



F' and Open Source

Michael Starch
NASA Jet Propulsion Laboratory
2022-10-19



Copyright © 2022 California Institute of Technology.
Government sponsorship acknowledged.



Jet Propulsion Laboratory
California Institute of Technology

Agenda

- F Prime and Open Source
- Benefits of Open Source
- Lessons Learned

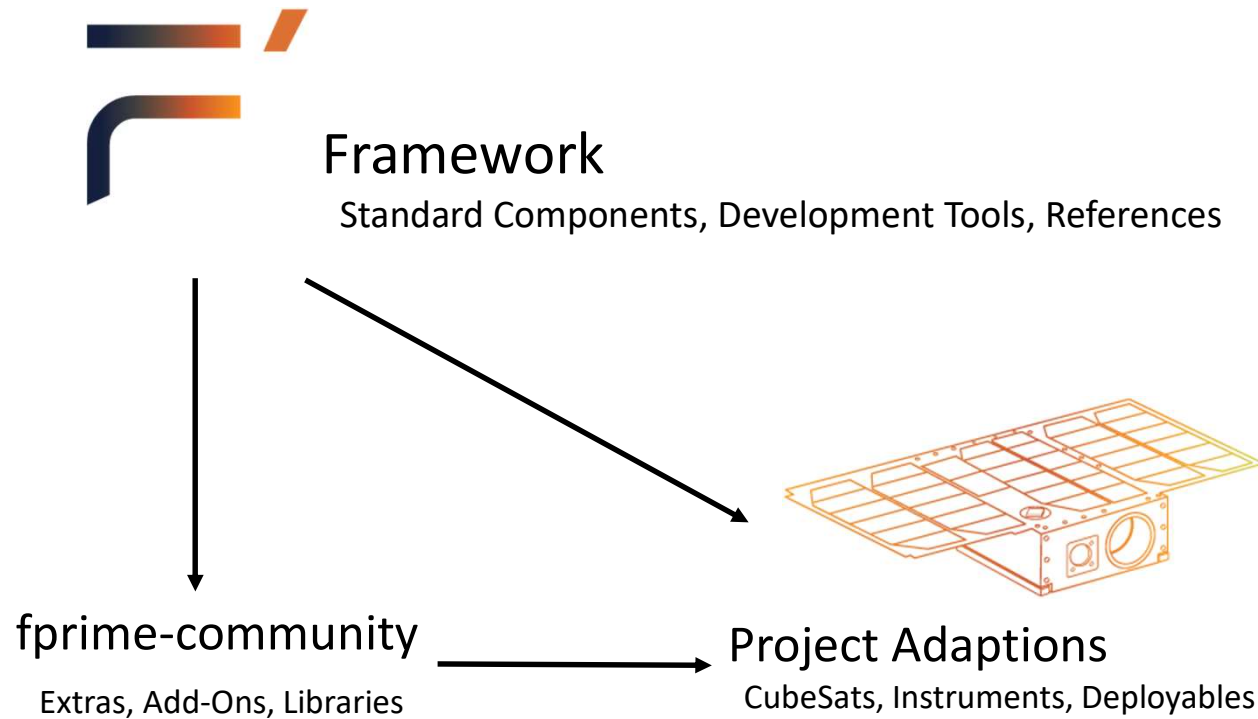
Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not constitute or imply its endorsement by the United States Government or the Jet Propulsion Laboratory, California Institute of Technology.



F' Embedded Systems Framework



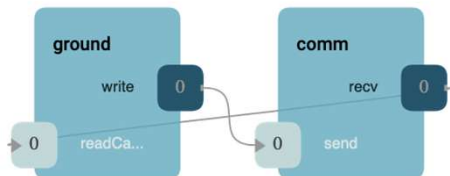
Framework and Projects



Framework Components



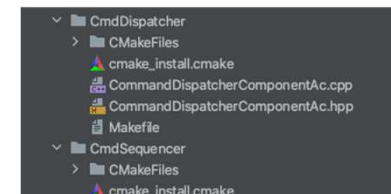
Documentation



Standard Components



References / Examples



Autocoding

The screenshot shows a testing tool interface with a table of events. The table has columns for Event Time, Event ID, Event Name, Event Severity, and Event Description. The events are listed in a table with alternating green and blue rows.

