Continuous Testing in Eclipse

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Continuous testing: inspired by continuous compilation

- Continuous compilation, as in Eclipse, notifies the developer quickly when a *syntactic error* is introduced:

	✓	!	Description
			Syntax error on token "a", "]" expected
			The method decode(String) from the type URLDecoder is deprec

- Continuous testing notifies the developer quickly when a *semantic error* is introduced:

	✓	!	Description
			Test failure: testArithmetic(ct.test.MainTestSuite)
			The method decode(String) from the type URLDecoder is deprec

Outline

- Continuous testing: defined and motivated
- Eclipse plug-in:
  - Design principles
  - User interface design: demo
  - Software design
- Next steps

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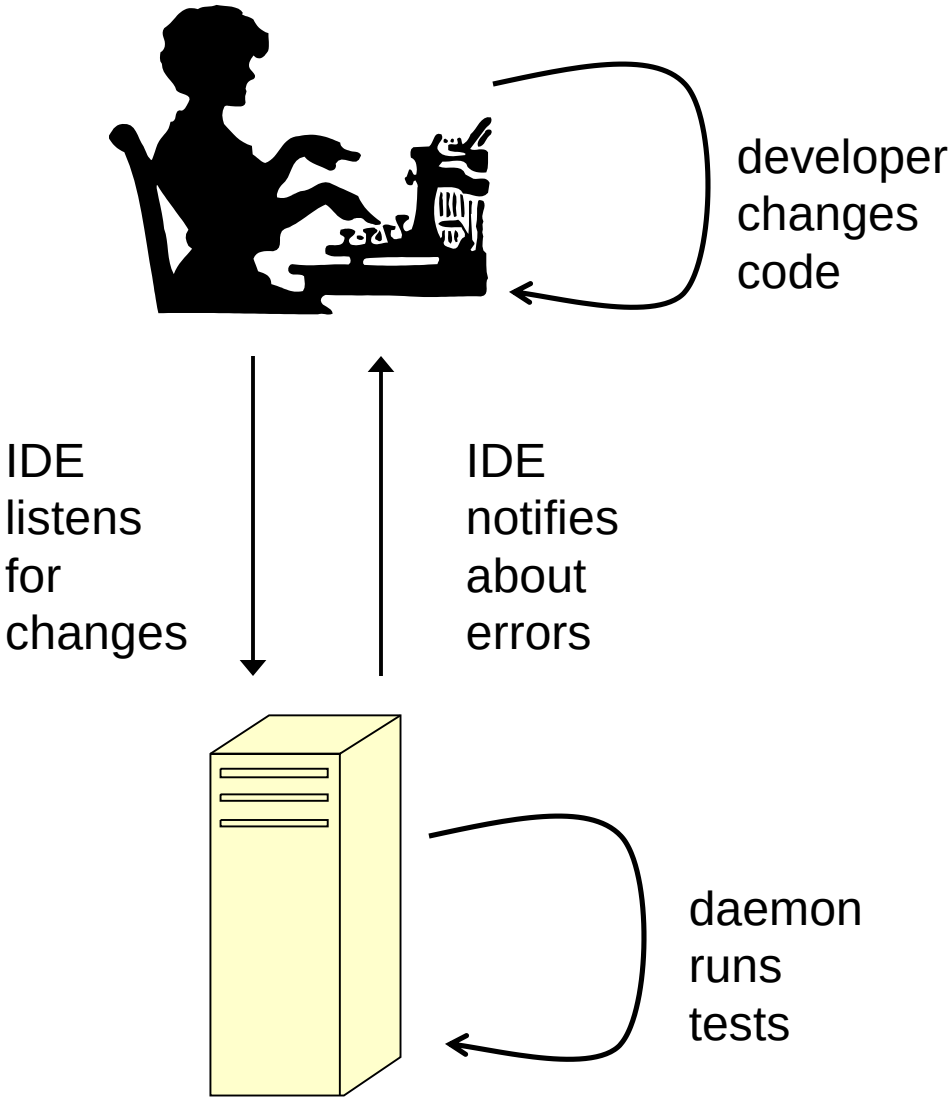
Continuous testing

- Continuous testing uses excess cycles on a developer's workstation to continuously run regression tests in the background as the developer edits code.



Goals of continuous testing

Continuous testing:

- No longer forces the developer to decide whether to test and what tests to run.
- Prevents long-standing regression errors.*
- Makes developer confident, not annoyed.

