

## ***Interactive comment on “Next generation framework for aquatic modeling of the Earth System” by B. M. Fekete et al.***

**Anonymous Referee #2**

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### General Comments

This paper presents NextFrAMES, an evolution of the earth science model development platform FrAMES. NextFrAMES is designed to allow scientists to easily express complex scientific models in a way that is able to harness modern computer hardware architectures. The general need for new model development platforms is certainly an important challenge facing the earth science modeling community, and so the description of the problem and the attempt to address the problem with NextFrAMES are timely and important. My primary criticism of the manuscript, however, is that it falls short in describing NextFrAMES, making it difficult to conclude that the manuscript represents a "substantial contribution to modeling science". The run time engine, a critical part of the NextFrAMES system, is only minimally described. No working examples are pre-

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sented, making the approach very abstract and difficult to clearly understand. I believe the paper could be published in GMDD if these criticism can be adequately addressed in a major revision. The topic is relevant and important, and the authors could make an important contribution to the literature regarding next generation earth science modeling systems. I encourage the authors to present a more complete description of the NextFrAMES system and to include a new "case study" section that demonstrates how one could apply NextFrAMES to an earth science system.

### Specific Comments

Abstract and other places in the manuscript – The term "Modeling XML" is mentioned repeatedly, but not adequately explained. Is this a particular XML Schema that the authors invented? I suggest renamed this term to "an XML Schema for Modeling" or something equivalent to better convey what the term means.

The abstract seems very long and could be stated more concisely.

Paragraph 1.1 "Earth System modeling ..." – The claim that "applications today are often limited by the read and write access of the vast amount of data required by the models" should be supported with citations because I am not sure this is a true statement. It likely depends on the type of modeling one is performing, the balance between the computational complexity and the data volumes, and the hardware set up used for the modeling. Furthermore, I do not understand from the manuscript how the NextFrAMES system addresses this limitation, and therefore I don't fully understand why it is mentioned in the first paragraph of the manuscript.

Paragraph 1.2 "To complicate the matter further ..." – Please explain how new data management methods put an extra burden on model developers. These new data management methods should alleviate burdens, not add to them. Can you provide an example to support your claim?

Paragraph 1.4 "Computer science has delivered ..." – I would not call parallel com-

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puters "commonplace" twenty years ago. Perhaps they were used then, but where they commonplace? Paragraph 1.5 "The lack of new development concepts . . ." – The authors argue that earth sciences must develop their own model development platform because "no common solution" [presumably in the computer sciences] has yet to emerge. I believe better argument would be that earth science must develop their own model development platform because common approaches in the broader software engineering field must be tailored to earth science systems.

Pg 283, line 9 – CCA is not designed to wrap legacy models. CCA is a lower level architecture for component-based software design.

Pg 285, line 7 – Many of these "popular modeling languages" are beginning to include ways to leverage parallel computing. For example, see <http://www.mathworks.com/products/parallel-computing/> and <http://www.rparallel.org/>.

Pg 285, line 14 – I do not understand the point of this section within the context of the paper.

Pg 387, line 6 – The "design goals" for NextFrAMES are not clearly described in the previous section.

Pg 387, line 10 – FrAMES is not well described, and so it is unclear how NextFrAMES "eliminates most of its [FrAMES] limitations".

Pg 288, line 1 – The "NextFrAMES model structure" section is fairly abstract and could greatly benefit from an implementation example.

Pg 289, line 24, This section requires more detail to fully describe the architecture and implementation of the run-time engine.

Pg 292, line 9 – The final paragraph of section 2.2 does not belong in this section as it describes a limitation of the system instead of the run-time engine. Consider moving this paragraph to the conclusions section.

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Pg 292, line 27 – Deficiencies in FrAMES are largely addressed in NextFrAMES – what are these deficiencies? They are not described in the manuscript.

Appendix A – Consider using UML to more easily convey XML schema structure

Figure 1 – very generic water system figure perhaps not necessary for this paper

Figure 3 – I would suggest avoiding screen shots

Technical Corrections

Pg 280 – line 14 "has numerous"; line 22 "as a vector of objects"; line 28 "present capabilities, NextFrAMES "

Pg 281 – line 2 "eliminate this limitation"; line 4 "scientists"; line 25 "emerging data management" (emerging new is repetitive)

Pg 282 – line 27 "independently, and what"

Pg 283 – line 2 "in the demands"; line 9 "realized a long"; line 11 "components, one"; line 12 replace "might be" with "is"; line 14 replace "might" with "can"

Pg 285 – line 7 "software perform"

Pg 286 – line 3 "but also"; line 5 "Earth system modeling tools"

Pg 292 – line 6 "run-time engine"; line 9 "needs, it"; line 16 "HTML dramatically changed the sharing"

Pg 293 – line 8 "plugins on single"

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Interactive comment on Geosci. Model Dev. Discuss., 2, 279, 2009.

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