# Open Source Lessons Learned with Open MCT

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Silicon Valley

Open Source CubeSat Workshop 2018

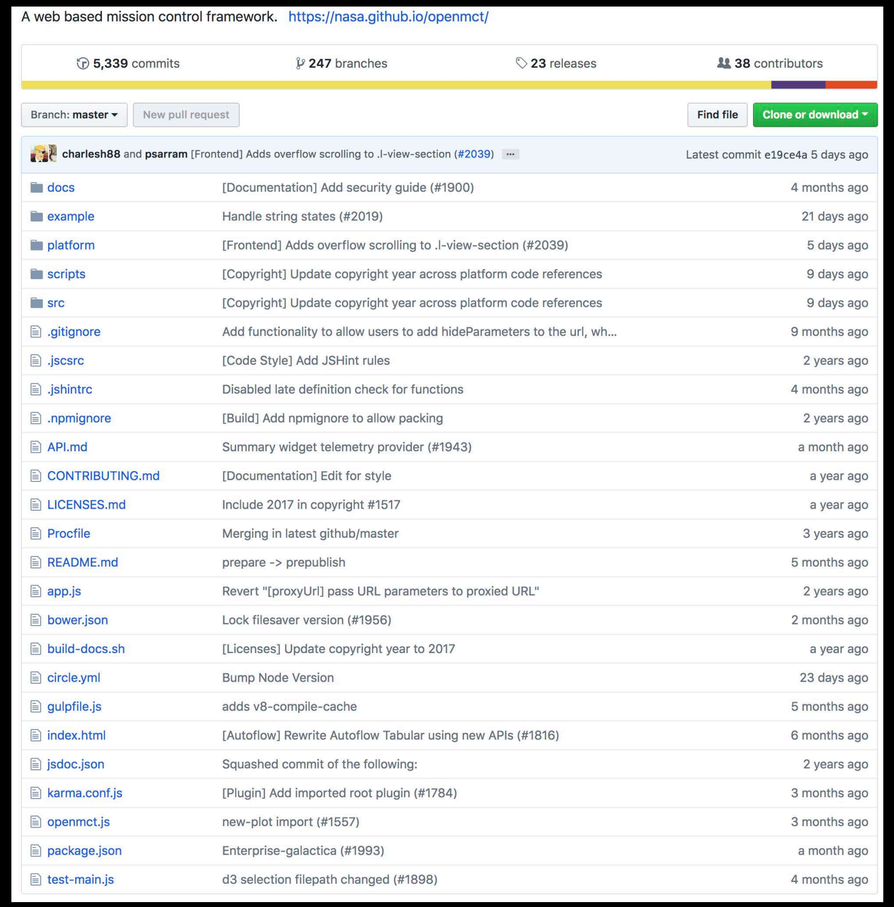
# The Vision

- Closed —> Open
- Ground systems have traditionally been built on proprietary systems.
  - Duplication of effort - we continually re-create the same thing
- Let’s move to a shared model for ground systems and build on each others work
- The internet economy as an analogy - companies may focus on their core differentiators and use existing infrastructure

**https://github.com/nasa/openmct**

# Immediate Benefits

- Collaboration that works
- Use, adopt, make it your own, contribute
- No ownership issues
- Instant access
- Fork/Pull



A web based mission control framework. https://nasa.github.io/openmct/

**5,339** commits | **247** branches | **23** releases | **38** contributors

Branch: master | New pull request | Find file | Clone or download

**charlesh88** and **psarram** [Frontend] Adds overflow scrolling to .l-view-section (#2039) ··· Latest commit e19ce4a 5 days ago