Event Time	Event ID	Event Name	Event Severity	Event Description
2021-01-28 17:01:19.0000	1076	CommandDispatcherComponentAc	WARNING	CommandDispatcherComponentAc: EventTime to port 1
2021-01-28 17:01:19.0000	1077	CommandDispatcherComponentAc	WARNING	CommandDispatcherComponentAc: EventTime to port 1
2021-01-28 17:01:19.0000	1078	CommandDispatcherComponentAc	WARNING	CommandDispatcherComponentAc: EventTime to port 1
2021-01-28 17:01:19.0000	1079	CommandDispatcherComponentAc	WARNING	CommandDispatcherComponentAc: EventTime to port 1
2021-01-28 17:01:19.0000	1080	CommandDispatcherComponentAc	WARNING	CommandDispatcherComponentAc: EventTime to port 1
2021-01-28 17:01:19.0000	1081	CommandDispatcherComponentAc	WARNING	CommandDispatcherComponentAc: EventTime to port 1
2021-01-28 17:01:19.0000	1082	CommandDispatcherComponentAc	WARNING	CommandDispatcherComponentAc: EventTime to port 1
2021-01-28 17:01:19.0000	1083	CommandDispatcherComponentAc	WARNING	CommandDispatcherComponentAc: EventTime to port 1
2021-01-28 17:01:19.0000	1084	CommandDispatcherComponentAc	WARNING	CommandDispatcherComponentAc: EventTime to port 1
2021-01-28 17:01:19.0000	1085	CommandDispatcherComponentAc	WARNING	CommandDispatcherComponentAc: EventTime to port 1

