NASA

Earth Science Data Systems
Software Reuse Working Group
Technical Report SRWG-TR-YYYY-NNN

(YYYY is the current year, and NNN is the current report # within that year, starting at 001, and incremented by 1 each time a new report is posted. Please note that the report number will be assigned by the NASA ESDS Software Reuse WG. Submit your tech reports to Michael Leyton (mleyton@dimacs.rutgers.edu) and James Marshall (James.J.Marshall@nasa.gov) after deleting this block of text.)

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ABSTRACT

This page contains only the abstract. To give you an illustration of the text format, we quote here an abstract from a book chapter that was being prepared by the working group: This chapter introduces a class of systems at the National Aeronautics and Space Administration (NASA) called "Earth science data systems". Earth science data is vast, voluminous, heterogeneous and geographically distributed across the globe, closely associated with the scientists that understand it. Many software systems spread out across tens of institutions play a part in the collection, processing, archiving, dissemination, and use of these scientific data throughout the data lifecycle. In this chapter, we focus in on the software architectures of these systems, specifically focusing on software reuse: the common components, the common architectural patterns, and the styles and interconnection mechanisms employed. We discuss several examples of architectures and additionally the work within NASA's Earth Science Data System (ESDS) Software Reuse Working Group (WG), one of four working groups with its attention set on NASA's Earth Science enterprise.

1 Example of Section Heading

Example of text: Again we quote here from from a book chapter that was being prepared by the working group:

Software reuse offers potential benefits for improving the quality and reducing the costs incurred during the development of systems within various domains, including Earth and space science (Marshall, Downs, and Samadi, 2010). Science data systems (SDS) at the National Aeronautics and Space Administration (NASA) receive raw science data from ground stations of Earth-observing remote sensing instruments that orbit the Earth multiple times daily. SDS process raw data by converting the instrument telemetry delivered to Earth from space into useful observational data for scientific research. SDS also distribute these products for public release, reprocess the products for algorithm improvements, and implement, maintain, and update the science algorithm software (Mattmann et al., 2009). Earth science data are very complex and may have various formats such as the network Common Data Format (netCDF), the Hierarchical Data Format (HDF), or the American Standard Code for Information Exchange (ASCII). The data are acquired constantly, and complex algorithms are needed to convert instrument measurements to geophysical quantities. New missions must anticipate and embrace the new vision of accelerated and enhanced research and analysis capabilities, effective mission execution, and validated information on which to base crucial public policy.

To date, many SDS are re-implemented for each NASA mission. This can be traced to a number of causes: instrument uniqueness, organizational skills, pet programming languages, and technologies, but most importantly - the life of each NASA mission is substantial, as is the lifespan of its software. While considering technology refresh is often unavoidable in these situations, the idea of reuse is not. There are several opportunities for the reuse of software assets, even in these situations. That includes reuse of software components, frameworks, and software architectures and patterns that have proven successful in the past. In short, software reuse contributes to the development, management, and maintenance of the software architecture for SDS, and will be the focus of the discussion for the remainder of the chapter.

Definition 1 *This is an example of a definition format.*

Theorem 2 *This is an example of a theorem format.*

Proposition 3 *This is an example of a proposition format.*

Comment 4 *This is an example of a comment format.*

Claim 5 *This is an example of a claim format.*

Example 6 *This is an example of an example format.*

Notation 7 *This is an example of an notation format.*

Terminology 8 *This is an example of a terminology format.*

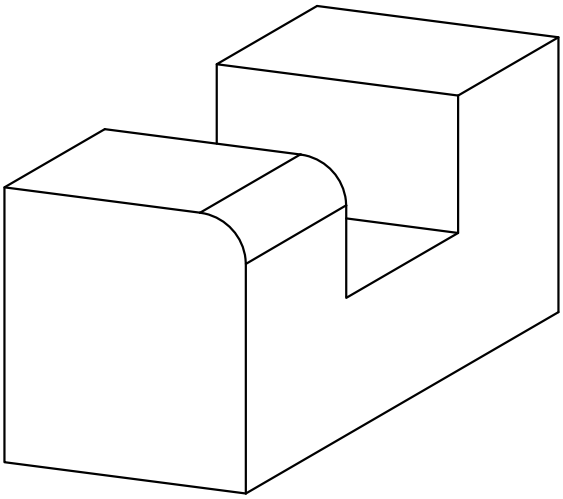

Figure 1: An example of the caption format of a figure

2 Another Example of Section Heading

References

Marshall J.J., Downs, R.R., and Samadi, S. (2010) Building the Next Generation of Aerospace Data Processing Systems by Reusing Existing Software Components. In Arif T.T., (ed), Aerospace Technologies Advancements. Croatia: IN-TECH.

Mattmann, C., Freeborn D., Crichton, D., Foster, B., Hart, A., Woollard, D., Hardman, S., Ramirez, P., Kelly, S., Chang, A. Y., Miller, C. E. A Reusable Process Control System Framework for the Orbiting Carbon Observatory and NPP Sounder PEATE missions. In Proceedings of the 3rd IEEE Intl' Conference on Space Mission Challenges for Information Technology (SMC-IT 2009), pp. 165-172, July 19 - 23, 2009.