* Saff, Ernst, ISSRE 2003: Reducing wasted development time via continuous testing

Continuous testing made students more productive

Treatment	N	Completed assignment
No tool	11	27%
Continuous compilation	10	50%
Continuous testing & continuous compilation	18	78%

$p < .03$

* Saff, Ernst, ISSTA 2004:
An experimental evaluation of continuous testing during development

Students appreciated continuous testing

I would use continuous testing…	Yes
…for the rest of the course	94%
…for my own programming	80%
I would recommend the tool to others	90%

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Design principles, 1 of 2

- Reuse
  - Whenever possible, plug in and reuse
- Future reuse
  - When reuse is impossible, copy and paste to show where Eclipse could be more flexible

Design principles, 2 of 2

- Consistent experience
  - Don’t change expected behavior
  - Build on current developer metaphors
- Minimal distraction
  - Don’t swamp benefits by sapping attention
- Testability
  - Add testing-specific API’s when necessary

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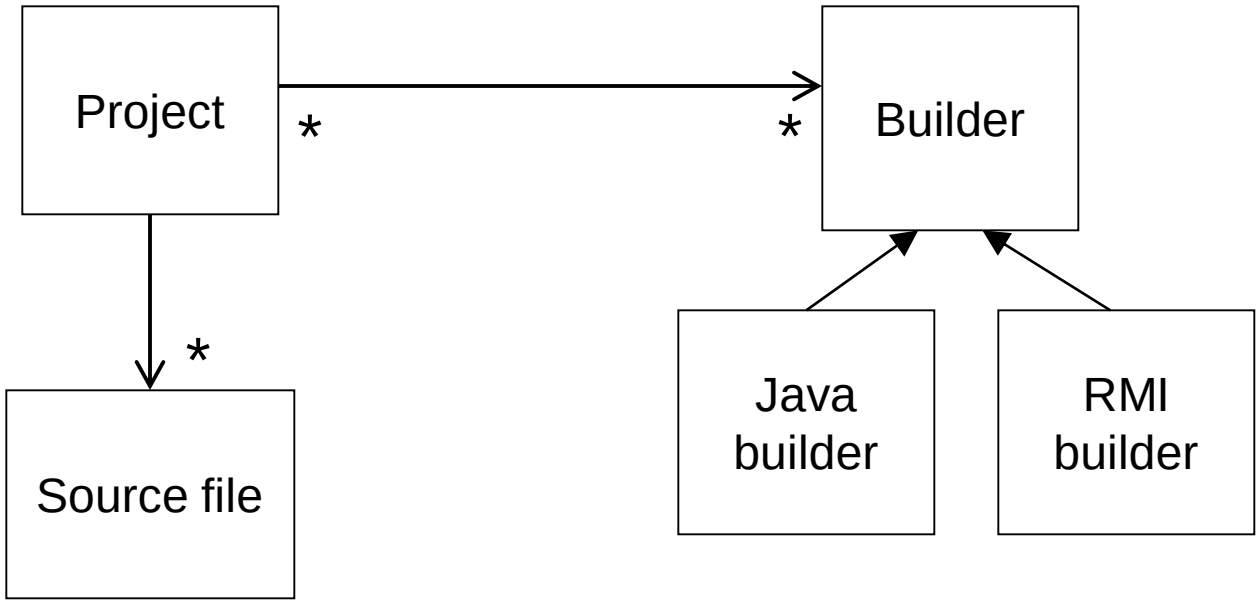
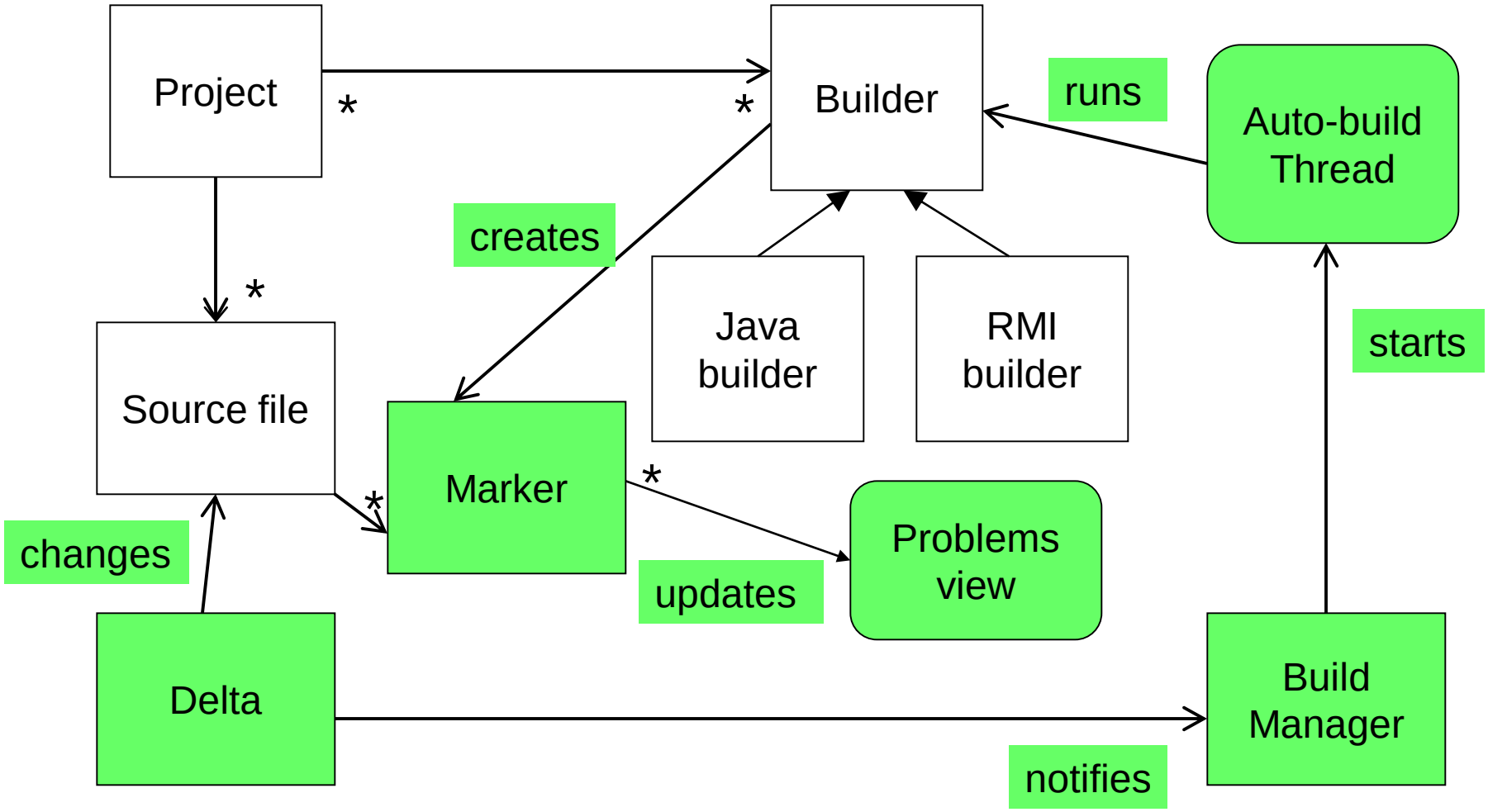
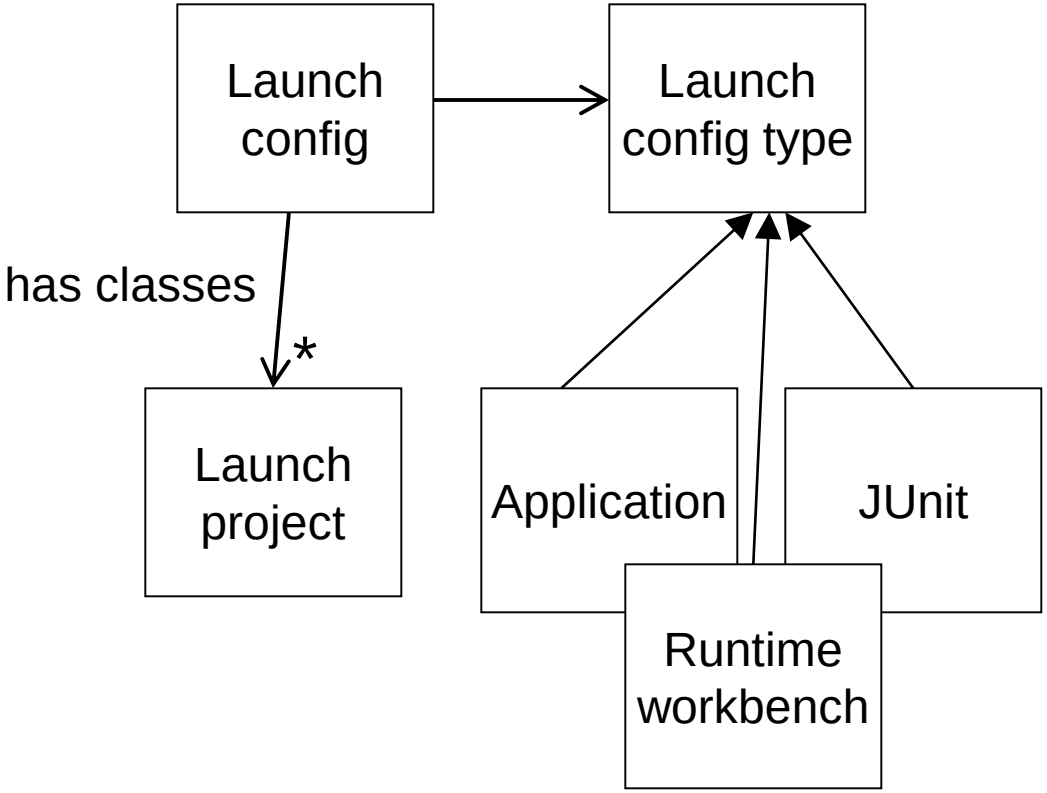
Eclipse auto-building: Static structure



