

# STARTS: STAtic Regression Test Selection

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ASE 2017

Urbana-Champaign, Illinois

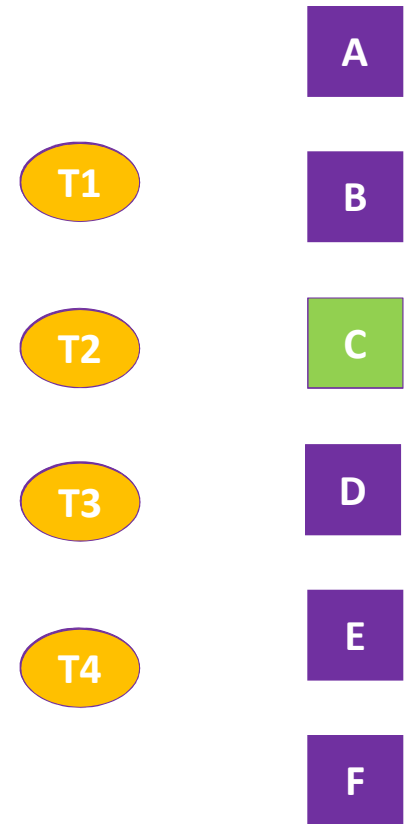
November 1, 2017



# Regression Testing

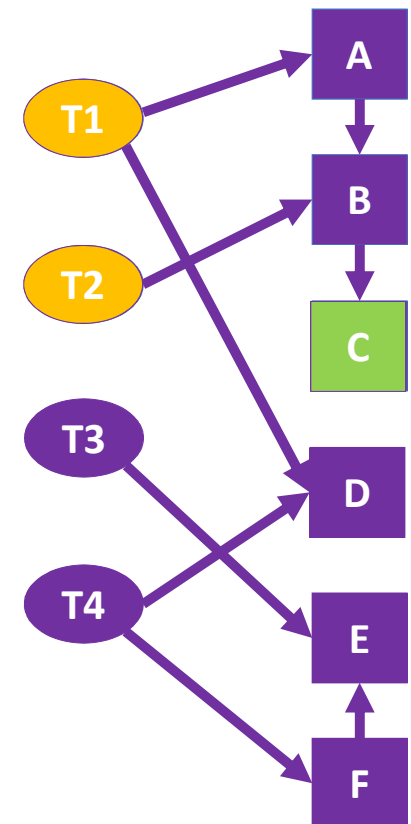
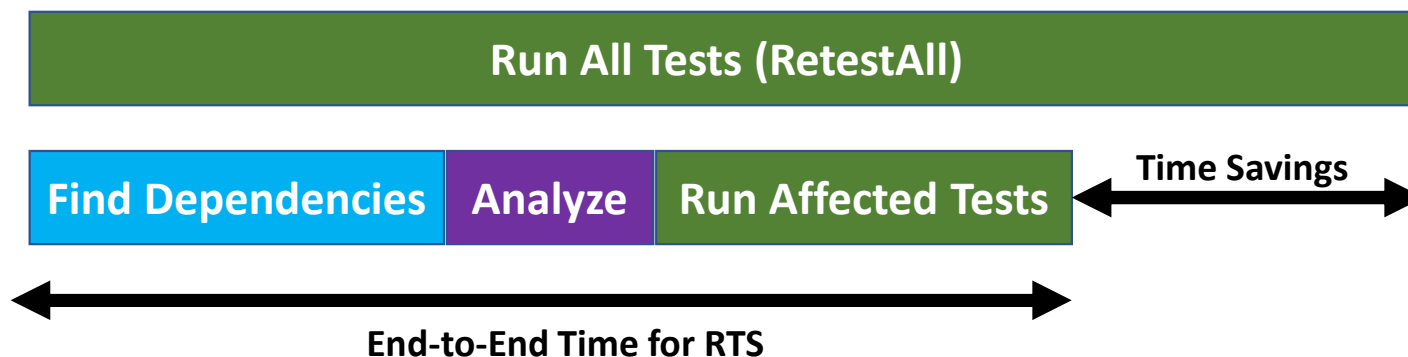
- Rerun tests after every change to check that existing functionality is not broken
- RetestAll: run all tests after each change

