time
- Ensuring reliability
- Saving money

- *Top three factors to increase reuse:*

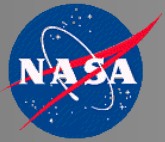
- Earth science catalog/repository of reusable assets
- Greater use of open source licensing
- More education and guidance on reuse

- Top two barriers to reuse:

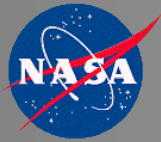
- Did not know reusable assets existed
- Did not know where to look for reusable assets



Areas where
the WG can
provide help.



-
- The WG conducted a trade study of various NASA and non-NASA sites.
 - The results showed that none of the existing systems satisfied the needs of the community of Earth science software developers.
 - The WG then conducted an architecture study to determine what existing software package/system was most suited for reuse in building the RES.
 - The results showed that the XOOPS content management system met the most requirements and would take the least time to develop.
 - The WG began work on developing a prototype RES built off the XOOPS package, adding to it and modifying it as necessary to meet all of the RES requirements.
 - Currently, the WG is developing a test plan for formal testing of the prototype, and plans to provide the prototype RES to the NASA community for their use.
 - The WG is also working on a set of policies for the operation and maintenance of the RES.



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NASA Earth Science Data Systems Software Reuse Working Group

Welcome to the Earth Science Data Systems (ESDS) Software Reuse Enablement System.

Software reuse can help the science community by reducing software development timescales, reducing costs, and contributing to the dissemination of knowledge and expertise. This Software Reuse Enablement System (RES) has been established by the Reuse Working Group to bring together a collection of resources that will facilitate reuse within the Earth science community. Over time, we will be collecting a variety of resources in the Earth and space science reuse communities. Our long-term goal is to establish a "marketplace" for reusable software development artifacts, to help establish a knowledge sharing community for software reuse in Earth science. Our software reuse portal web site has additional information [about our group](#). Please use the menus at the top and left side of the page to navigate to other areas of our site.

Home page as viewed by an Anonymous User

Other highlights:

- When logged in, a menu bar appears above the reuse banner.
- Registered users can sign up for notifications.
- Consumers see a note about registering for provider status if they want to submit assets to the RES.

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calc

Description:
This web page offers a calculator Perl script that includes mathematical functions and pre-defined constants commonly used in astronomy.

by Alexey Vikhlinin

Submitter: RES Admin
Released: Mon, 15-Oct-2007

Version: 0
Downloads: 12
File Size: 8.00 KB
Platform: None
Checksum:
Home Page: Astronomy aware Unix Calculator

Rating:

(2 Votes)

Download Times:
Modem(56k) : 1s
ISDN(64k) : 1s
DSL(768k) : 0.09s
LAN(10M) : 0.01s

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Other files by: RES Admin
[test download](#) (Wed, 24-Oct-2007)
[Perl Limericks](#) (Tue, 16-Oct-2007)
[coord_conv.pl](#) (Tue, 16-Oct-2007)
[circle.c](#) (Tue, 16-Oct-2007)
[calc](#) (Mon, 15-Oct-2007)
[linept.c](#) (Mon, 15-Oct-2007)
[linreg.c](#) (Mon, 15-Oct-2007)
[ESDS Software Reuse Working Group Year End Report 2006](#) (Tue, 11-Sep-2007)

Comments

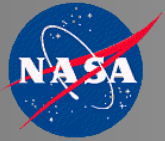
Nested Oldest First

The comments are owned by the poster. We aren't responsible for their content.

Poster	Thread
marshall Joined: 2008/3/21	Posted: 2008/4/1 13:49 Updated: 2008/4/1 13:49 Re: calc I've used this tool since grad school. It's useful as a general

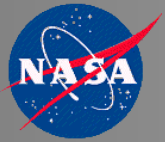
Current categories are not final

Full detail page for an asset (Provider view)



- Through discussions on weekly and monthly telecons, the Software Reuse WG made the following decisions:
 - To use nine levels, to align with the familiar TRL scale.
 - To look at nine topic areas that the WG felt were important for measuring the reuse maturity of software.
- Volunteers from the WG:
 - Wrote an initial set of levels for each topic (2+ people per topic),
 - Drafted summaries of each RRL, looking at the levels for all topic areas,
 - Created a set of summary RRLs by combining information from all topics at the same level, and
 - Made suggested revisions based on feedback received from the community.