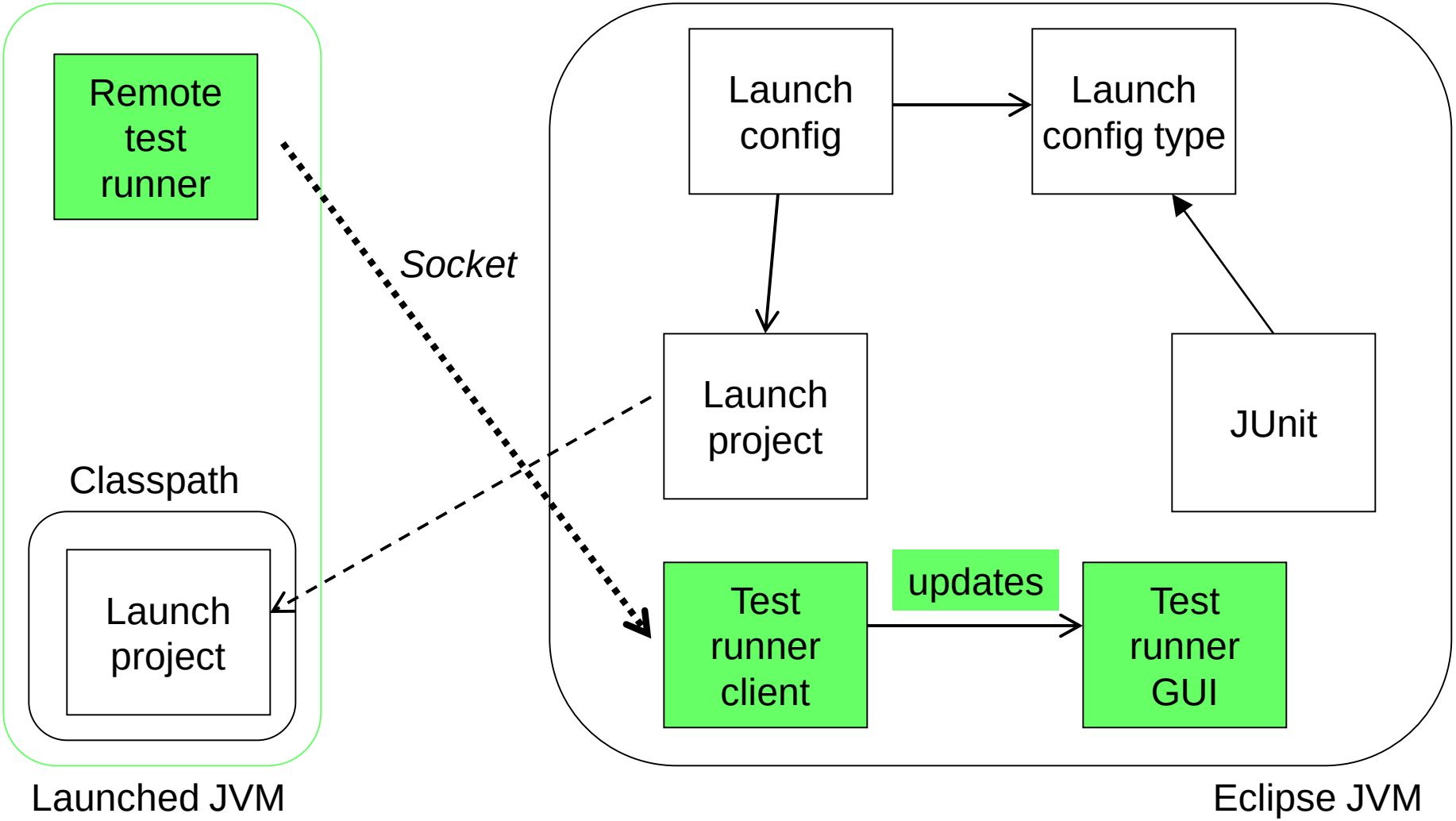
Eclipse auto-building: Dynamic behavior