**Problem:** RetestAll can be slow especially when there are many tests!



# Regression Test Selection (RTS)

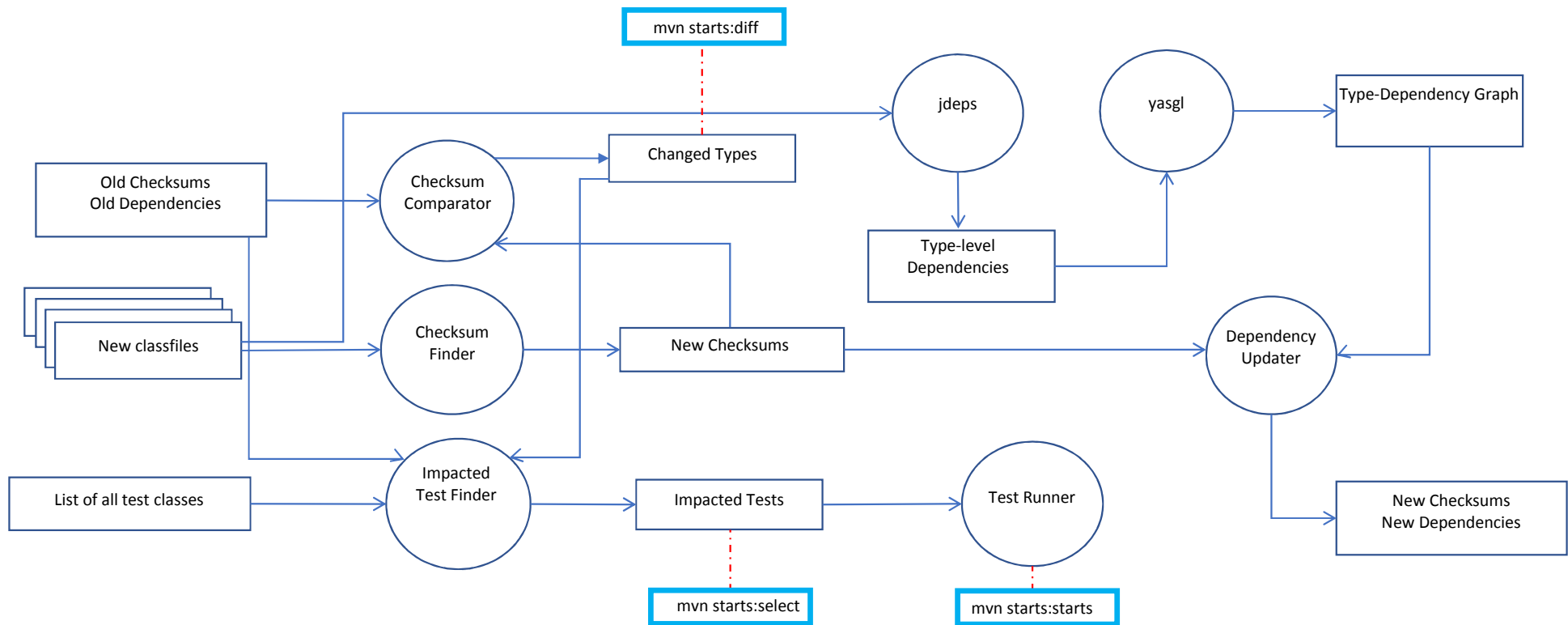
- RTS speeds up regression testing by rerunning only tests that are affected by the code changes
- End-to-end time for RTS steps must be less than time to rerun all tests



# STARTS

- STARTS is an RTS tool that finds dependencies **statically**
  - Dynamic may be too slow, or infeasible in some settings
- We implemented STARTS as a Maven plugin
- STARTS source code is publicly-available on GitHub:
  - <https://github.com/TestingResearchIllinois/starts>