| | | |
|---|---|---|
| docs | [Documentation] Add security guide (#1900) | 4 months ago |
| example | Handle string states (#2019) | 21 days ago |
| platform | [Frontend] Adds overflow scrolling to .l-view-section (#2039) | 5 days ago |
| scripts | [Copyright] Update copyright year across platform code references | 9 days ago |
| src | [Copyright] Update copyright year across platform code references | 9 days ago |
| .gitignore | Add functionality to allow users to add hideParameters to the url, wh... | 9 months ago |
| .jscsrc | [Code Style] Add JSHint rules | 2 years ago |
| .jshintrc | Disabled late definition check for functions | 4 months ago |
| .npmignore | [Build] Add npmignore to allow packing | 2 years ago |
| API.md | Summary widget telemetry provider (#1943) | a month ago |
| CONTRIBUTING.md | [Documentation] Edit for style | a year ago |
| LICENSES.md | Include 2017 in copyright #1517 | a year ago |
| Procfile | Merging in latest github/master | 3 years ago |
| README.md | prepare -> prepublish | 5 months ago |
| app.js | Revert "[proxyUrl] pass URL parameters to proxied URL" | 2 years ago |
| bower.json | Lock filesaver version (#1956) | 2 months ago |
| build-docs.sh | [Licenses] Update copyright year to 2017 | a year ago |
| circle.yml | Bump Node Version | 23 days ago |
| gulpfile.js | adds v8-compile-cache | 5 months ago |
| index.html | [Autoflow] Rewrite Autoflow Tabular using new APIs (#1816) | 6 months ago |
| jsdoc.json | Squashed commit of the following: | 2 years ago |
| karma.conf.js | [Plugin] Add imported root plugin (#1784) | 3 months ago |
| openmct.js | new-plot import (#1557) | 3 months ago |
| package.json | Enterprise-galactica (#1993) | a month ago |
| test-main.js | d3 selection filepath changed (#1898) | 4 months ago |

**https://github.com/nasa/openmct**

# More benefits

- Better software
  - More eyes on your software
  - More users
  - A community that drives you to be better
  - Yes, missions do some of this, but the environment is somewhat insular so there are benefits to a broader group of users and contributors