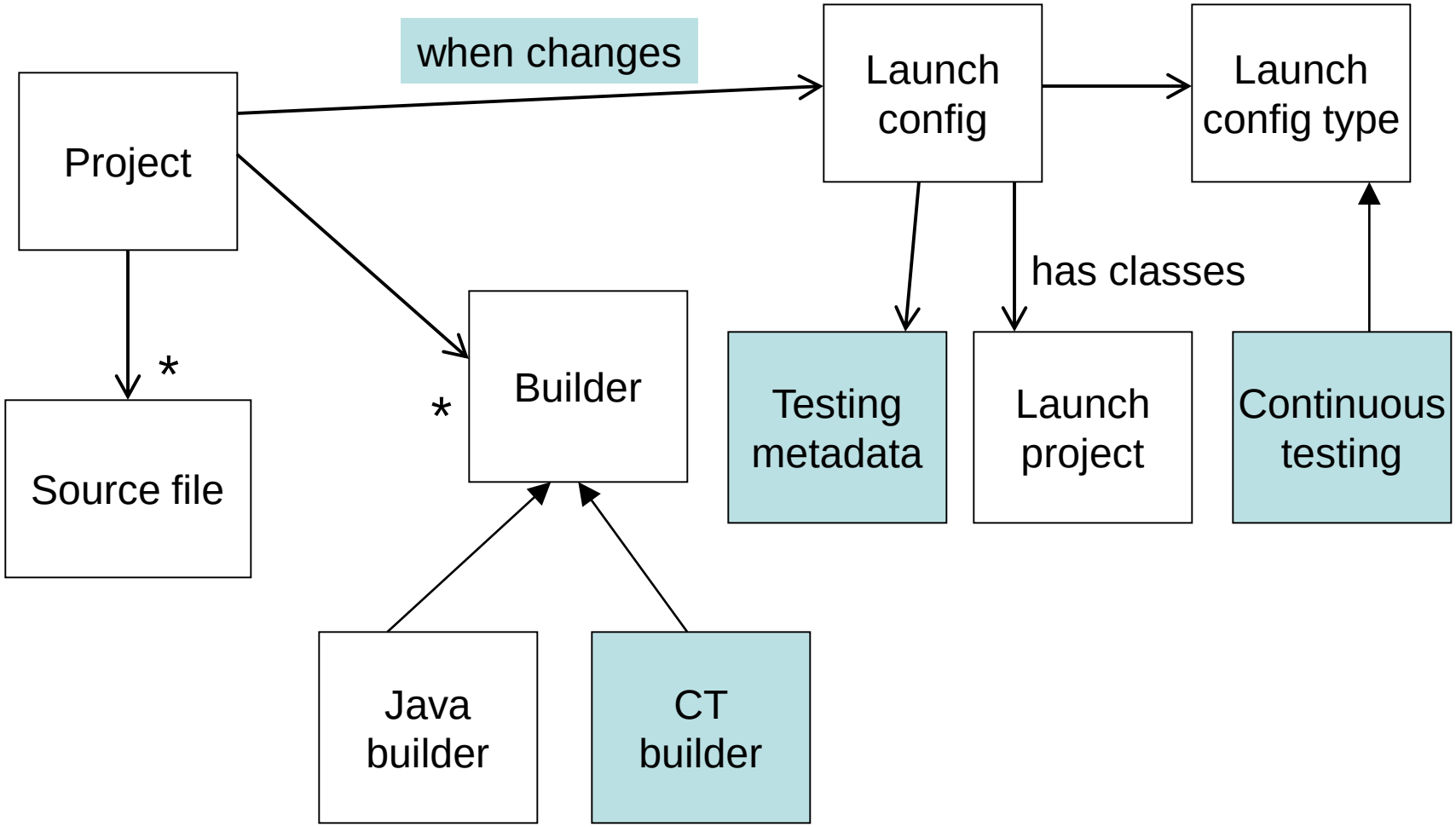
Eclipse launching: Static structure



Eclipse launching: Dynamic behavior (JUnit)