Note: the RRLs presented here are still under development.



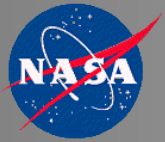
Topic areas included:

- Documentation
- Extensibility
- Intellectual Property Issues
- Modularity
- Packaging
- Portability
- Standards compliance
- Support
- Verification and Testing

Example from Verification and Testing

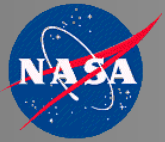
RRL 4 – Software application tested and validated in laboratory environment

Following successful testing of inputs and outputs, the testing would include integrating an application to establish that the “pieces” will work together to achieve concept-enabling levels. This validation must be devised to support the concept that was formulated earlier and should also be consistent with the requirements of potential system applications. The validation is relatively “low-fidelity” compared to the eventual system: it could be composed of ad hoc discrete components in a laboratory; for example, an application tested with simulated inputs.

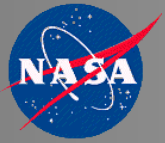


Draft RRL Summaries

Level	Summary	Description
RRL 1	No reusability; the software is not reusable.	Little is provided beyond limited source code or pre-compiled, executable binaries. There is no support, contact information for developers or rights for reuse specified, the software is not extensible, and there is inadequate or no documentation.
RRL 2	Initial reusability; software reuse is not practical.	Some source code, documentation, and contact information are provided, but these are still very limited. Initial testing has been done, but reuse rights are still unclear. Reuse would be challenging and cost-prohibitive.
RRL 3	Basic reusability; the software might be reusable by skilled users at substantial effort, cost, and risk.	Software has some modularity and standards compliance, some support is provided by developers, and detailed installation instructions are available, but rights are unspecified. An expert may be able to reuse the software, but general users would not.
RRL 4	Reuse is possible; the software might be reused by most users with some effort, cost, and risk.	Software and documentation are complete and understandable. Software has been demonstrated in a lab on one or more specific platforms, infrequent patches are available, and intellectual property issues would need to be negotiated. Reuse is possible, but may be difficult.
RRL 5	Reuse is practical; the software could be reused by most users with reasonable cost and risk.	Software is moderately portable, modular, extendable, and configurable, has low-fidelity standards compliance, a user manual, and has been tested in a lab. A user community exists, but may be a small community of experts. Developers may be contacted to request limited rights for reuse.
RRL 6	Software is reusable; the software can be reused by most users although there may be some cost and risk.	Software has been designed for extensibility, modularity, and portability, but software and documentation may still have limited applicability. Tutorials are available, and the software has been demonstrated in a relevant environment. Developers may be contacted to obtain formal statements on restricted rights or to negotiate additional rights.
RRL 7	Software is highly reusable; the software can be reused by most users with minimum cost and risk.	Software is highly portable and modular, has high-fidelity standards compliance, provides auto-build installation, and has been tested in a relevant environment. Support is developer-organized, and an interface guide is available. Software and documentation are applicable for most systems. Brief statements are available describing limited rights for reuse and developers may be contacted to negotiate additional rights.
RRL 8	Demonstrated reusability; the software has been reused by multiple users.	Software has been shown to be extensible, and has been qualified through test and demonstration. An extension guide and organization-provided support are available. Brief statements are available describing unrestricted rights for reuse and developers may be contacted to obtain formal rights statements.
RRL 9	Proven reusability; the software is being reused by many classes of users over a wide range of systems.	Software is fully portable and modular, with all appropriate documentation and standards compliance, encapsulated packaging, a GUI installer, and a large support community that provides patches. Software has been tested and validated through successful use of application output. Multiple statements describing unrestricted rights for reuse and the recommended citation are embedded into the product.