**https://github.com/nasa/openmct**

# How have we advanced since the 1960’s?

MERCURY

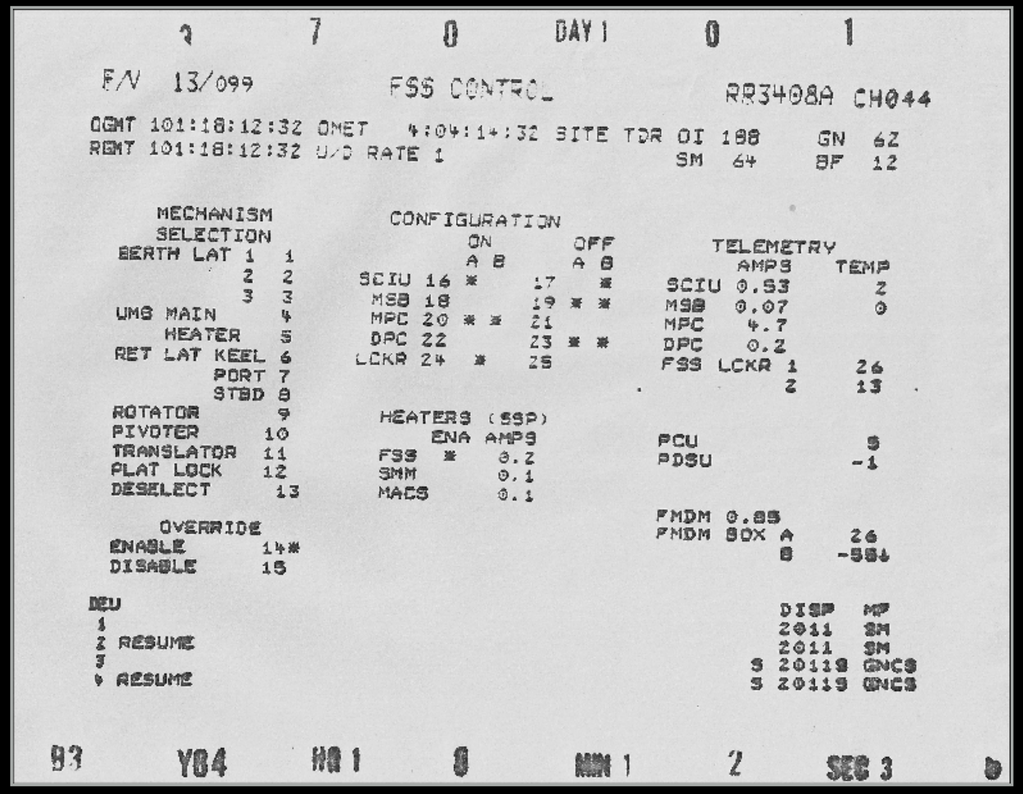
1960’s

APOLLO

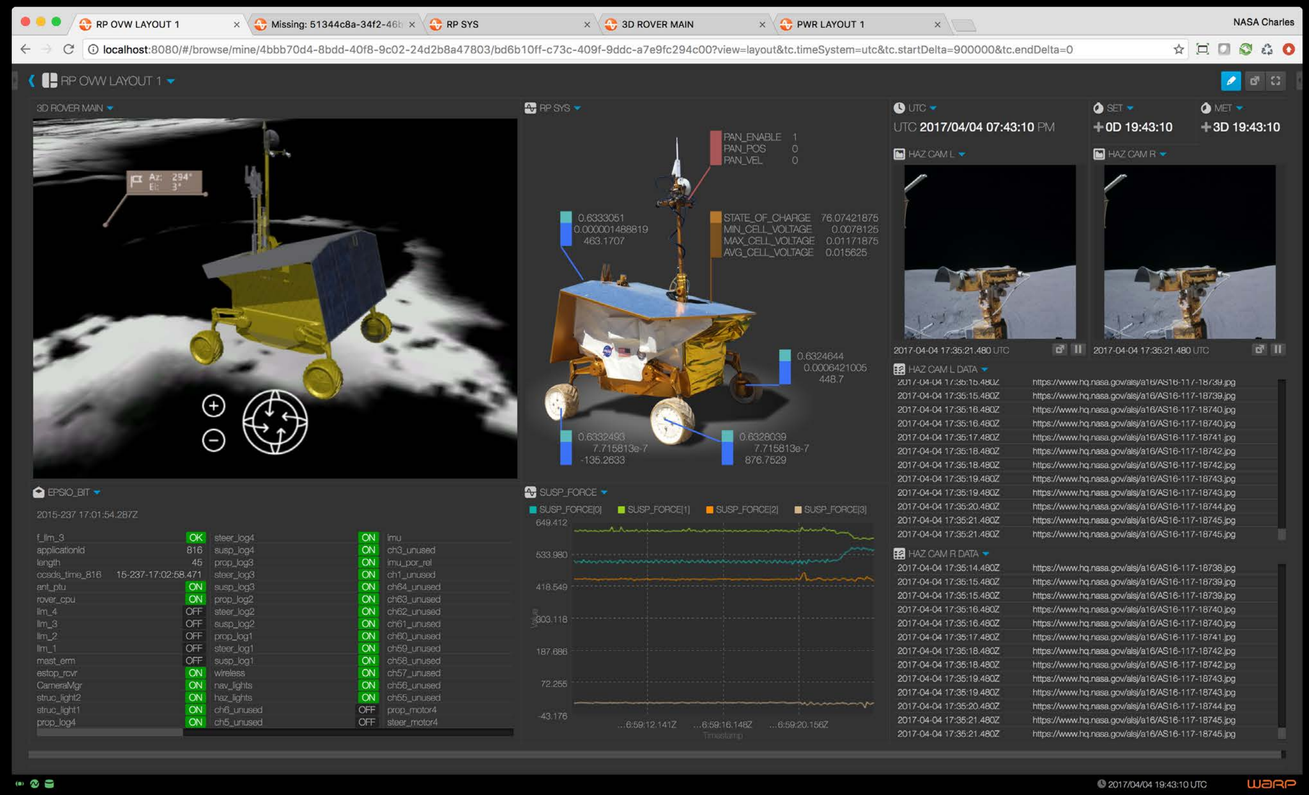
SHUTTLE AND ISS

2000 and beyond

