

**ExMAn: A Generic and Customizable  
Framework for Experimental  
Mutation Analysis  
(MUTATION 2006)**

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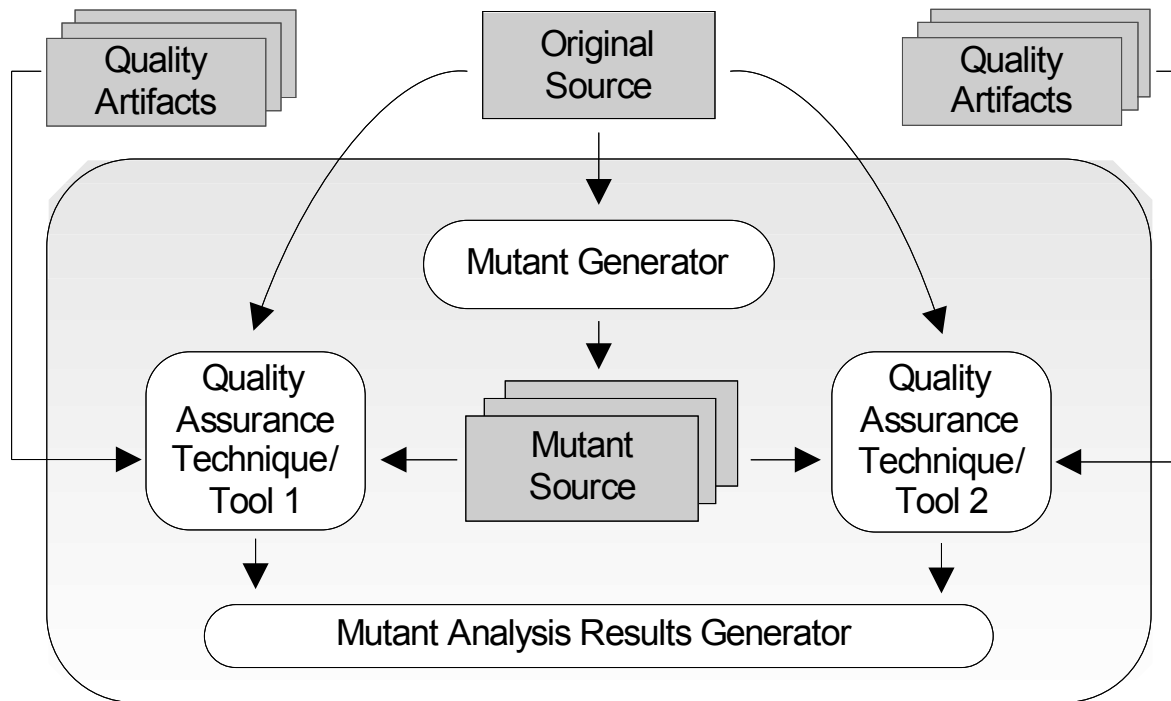
# Motivation

- Mutation as a comparative technique has been used traditionally within the **sequential testing** community
- Our work is based on the idea that mutation can also be used to assess:
  - **concurrency testing** (e.g., IBM's ConTest)
  - **static analysis** (e.g., FindBugs, Jlint, PathInspector)
  - **model checking** (e.g., Java PathFinder, Bogor)
  - **dynamic analysis**