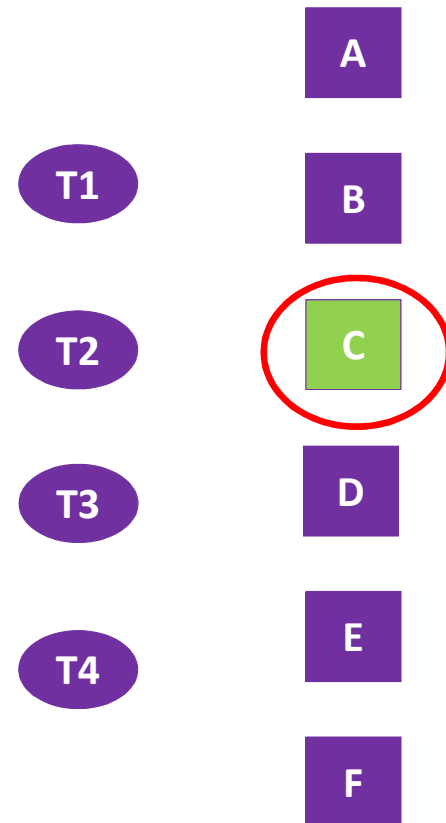
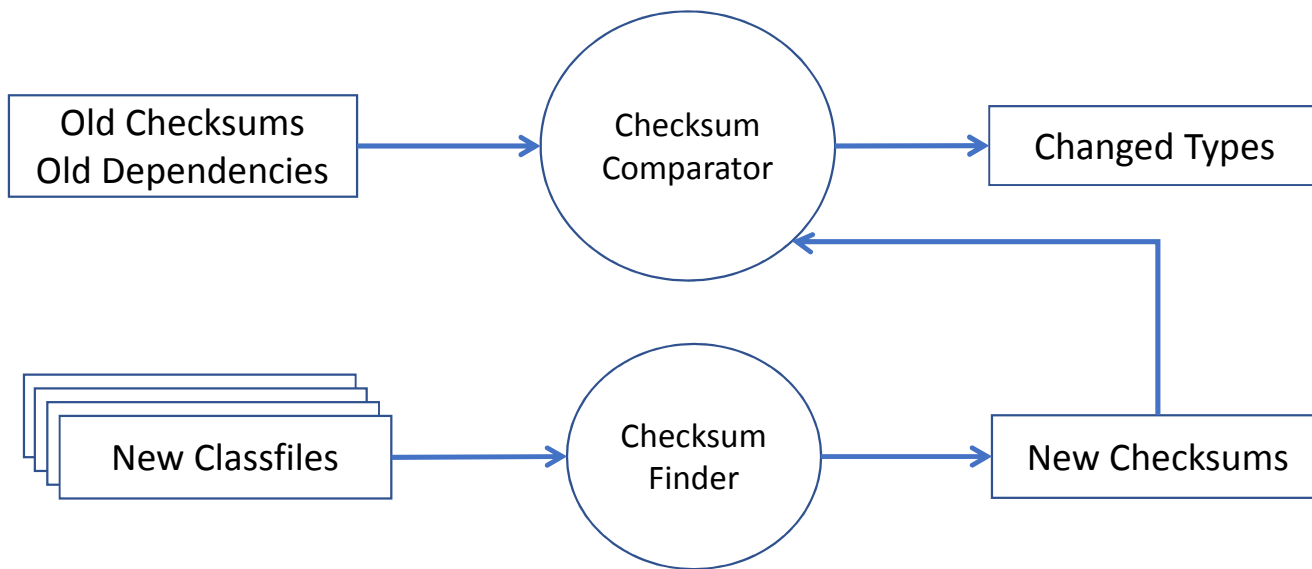
# STARTS Architecture



