MODULAR SOFTWARE

The Space Dynamics Laboratory's (SDL) Modular Software team specializes in software development and engineering services including entire spaceflight systems, responsive space functionality, individual module development, and consulting. These services also encompass process improvement, requirements generation, and technical coordination, advisement, and development, as well as independent verification and validation, ground support equipment development, and data post-processing.

As a nonprofit University Affiliated Research Center (UARC), SDL is a trusted Government agent for developing essential software engineering technologies. Due to this partnership, SDL provides unlimited rights to Government customers with no licensing fees for any code that the Modular Software team develops.

The Modular Software team has increased process responsiveness by incorporating software engineering best practices from the general IT industry (shown in the blue box) into the traditional aerospace software development process. As a result, the code is very stable, with minimal regression errors.

PRIMARY BENEFITS
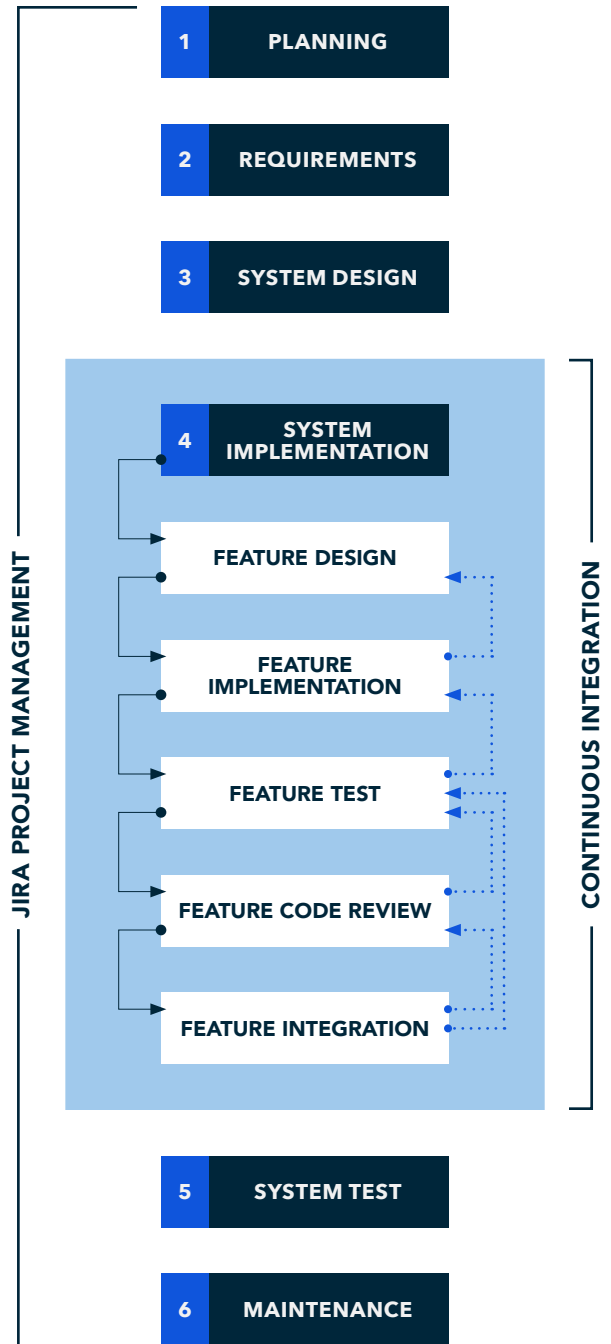
Transparent Development Process
- Customers have complete access to the online tool used for software project management
- Customers can see all development activity, status, code commits & the repository in real time

Thorough Code Review
- Efficient, remote & continual peer review; all code is reviewed before being committed to the repository
- Shared knowledge increases team flexibility

Continuous Integration (CI) Process
- Ensures code quality & stability
- Dramatically reduces regression errors
- Checks for clean, warning-free code compilation
- Executes unit & system integration suite tests
- Performs memory & static analysis
- Generates software documentation
- Checks code style

1	PLANNING
2	REQUIREMENTS
3	SYSTEM DESIGN
4	SYSTEM IMPLEMENTATION
	FEATURE DESIGN
	FEATURE IMPLEMENTATION
	FEATURE TEST
	FEATURE CODE REVIEW
	FEATURE INTEGRATION
5	SYSTEM TEST
6	MAINTENANCE

