

# Supporting Web-based Modeling and Simulation

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## Abstract

This position paper addresses some opportunities and challenges relative to creating an extensible framework for Web-based modeling and simulation – Extensible Modeling and Simulation Framework (XMSF).

## 1 Introduction

Nowadays, the World Wide Web is not only a means for providing information but it also stands for a platform through which services are delivered globally. This position paper aims to be part of a large effort for creating a framework of extensible technical capabilities for enabling and fostering modeling and simulation over the Web.

In this paper we analyze some key opportunities, open problems, and recommendations pertaining to the successful creation of an extensible framework for Web-based modeling and simulation. This analysis is done chiefly in the context of three-dimensional (3D) scientific and information visualization.

## 2 Key opportunities

There are numerous opportunities in the field of 3D scientific and information visualization that support the case for Web-based modeling and simulation. Most of these opportunities are linked to the fact that the Web provides a cost-effective and ubiquitous means for delivery, along with a high-level of infrastructure and platform independence.

More and more, businesses are global. It is quite common nowadays for even small to medium businesses to have their offices disseminated all over the world (e.g., [trema.com](http://trema.com), 300 employees, 9 offices' locations over 4 continents). The deployment of an extensible modeling and simulation framework for the Web fosters worldwide collaborative scientific and information visualization. Being able to share information interactively, simultaneously, and securely over the Web at a limited cost and relying on an open architecture is an attractive scenario.

### 3 Open problems

The fact that we are aspiring for an extensible framework for Web-based modeling and simulation is in itself a reflection of some of the open problems that currently exist. There are many technologies available that are potential candidates for Web-based simulation and modeling, some of them based on open standards and interoperable, but there is yet no means of exploiting all these capabilities to a common goal.

Additionally, some pertinent questions remain open. In my view, one of the most important challenge is doing real-time dynamics simulation over the Web. There is Internet latency to consider and the unreliability of its service quality. Furthermore, there is also the delay on the client-side rendering the dynamics to take into account. These are relevant issues when dealing with time-critical applications or scenarios. Another important issue is bandwidth. Realistic modeling and simulation are bound (so far) to take up a large amount of space. Effective compression methods are required to deal with inevitable bandwidth problems.

### 4 Recommendations

I believe that the key to rapid growth of new modeling and simulation applications and services will be the deployment of applications built on open standards and frameworks. Design patterns are a formal mechanism for capturing collective knowledge and experience and make available to the entire community solutions to common design problems.

In my view, one of the deliverables of XMSF should be the creation of a public collection of design patterns and interaction paradigms for 3D scientific and information visualization, in the manner of [1] for user interfaces patterns or [2] for Web design patterns.

### References

- [1] Jenifer Tidwell. *Ui patterns and techniques*, 2002.  
<<http://time-tripper.com/uipatterns/>>.
- [2] Martijn van Welie. *Web design patterns*, 2002.  
<<http://www.welie.com/patterns/>>.