# STARTS: Finding Changes

`mvn starts:diff`

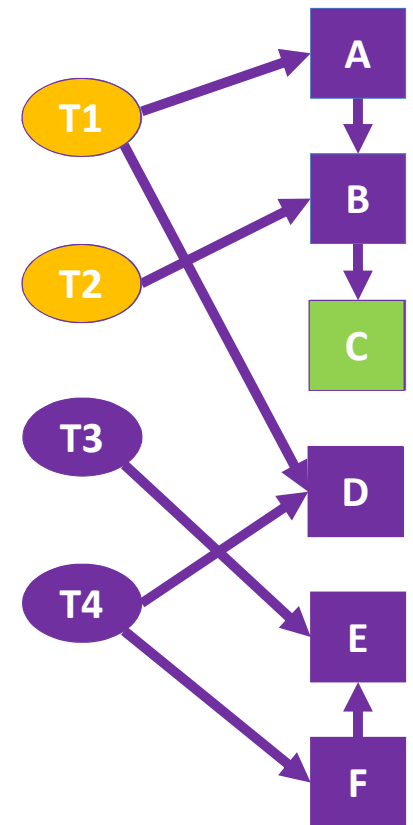
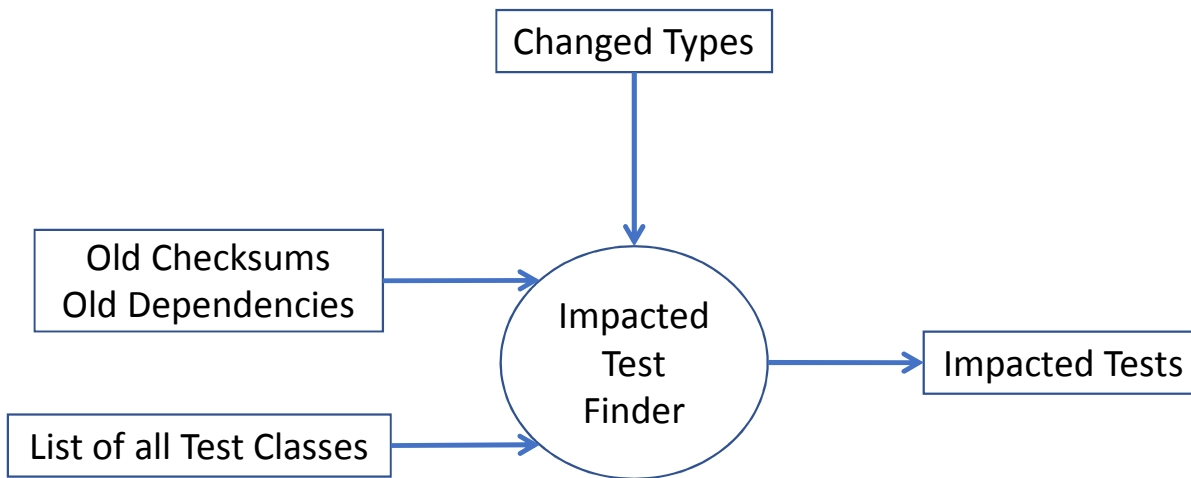
Find changes since last time STARTS was run