JIRA PROJECT MANAGEMENT

CONTINUOUS INTEGRATION
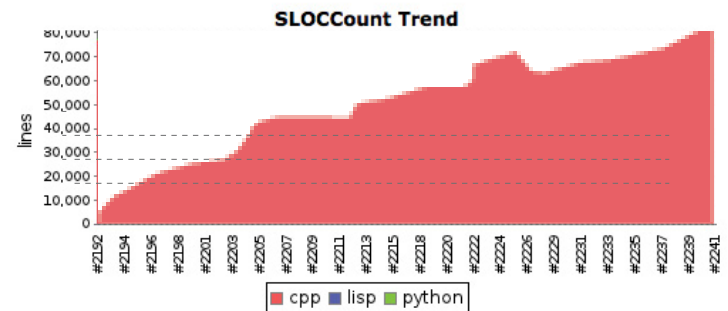
Traditional development waterfall
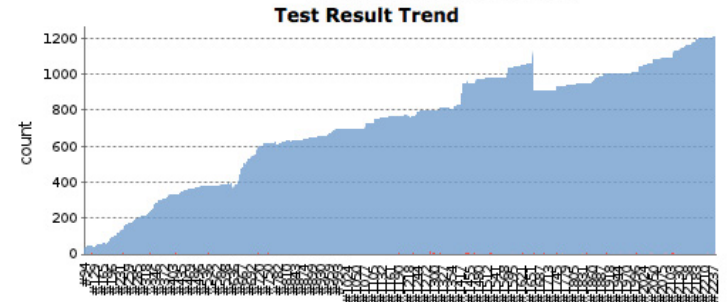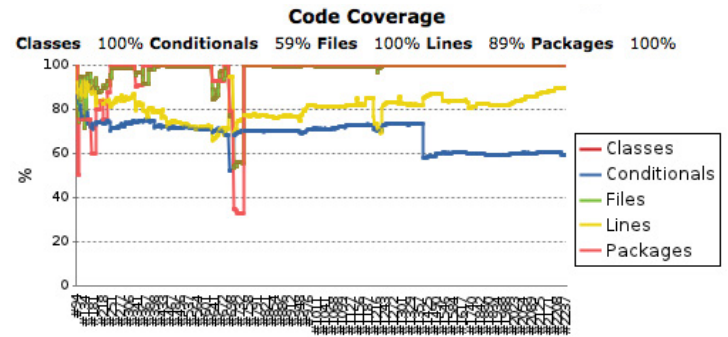
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SDL'S MODULAR SOFTWARE TEAM EXPERIENCE
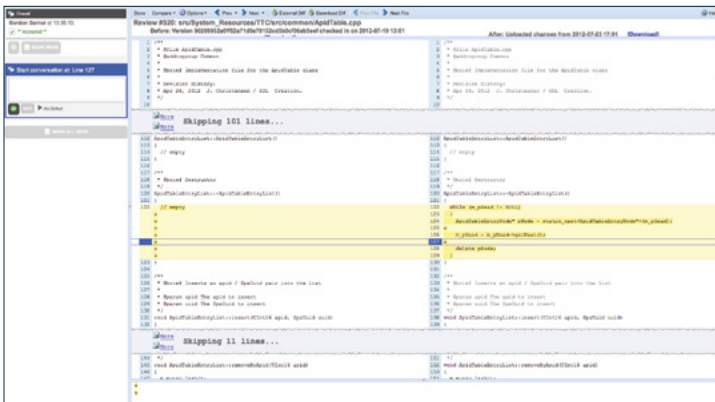
Software Capabilities

- Spaceflight payload & satellite Command & Data Handling (C&DH)
- Spaceflight Attitude Determination & Control Systems (ADCS)
- Ground Command & Control (C2)
- Ground resource management tools
- Consultative Committee for Space Data Systems (CCSDS)
- AX.25 Link-Layer Protocol
- Space Plug-&-Play Architecture (SPA) core infrastructure & applications
- Electronic Ground Support Equipment (EGSE)
- Assembly, Integration & Test (AI&T)
- Verification & Validation (V&V)
- Hardware interface, instrumentation & development
- Device drivers
- Database development & management
- Post-acquisition data processing & analysis
- Image processing
- Cloud architecture & networks

Tools & Technologies

- VxWorks, Linux, Windows
- Jira, BitBucket, Confluence
- UML, Enterprise Architect
- SpaceWire
- CCSDS
- XML, XSD
- Code Collab, Jenkins, git, Valgrind, Subversion, xUnit testing including C++
- C, C++, C#, Java
- FOSSA
- Eclipse plugin development
- Embedded software, 8051, AVR, SPARC, LEON-3, PPC
- Amazon Web Services (AWS)

Code Coverage

Classes 100% Conditionals 59% Files 100% Lines 89% Packages 100%

- Classes
- Conditionals
- Files
- Lines
- Packages

Test Result Trend

SLOCCount Trend

cpp ▪ lisp ▪ python

CI technology provides continuous monitoring of development metrics and codebase.

Efficient and thorough code review detects and eliminates defects early in the lifecycle.
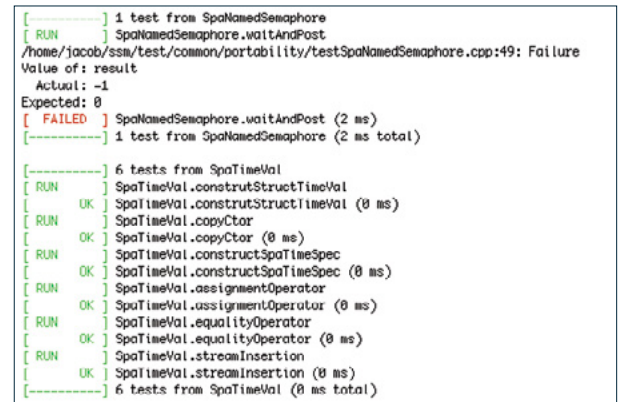
Comprehensive unit integration test suites help eliminate regression errors and ensure code stability.