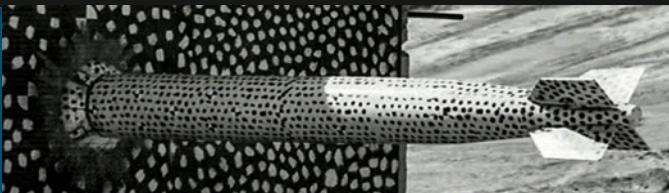
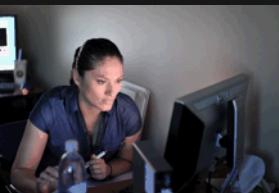




Software Engineering Analytics Toolkit: Dependency Management in Mature Codes



SAND2018-1508C



PRESENTED BY

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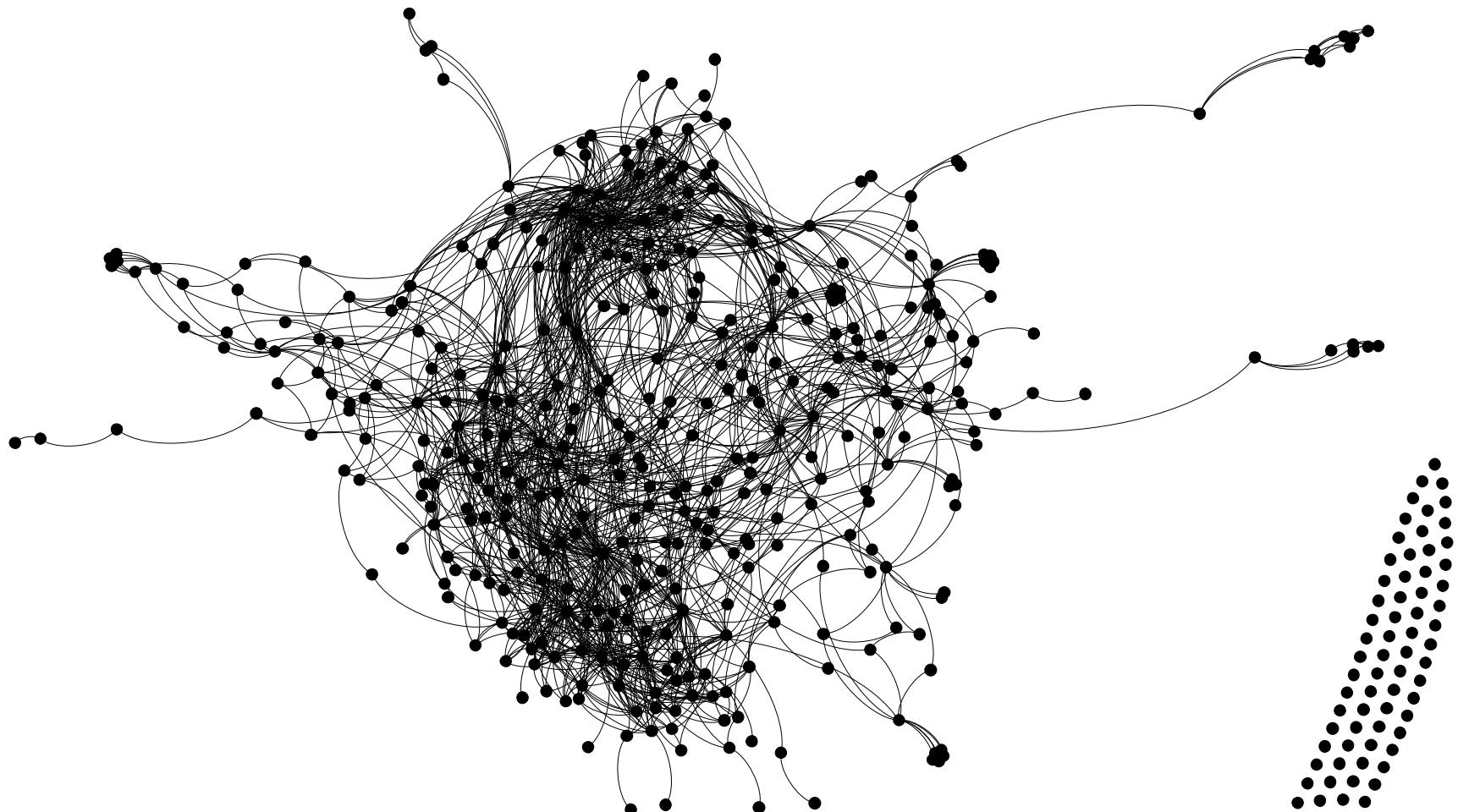
Preview