# STARTS: Selecting Impacted Tests

`mvn starts:select`

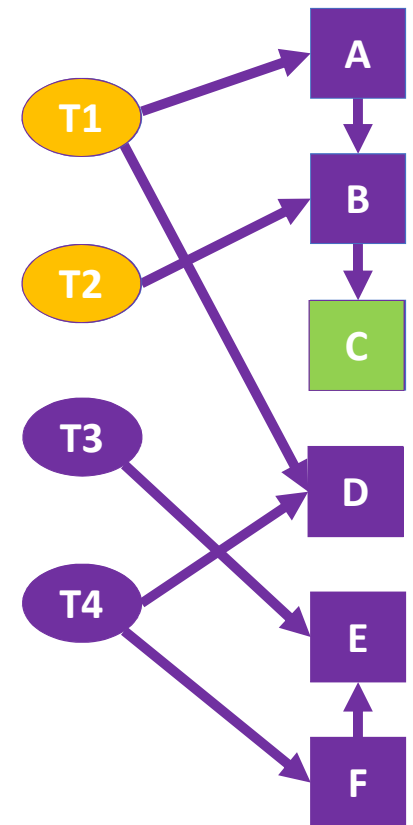
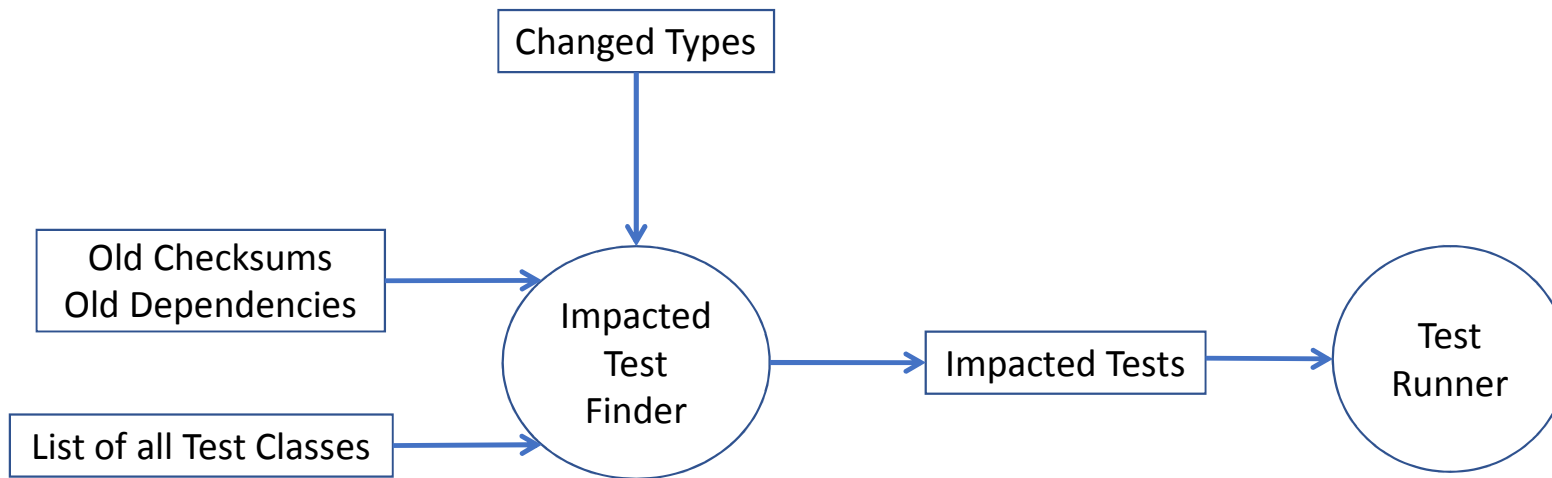
Select impacted tests without running them