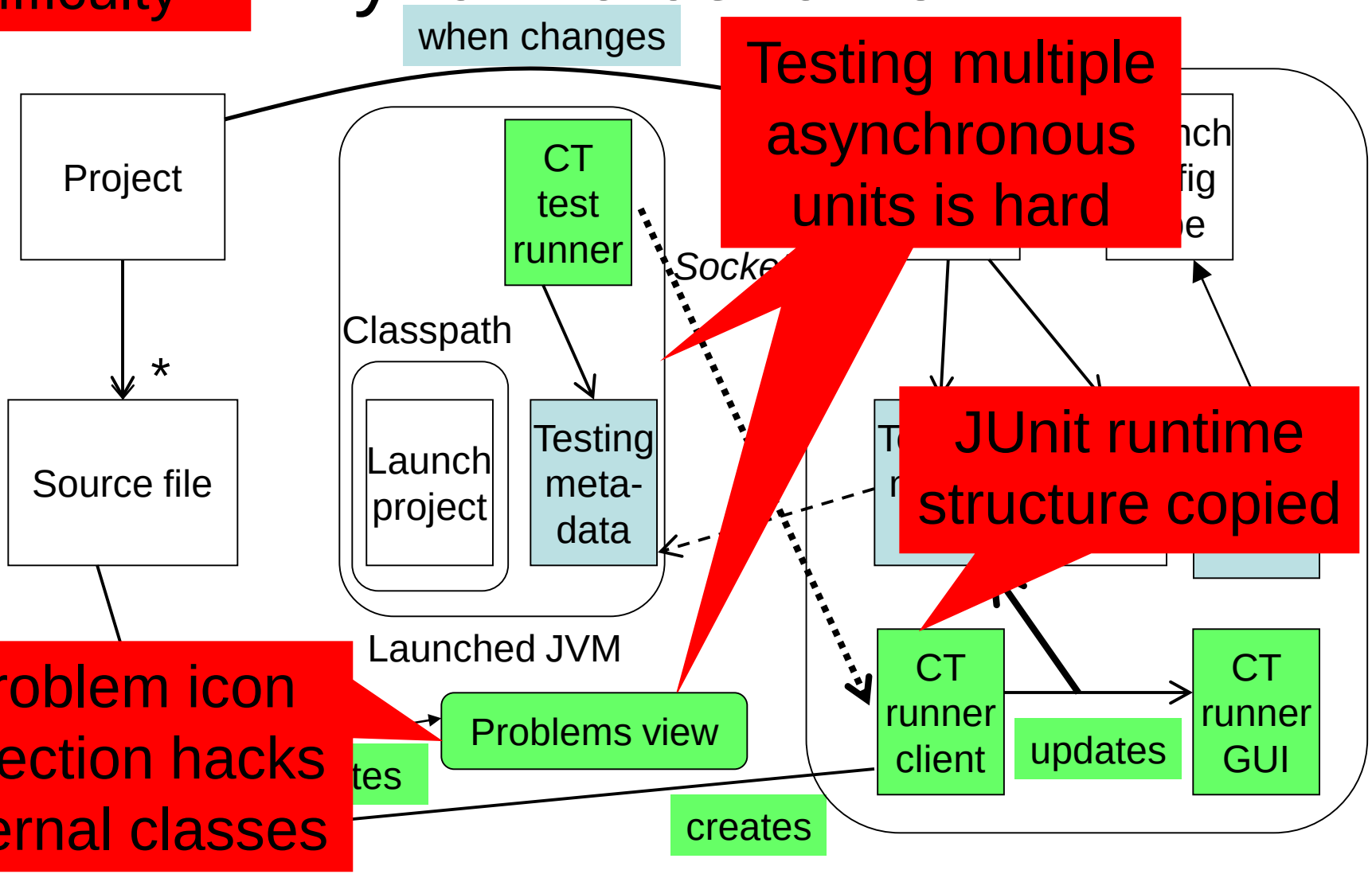


Continuous Testing
Static structure



Continuous Testing Dynamic behavior

Places we had difficulty



Testing multiple asynchronous units is hard

JUnit runtime structure copied

Problem icon selection hacks internal classes

Suggestions for Eclipse

- JUnit integration:
  - Display results from multiple simultaneous test runs
  - Allow plug-ins to contribute prioritization
- Problems view:
  - More flexibility in icons
- Tools for testing asynchrony
  - It’s hard to create deterministic unit tests