Testing Tools



F' and Open Source

Open Sourcing



Jet Propulsion Laboratory
California Institute of Technology



<https://octodex.github.com/original/>

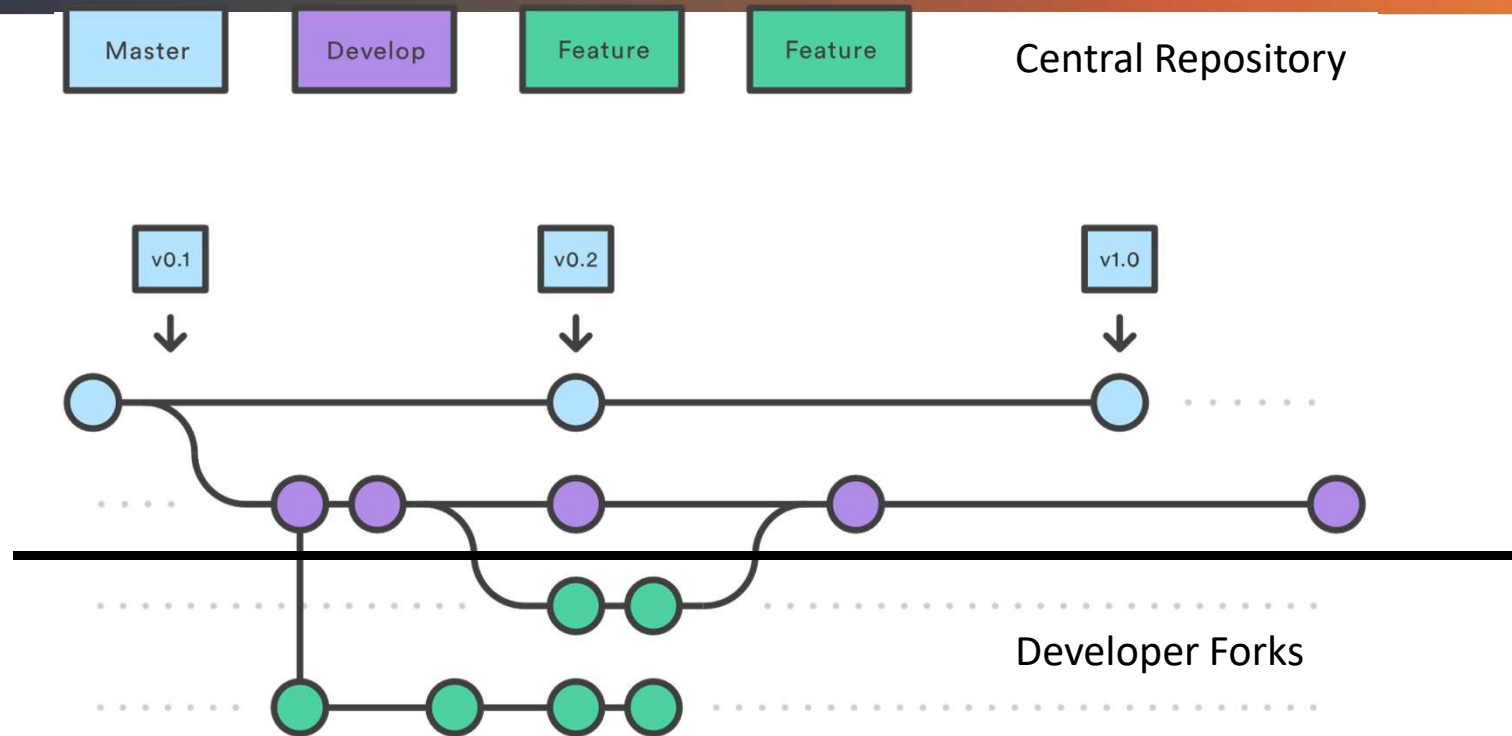


2013	Internal Development	2017	Open Development	2021
------	----------------------	------	------------------	------

Apache License, Version 2.0



F ' Open Development Model



<https://www.atlassian.com/git/tutorials/comparing-workflows/gitflow-workflow>



Open Tooling and Documentation



Static Analysis







<https://www.doxygen.nl/index.html>



<https://www.sphinx-doc.org/en/master/>

Generated Documentation

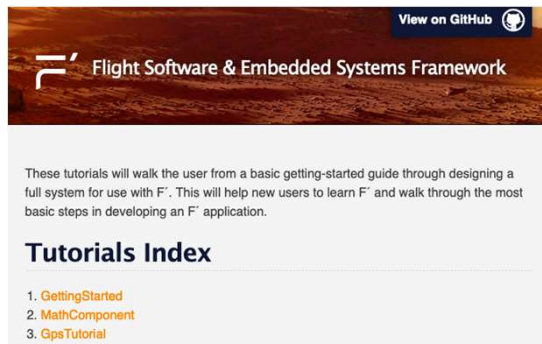
✓	All checks have passed 2 successful and 2 neutral checks	Hide all checks
✓	 CI / build (pull_request) Successful in 20m	Required Details
■	 LGTM analysis: JavaScript Completed in 42s — No code changes detected	Details
■	 LGTM analysis: Python Completed in 42s — No code changes detected	Details
✓	 LGTM analysis: C/C++ Successful in 7m — 1 new alert	Details

Automatic Pull Request Verification

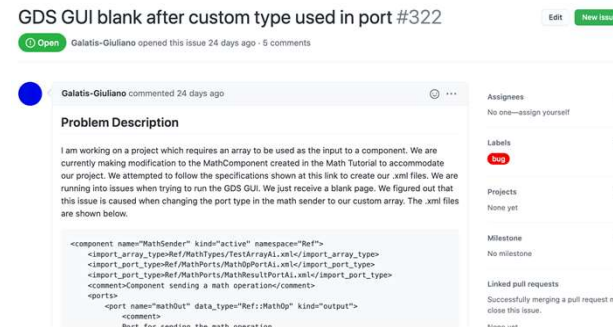


Benefits of Open Source

Extended Oversight



Documentation Edits



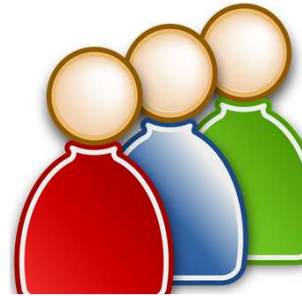
Error Reports



Design and Code Reviews



Community of Expertise



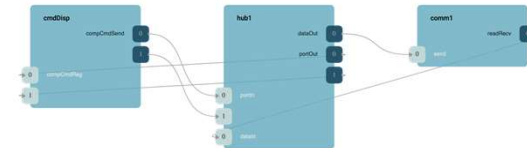
<https://commons.wikimedia.org/wiki/File:User-group-square.svg>



