Proposal for the First Alloy Workshop

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Abstract

The First Alloy Workshop will provide a one-day forum for practitioners, researchers, and educators to share their experiences using Alloy to design and analyze software. Participants will vary in their areas of expertise, from formal methods and software design, to testing and code verification. The workshop will host a series of paper presentations and allot ample time for discussion and interaction. Moreover, it will help foster a stronger community for Alloy research and education.

Background

Alloy comprises three key elements: a logic, a language, and an analysis. The Alloy logic is a first-order logic with sets, relations, and transitive closure. The language is a simple and intuitive notation for expressing and structuring specifications in the logic. The analysis is embodied in a tool known as the Alloy Analyzer, which mechanically checks properties expressed in the language for validity. The Analyzer performs an exhaustive search for a counterexample to a claimed property, within bounds that the user provides. If it finds a counterexample, the counterexample is guaranteed to represent a true violation of the property; however, the analysis can fail to find counterexamples when they require larger bounds for their detection. Nevertheless, in practice most counterexamples are found in small bounds.

Alloy is useful for modeling systems from a variety of domains. Unlike most formal methods, Alloy can easily express structural properties of systems. Such structural properties are crucial to expressing the correctness of linked data structures and data structure operations, which are pervasive in object-oriented software. Alloy is also conducive to modeling the behavior of abstract state machines, and users can apply the analysis to search for traces of state machines that violate a claimed property. The inherent non-determinism in Alloy allows distributed algorithms to be readily specified as well. The Alloy Analyzer provides a wide array of visualization options, so regardless of the domain, simulations of systems and counterexamples to properties can be presented to the user in an intuitive and aesthetically-pleasing illustration.

Since its inception, Alloy has steadily grown in popularity and recognition. It has been taught in at least twenty courses in nineteen universities around the world. The Alloy discussion group now exceeds 300 members. The proposed tutorial will occur within six months of the formal release of the Alloy Analyzer 3.0, as well as the release of *Software Abstractions: Logic, Language, and Analysis* (MIT Press, March 2006), a book by Professor Daniel Jackson, the lead of the Alloy project. *Software Abstractions* uses Alloy as a vehicle for illustrating the benefits of abstract modeling, though its lessons could be applied in the context of other formal methods.
**Format**

The First Alloy Workshop will be a one-day event, which due to the religious observances of the organizers, can be held only on November 6. It will require a room that seats at least 50, a table to seat at least 3 panelists, and an LCD projector to accommodate laptops.

The workshop day will be divided into sections, each of which will be devoted to a particular topic. About three papers will be presented consecutively in each section, with 15 minutes allotted for each presentation. Immediately following the presentations, the presenters will form a panel, and we will open the floor to approximately 20 minutes of questions. The audience can question a presenter about his or her individual work, or they can ask multiple presenters to compare and contrast their work to one another's. We expect the panel questions to evolve into a more general discussion beyond the topic in question.

**Participation**

The First Alloy Workshop will provide a forum for practitioners, researchers, and educators to share their experiences using Alloy to design and analyze software. We expect to draw between 20 and 50 people, whose experiences with Alloy vary widely in their domain and application.

The workshop will be publicized to a number of people and communities with Alloy and Alloy-related interests. Naturally, we will notify the 300 or so members of the Alloy discussion group. We will also individual solicit the professors that use Alloy in their research, as well as those that teach it in their formal methods courses. Lastly, we will be sure to notify appropriate individuals in the formal methods community.

Our calls for papers will note that we will accept submissions — at most five pages in length — from a variety of domains and for a variety of applications. A draft of the initial call for papers follows:

> The First Alloy Workshop will provide a one-day forum for practitioners, researchers, and educators to share their experiences using Alloy to design and analyze software. The workshop will host a series of paper presentations and allot ample time for discussion and interaction. Moreover, it will help foster a stronger community for Alloy research and education.

> Paper topics may be from a variety of research areas. Potential topics include, but are not limited to the following: Alloy language enhancements, Alloy modeling idioms and patterns, software design analysis, software code analysis, automatic test-case generation, case studies, and pedagogical approaches and experiences teaching Alloy in the classroom. Papers should not exceed five pages in length.
**Program Committee**

Papers will be reviewed by a program committee of 8 to 10 members. The organizers will select the members of the committee based on their experience working with Alloy or formal methods generally. The following individuals have already agreed to sit on the potential committee:

Paulo Borba  
*Universidade Federal de Pernambuco, Brazil*

Marcelo Frias  
*University of Buenos Aires, Argentina*

Michael Butler  
*Imperial College, London, UK*

Martin Gogolla  
*University of Bremen, Germany*

Matthew Dwyer,  
*University of Nebraska, USA*

Jim Woodcock  
*University of York, England*

John Fitzgerald  
*University of Newcastle*

Pamela Zave  
*AT&T, USA*

**Organizers**

Daniel Jackson is Professor of Computer Science at the Massachusetts Institute of Technology. He received an MA from Oxford University in Physics, and his PhD from MIT in Computer Science. He has been a software engineer for Logica UK Ltd., and an Assistant Professor of Computer Science at Carnegie Mellon University. He has been a member of the editorial boards of TOSEM, TOPLAS and STTT, and has served on program committees for FSE, ISSTA, CAV, OOPSLA and many other conferences. He has broad interests in many areas of software engineering, especially in specification and design, critical systems, formal methods, static analysis and model checking. Currently, he is chairing a National Academies study entitled "Sufficient Evidence? Building Certifiably Dependable Systems".

Greg Dennis is a third year PhD student with the Software Design Group in the Computer Science and Artificial Intelligence Laboratory at MIT. He received a BS and MEng from MIT in Computer Science and Engineering. He has worked on the design and development of the Alloy language and analyzer, and he is currently using Alloy technology to check the conformance of software to declarative specifications. He is also a co-author of the the online Alloy tutorial.