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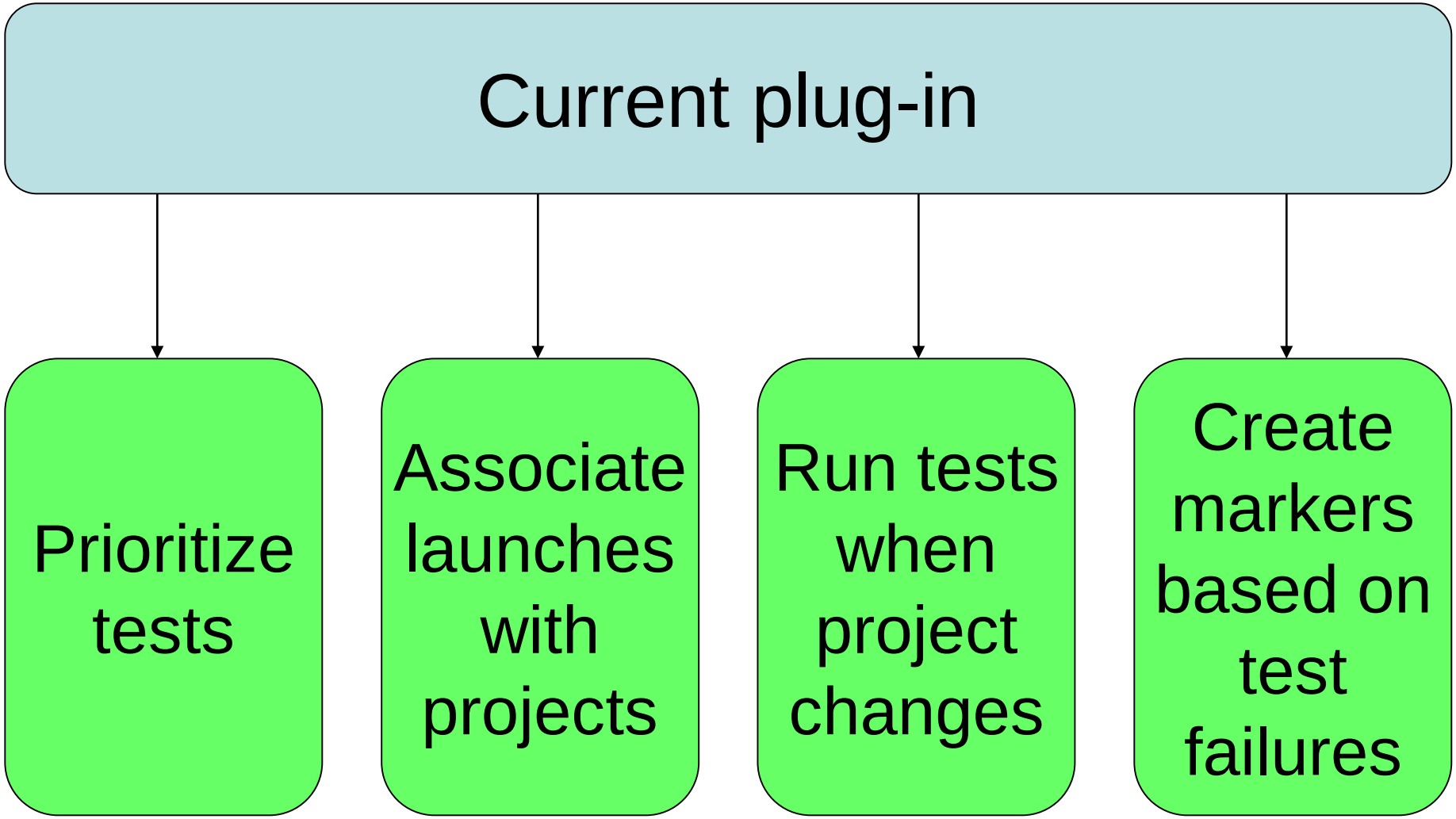
Next steps:
split into individual plug-ins