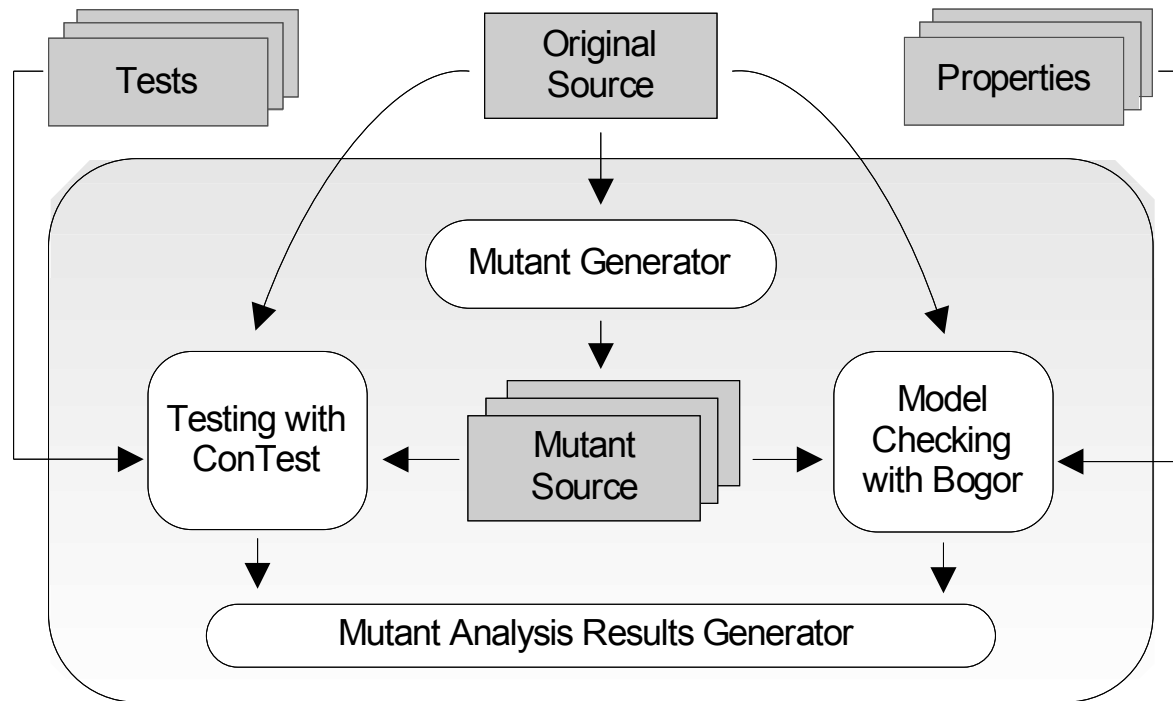
# Research Goals

1. To compare different techniques using mutation to better **understand** any **complementary** relationship that might exist
2. To use the assessment to design improved **hybrid** techniques to detect bugs.

# Experimental Mutation Analysis



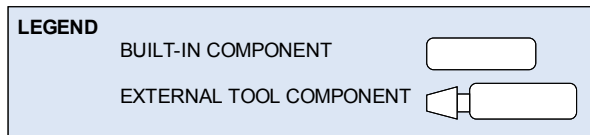
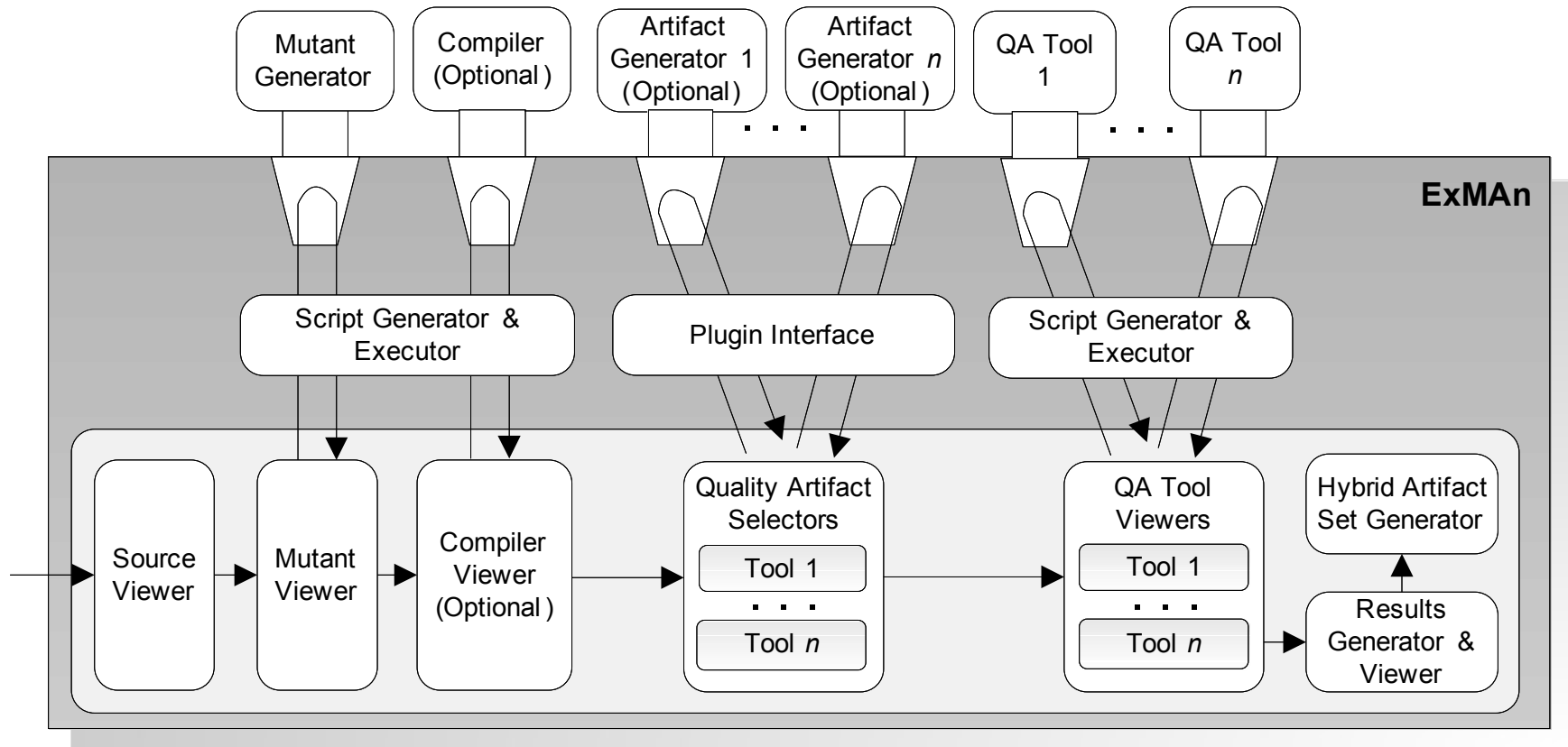
# Experimental Mutation Analysis