# Can open source be a vehicle for advancing technology?



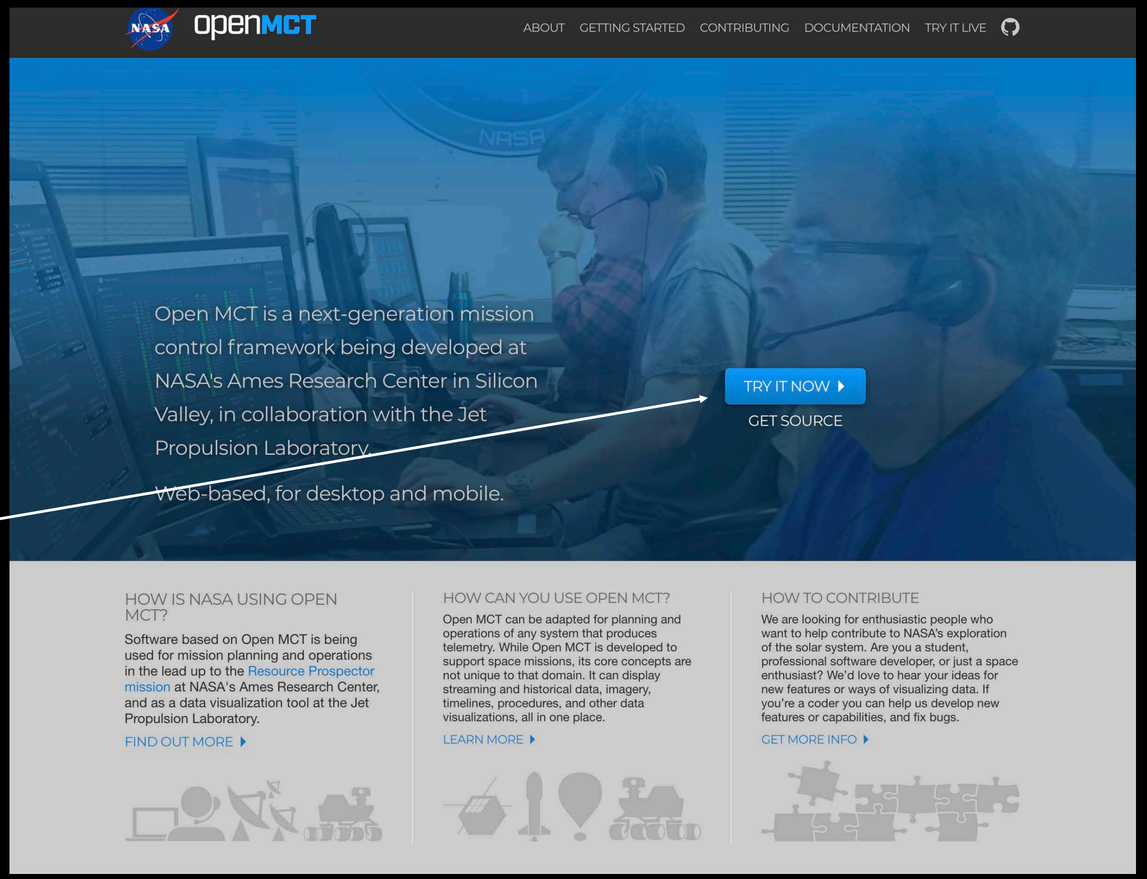

1980's Space Shuttle Display



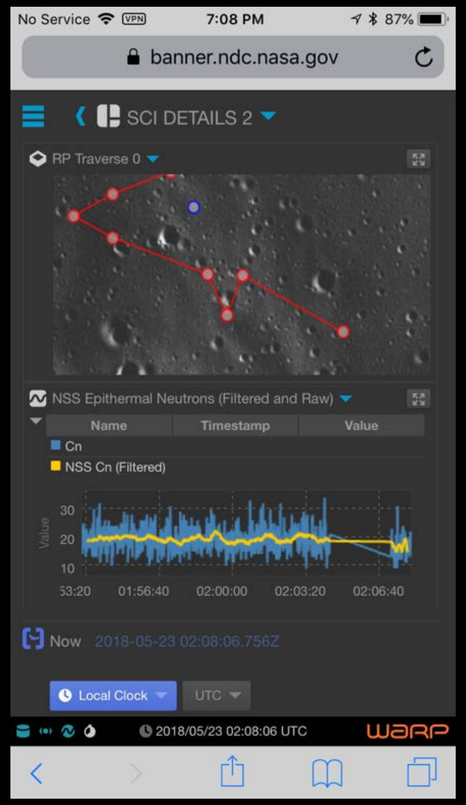

Open MCT Display