Best Practices



Answers



Recommended Patterns



Ecosystem Surrounding Framework

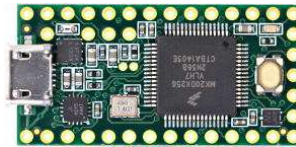


https://commons.wikimedia.org/wiki/File:OpenMoji-black_1F527.svg

Extended Tooling



Useful Libraries



prjc.com

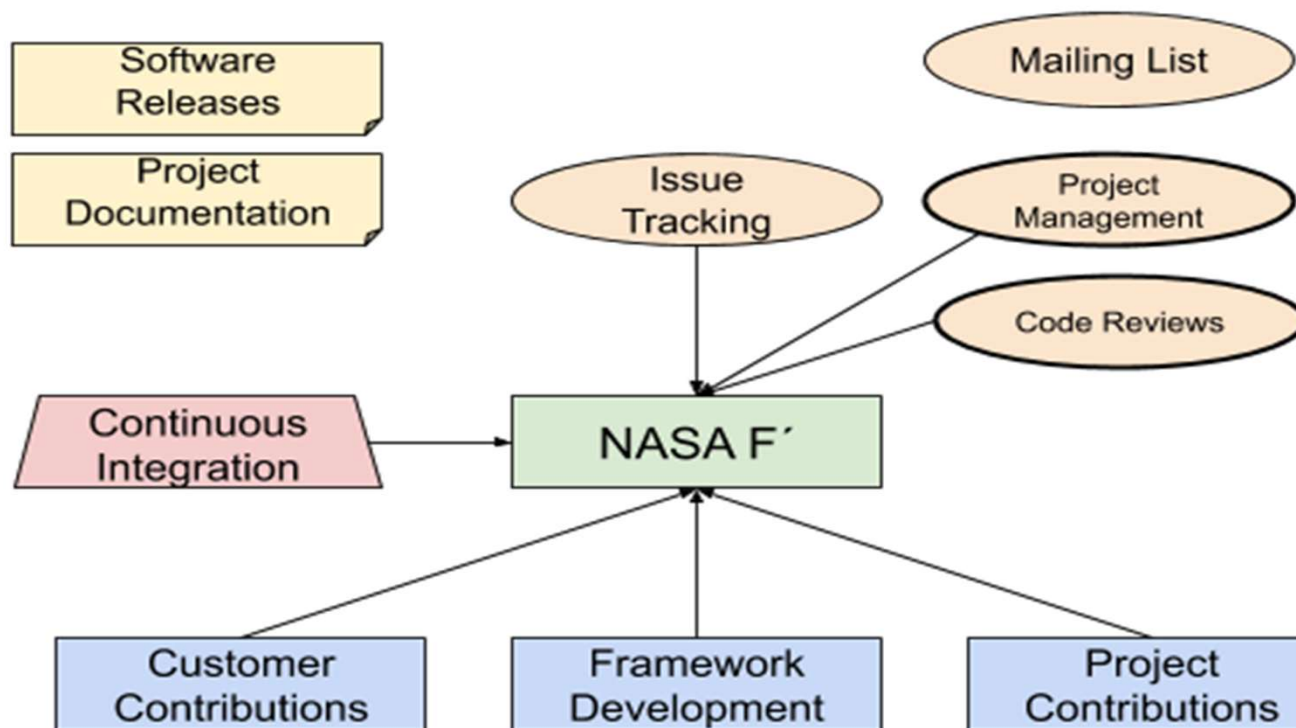
New Use Cases



Lessons Learned

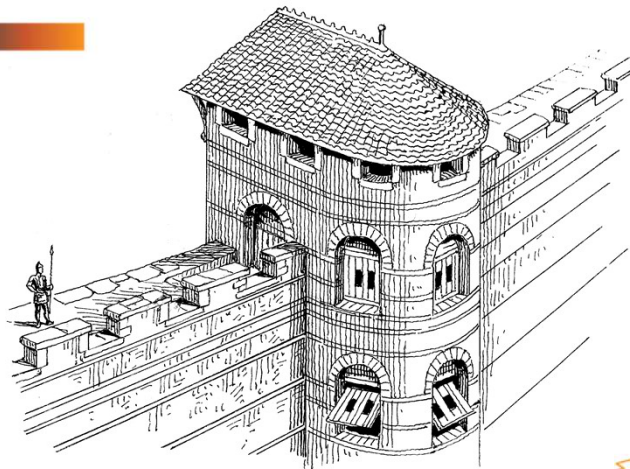


Embrace Openness

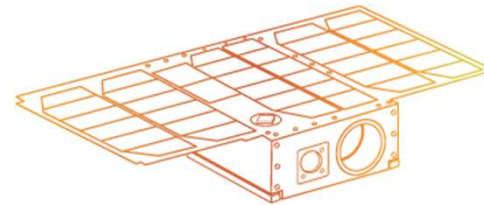




Separate Product Line from Projects



Pearson Scott Foresman, Public Domain



Budget, Schedules, Short-Cuts



Leverage Tools and Automation



Free and Open



<https://docker.com>

Ease Maintenance



Standard Practice



Low Integration Overhead



Reduce Development



Questions?



NASA/JPL-Caltech



Further Information on F Prime

F Prime Website:

<https://nasa.github.io/fprime>

F Prime Software:

<https://github.com/nasa/fprime>

F Prime Community:

<https://groups.google.com/g/fprime-community>



Jet Propulsion Laboratory
California Institute of Technology

jpl.nasa.gov