- **Challenges of maintaining and extending mature codes**
- **Complexity of library-level dependencies in Sierra**
- **Web demo of SEAT**
- **Future directions**

Challenges in Maintaining and Developing in Mature Codes

- Millions of significant lines of code:
 - ✧ **Sierra** ~ 15 million
 - ✧ **Trilinos** ~ 3 million
 - ✧ **E3SM** ~ 1 million
- Code and dependency chains can become opaque, exhibiting these problems:
 - Protracted build and test times
 - Executable bloat (impacting runtime performance)
 - Large memory footprints
 - Unwieldy, poorly understood dependency graphs at the app level
 - Difficulty resolving build and test failure
 - Portability issues

Sierra Library Dependencies



478 nodes (libraries)

1695 edges

Access SEAT as "Dependencies" on CDash

SNTools

Dashboard Calendar Previous Current Project Trac Site Rally Site External SQA Team Views

update data as of **Monday, February 05 2018 - 18:00 MST**

118 tests failed on recent-sntools-changes

8 tests failed on recent-sntools-changes

1 test failed on sntools.4.44

2 tests failed on sntools.4.46

61 tests failed on sntools.4.46

ightly

	Build Name	Update		Build		Test		FCT
		Files	Error	Warn	Not Run	Fail	Pass	
csierra12	sntools.master	8	0	0	0	89 ⁺¹ ₋₁	313 ⁺¹ ₋₁	16 hours ago
csierra12	sntools.4.44	0	0	0	0	77	152	16 hours ago
csierra12	sntools.4.46	0	0	0	0	61	322	16 hours ago
ra-any	sntools.4.46	0	0	0	0	2	422	16 hours ago
ra-any	sntools.master	0	0	0	0	2	453 ⁺¹ ₋₁	16 hours ago
ra-any	sntools.4.44	0	0	0	0	1	429	15 hours ago
csierra12	master-gcc-4.9-heavy-test-itar	0	0	0	0	0	1	19 hours ago
csierra12	master-gcc-4.9-heavy-test-base	0	0	0	0	0	1	22 hours ago
ra-haswell	master-intel-17.0-heavy-test-itar	0	0	0	0	0	1	22 hours ago
ra-any	master-intel-17.0-heavy-test-base	0	0	0	0	0	1	22 hours ago
	Build Name	Build		Test		Start Time		
		Error	Warn	Not Run	Fail		Pass	
ra-macs Sierra	recent-sntools-changes	0	0	0	118 ⁺¹ ₋₁	4 ⁺⁴ ₋₂₉	4 hours ago	
ra-any	recent-sntools-changes	0	0	0	8 ⁺¹ ₋₁	8 ⁺⁸ ₋₄₀	4 hours ago	

<http://compsim-dashboard.sandia.gov/sierraWWW/SEAT/portal/index.html>

What's Next?

- **Implement with production builds (Sierra, Trilinos), with a view to deploying with other codes (e.g., E3SM, SPARC)**
- **Customize to B61 code-quality requirements**
- **Identify potential refactoring targets**
- **Advanced data grooming, mining, visualization and extraction tools focused on code quality, code improvement**

Acknowledgements



Jake Healy



Mike Glass



Paul Wolfenbarger



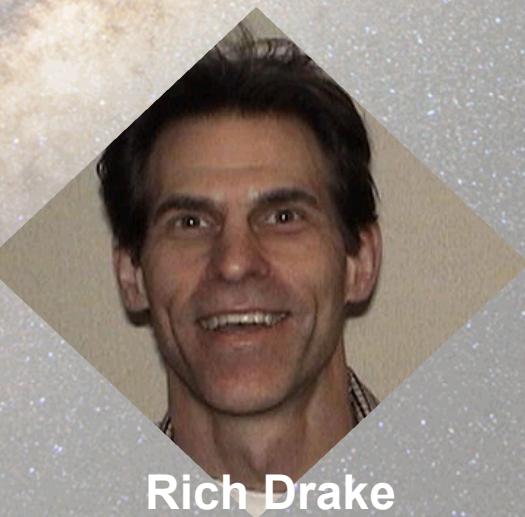
Mark Hamilton



Jim Flahive



Terri Galpin



Rich Drake



**DevOps
ASC**





SLIDE DESIGN SAMPLES ON DARK BACKGROUND