# The platform

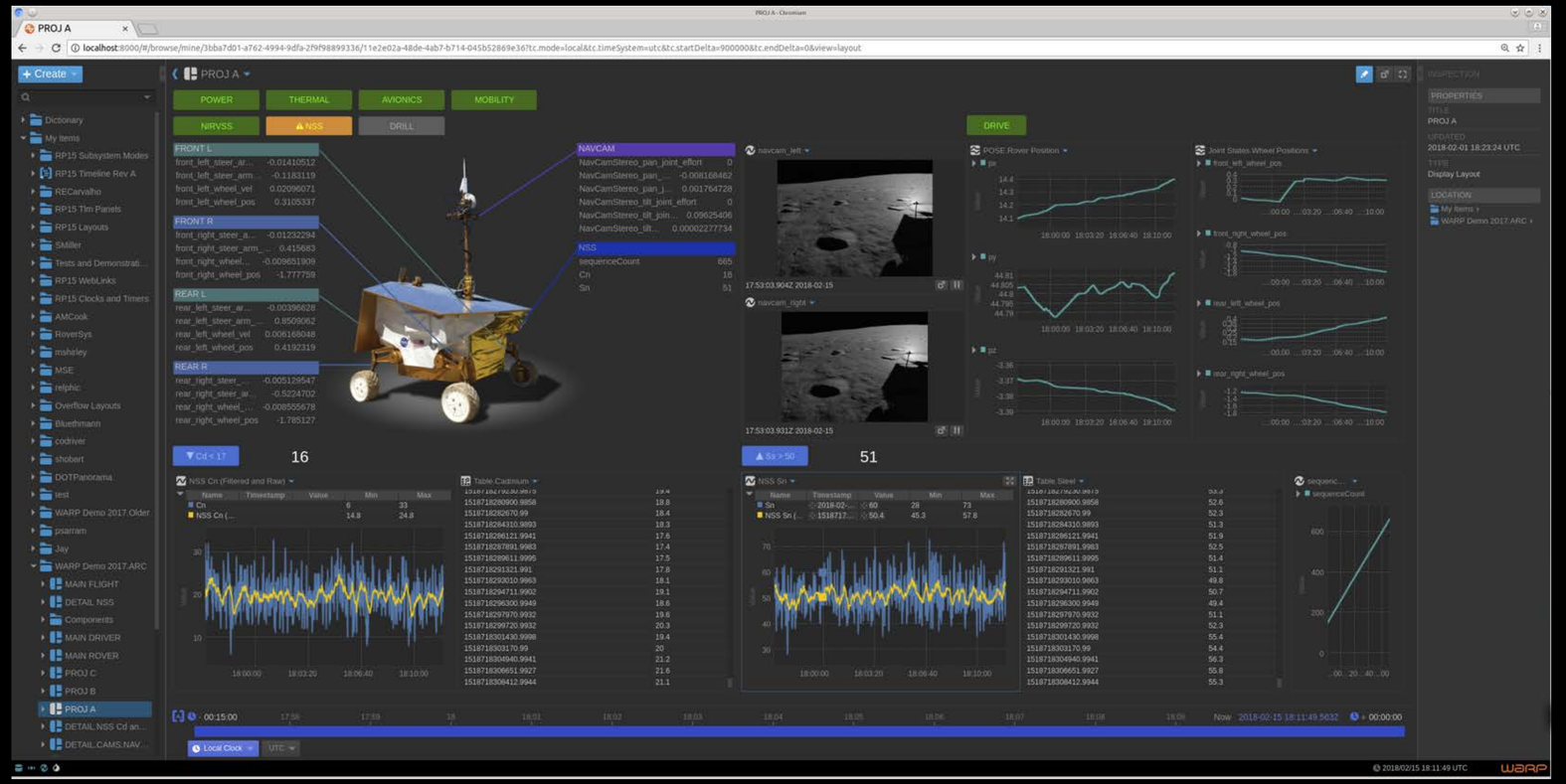
- Open Mission Control Technologies - Open MCT
- Info
  - https://nasa.github.io/openmct/
  - From info site, click on Try it Now
- Code
  - https://nasa.github.io/openmct/