# STARTS: Running Impacted Tests

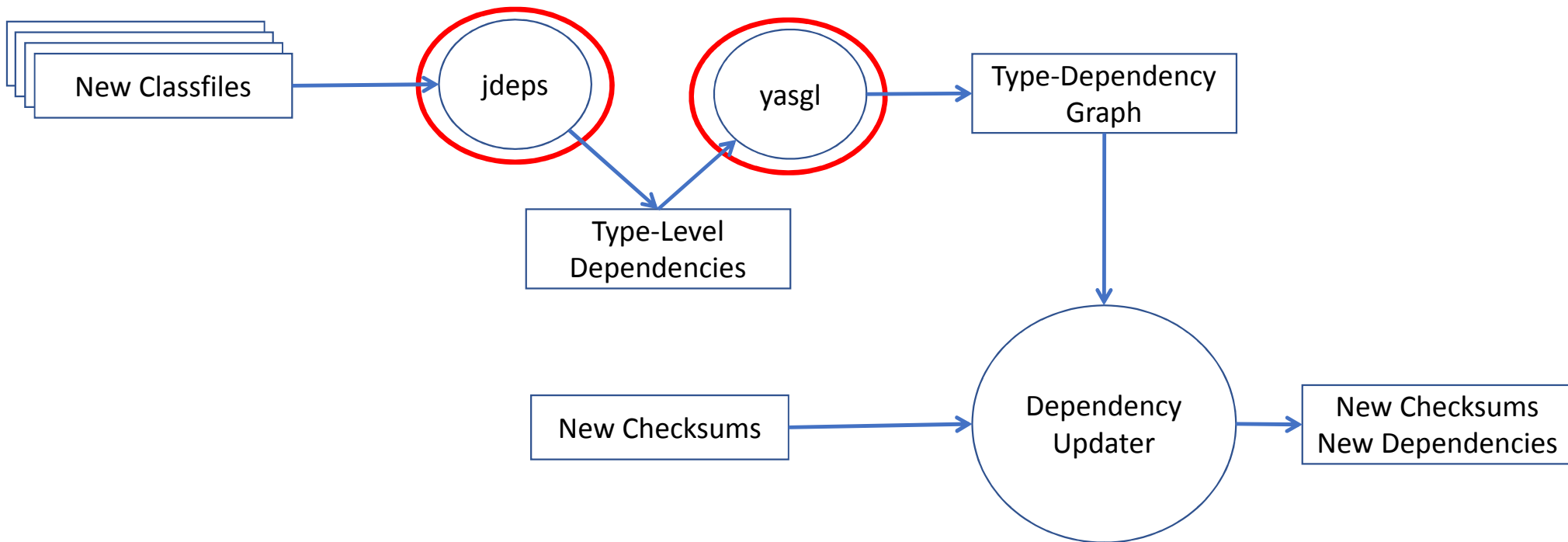
`mvn starts:starts`

Select and run impacted tests





# STARTS: Updating for the Next Run



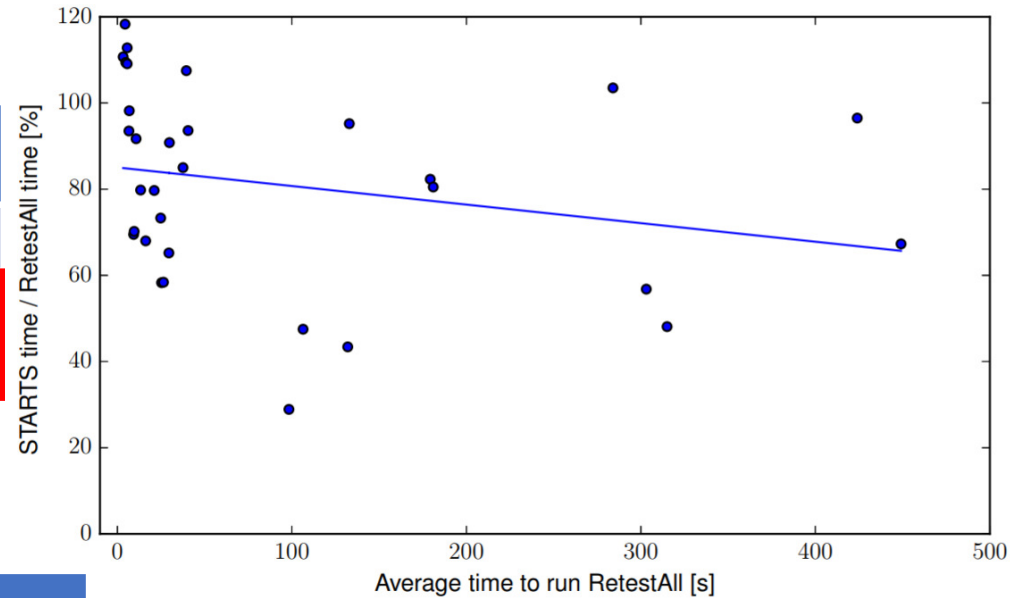
**jdeps** is part of the standard JDK and quickly finds direct class dependencies

**yasgl** is our custom graph library for computing the transitive closure

# Results on 840 versions of 32 GitHub projects

	Tests (#)	Selected Tests (#)	Selected Tests (%)	RetestAll Time (s)	STARTS Time (%)
Avg (SHORT)	58.0	16.4	32.4	17.6	87.8
Avg (LONG)	155.9	54.1	40.5	236.8	68.2
Avg (OVERALL)	91.7	29.4	35.2	93.0	81.0

**STARTS is more effective for longer-running projects**



	STARTS Breakdown (%)			
	<i>analysis</i>	<i>execution</i>	<i>graph constr.</i>	Compilation
Avg (SHORT)	1.0	25.9	8.7	64.4
Avg (LONG)	0.8	70.8	2.3	26.2
Avg (OVERALL)	0.9	41.3	6.5	51.3

**STARTS analysis and graph construction time is relatively efficient**

# Conclusions

- STARTS is a publicly-available, purely static, class-level regression test selection tool
- We are investigating ways to make STARTS safer
  - Maybe also more precise?
- STARTS is available on GitHub
  - <https://github.com/TestingResearchIllinois/starts>

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