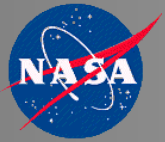


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- Key drivers for the web portal include:
 - Serve the community of Earth science data systems and software developers who are interested in reuse
 - Serve as a gateway for reuse information relevant to the community
 - Establish a portal for the community to share resources on reuse
 - Distribute various resources on reuse to the community
 - Foster easier access to resources on reuse
 - Major content categories based on purposes identified for the web portal include:
 - List of catalogs of reusable assets, tools, etc.
 - Reference library including events, news, Working Group documents, guidelines, and other resources
 - Information on open source software projects and licensing
 - Funding opportunities within and outside NASA
 - “Suggest content” feature for user-submitted ideas

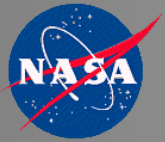


- Basic development
 - Built using the open source products Plone and Zope
 - Content organized into 4 main areas
- Basic web stats, 12/05 to 6/08:
 - Close to 20000 visits by more than 14000 unique visitors, including over 1700 repeat visitors
 - Almost 65000 page views
 - Average ~635 visitors per month
 - Site has been in top 3 hits for “software reuse” on major search engines, and still achieves high placement in search results
 - Had Google PageRank 6 before site changed its domain name.

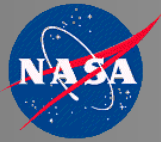




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- The WG developed a Peer-Recognition Software Reuse Award to recognize those people whose efforts and projects contribute to the practice of software reuse in the Earth science community.
 - There are three categories of the Reuse Award:
 - Contribution, for the creation and offering of reusable software assets
 - Utilization, for the reuse of existing software assets in new projects and the demonstration of reuse for the benefit of the community
 - Peer Education, for providing guidance to others on preparing or adopting software for reuse
 - **Nominations are now being accepted for this year's awards.**
 - Follow the “peer-recognition award” link on the main page of <http://www.esdswg.com/softwarereuse> for more information.



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- What work are other organizations doing in the area of software reuse?
 - Are there reuse groups at other organizations? If not, should there be?
 - Do other organizations find the NASA ESDS work useful/beneficial?
 - What possibilities are there for collaboration between NASA and other organizations?



- NASA Earth Science Data Systems (ESDS) Working Groups
 - Acting Coordinator, Frank Lindsay (<http://esdswg.gsfc.nasa.gov/>)
- Software Reuse Working Group
 - Chair, Robert Wolfe (Robert.E.Wolfe@nasa.gov)
 - General Information: Jim Marshall (James.J.Marshall@nasa.gov)

Earth Science Software Reuse
last modified 2008-06-02 11:29 AM

Welcome to the Earth Science Data System (ESDS) Software Reuse Portal. Please visit the [ESDS Working Group Page](#) for more information about our group.

We have posted some [reuse definitions](#) about what the Working Group does and does not consider reuse in our Resources, Library section, along with a [brochure](#) about our group and its activities. A number of [bottom-up reuse guidelines](#) are now available in the Resources, Guideline Documents section. We have also added a [technology transfer guideline](#) and [technology transfer FAQ](#) to help explain NASA's technology transfer process in the same section of the site. Some of our more recent [publications](#) have been added to the Resources, Library, Publications section, the latest of which are our [DSADR paper](#) discussing some of the WG's major activities. It was presented at a workshop during the ICSSR, here are the [DSADR slides](#) used for the presentation. The [S4PM case study](#) and the [SOSE case study](#) have been added to the Resources, Library, Case Studies section. A few new [non-NASA funding links](#) are on our Funding Opportunities page. Materials presented at the [6th ESDS WG Meeting](#) in October 2007 are now available, including some early work on drafting Reuse Readiness Levels (RRLs). The slides used for our discussion of [RRLs at the 2008 Winter ESIP Meeting](#) are now available in the Resources, Events, Event Highlights section. Our full list of upcoming [events](#) is also in the Resources section, and we have added a list of some [awards](#) that are relevant to reuse projects in a new folder in the Resources section, including a new [peer-recognition award](#) developed by the WG.

We have completed our survey to better understand the practice of software reuse within the Earth Science community. Preliminary [survey findings](#) are available on the web and have been published in a [2006 IGARSS paper](#). We have also posted some of our documents related to our proposed [Reuse Enablement System \(RES\)](#) in a new folder under the Resources section. Our trade study of existing systems, use cases for the proposed RES, and requirements for the proposed RES are currently available.

For more information, please visit our [News](#), [Site Map](#), [About Us](#), [FAQ](#), [Suggest Content](#) and/or [Contact](#) page.

Developing an internal marketplace for reusable software development artifacts

Demand

Demonstrate the feasibility and value of reuse through focused projects

Increase community capacity and desire (knowledge & tools) to reuse existing assets