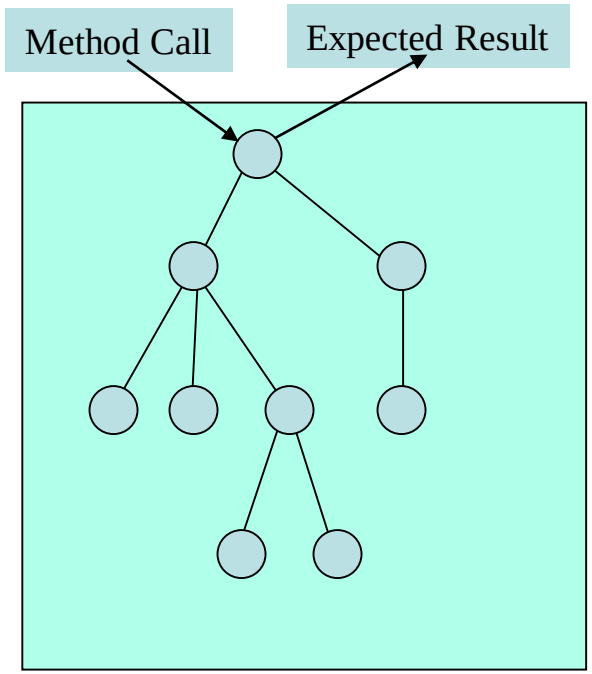


Next steps: feature enhancements

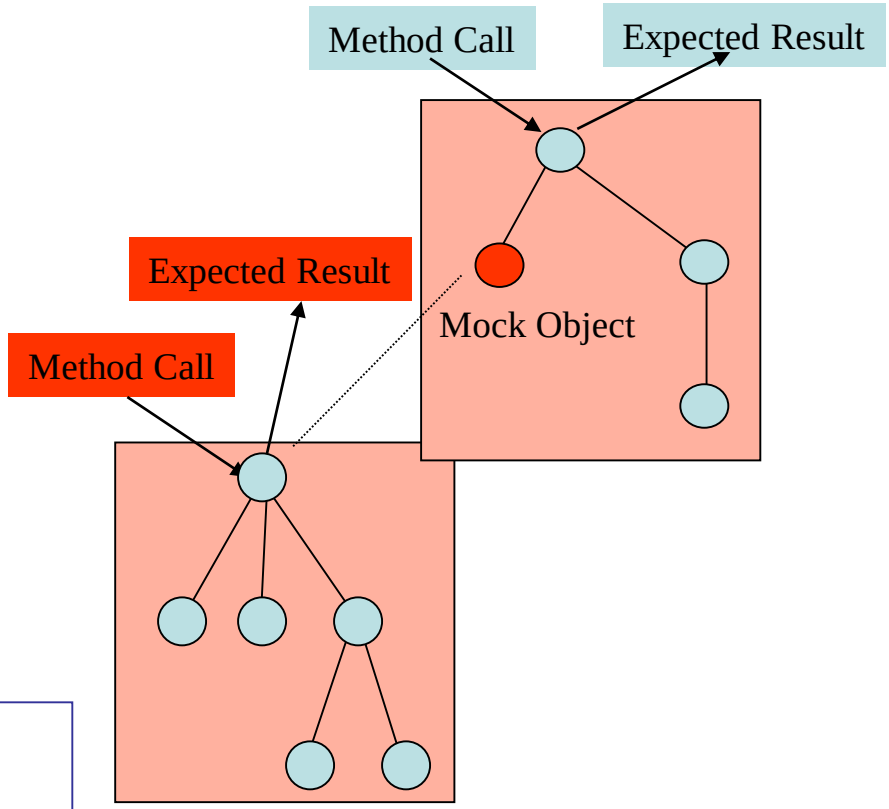
- Extend to Plug-in Development Environment
- Prioritize based on which methods, classes, etc. changed
- Use hot-swapping JVM to reduce start-up time
- Increase resolution: associate suite with package? class? method?

Next steps: test factoring

- User-supplied test:



- Factored tests:



* Saff, Ernst, PASTE 2004:
  Automatic mock object creation
  for test factoring

Further reading

- Model of developer behavior
  - Saff, Ernst, ISSRE 2003: Reducing wasted development time via continuous testing
- Controlled student experiment
  - Saff, Ernst, ISSTA 2004: An experimental evaluation of continuous testing during development
- Test factoring
  - Saff, Ernst, PASTE 2004: Automatic mock object creation for test factoring

Conclusion

- Plug-in is publicly available at http://pag.csail.mit.edu/~saff/continuoustesting.html
- Many are using and enjoying continuous testing: give it a try!
- Eclipse was an excellent platform for meeting our design goals.
- Research and implementation continues