# The ExMAAn Framework

- **ExMAAn** = **Ex**perimental **M**utation **A**nalysis
- What is ExMAAn?
  - “*ExMAAn is a reusable implementation for building different customized mutation analysis tools for comparing different quality assurance techniques.*”

# ExMAN Architecture



# Video Demo



# Related Work

- **Mothra**
  - a mutation tool for Fortran programs
  - method level mutation operators (e.g. relational operator replacement).
- **Proteum**
  - a mutation analysis tool for C programs
- **MuJava**
  - the most recent mutation tool
  - designed for use with Java
  - method-level operators
  - class mutation operators to handle object oriented issues such as polymorphism and inheritance

# Conclusions

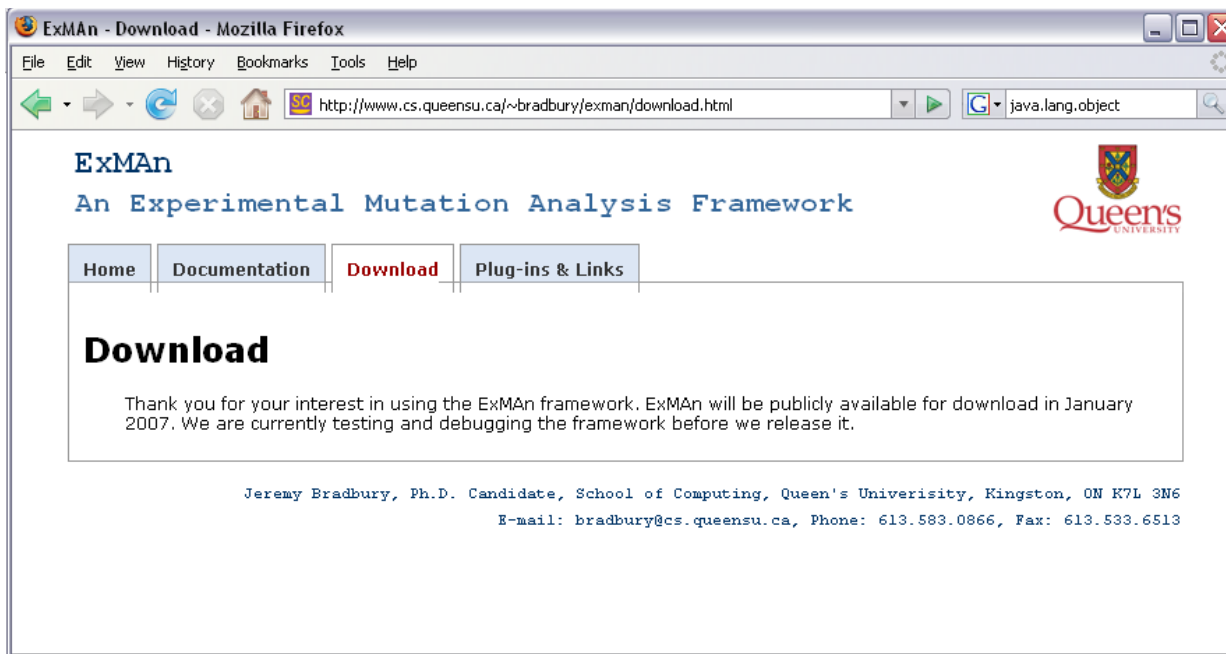
- ExMAN is a **generic** and **flexible** framework
- It allows for the automatic comparison of **different** quality assurance techniques
- It allows for the development of **hybrid** quality assurance approaches

# Future Work

- Add equivalent mutant identification
- Add ability to automatically specify patterns for the creation of mutation operators
- Expand the artifact selection to allow for the selection of multiple quality artifact sets for each type and thus allow for statistical analysis

# Availability

- ExMAN will be available for download in Spring 2007  
<http://www.cs.queensu.ca/~bradbury/exman/>



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