# The Platform



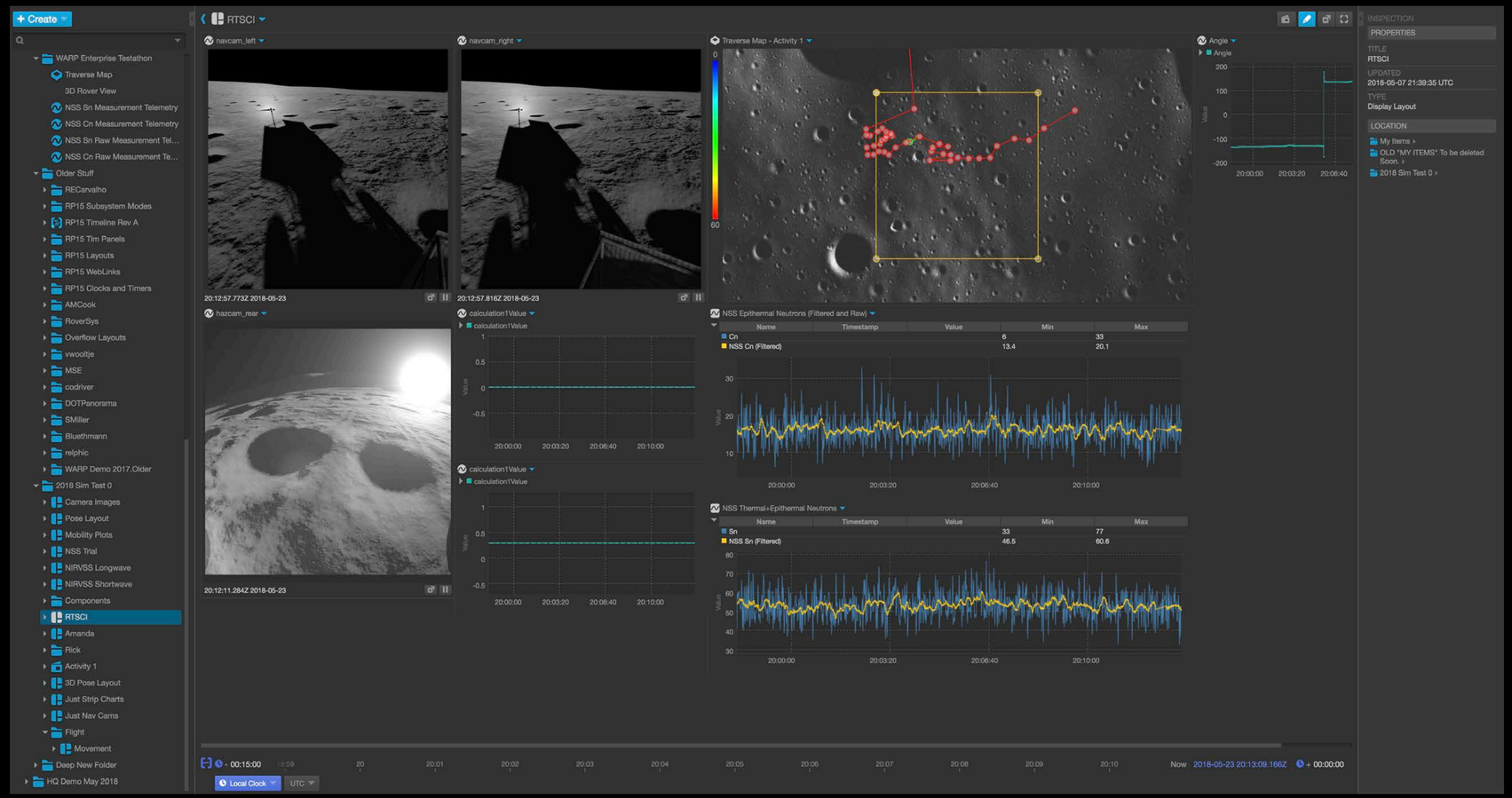

Mobile




Desktop

https://github.com/nasa/openmct

# All Your Data in One Place

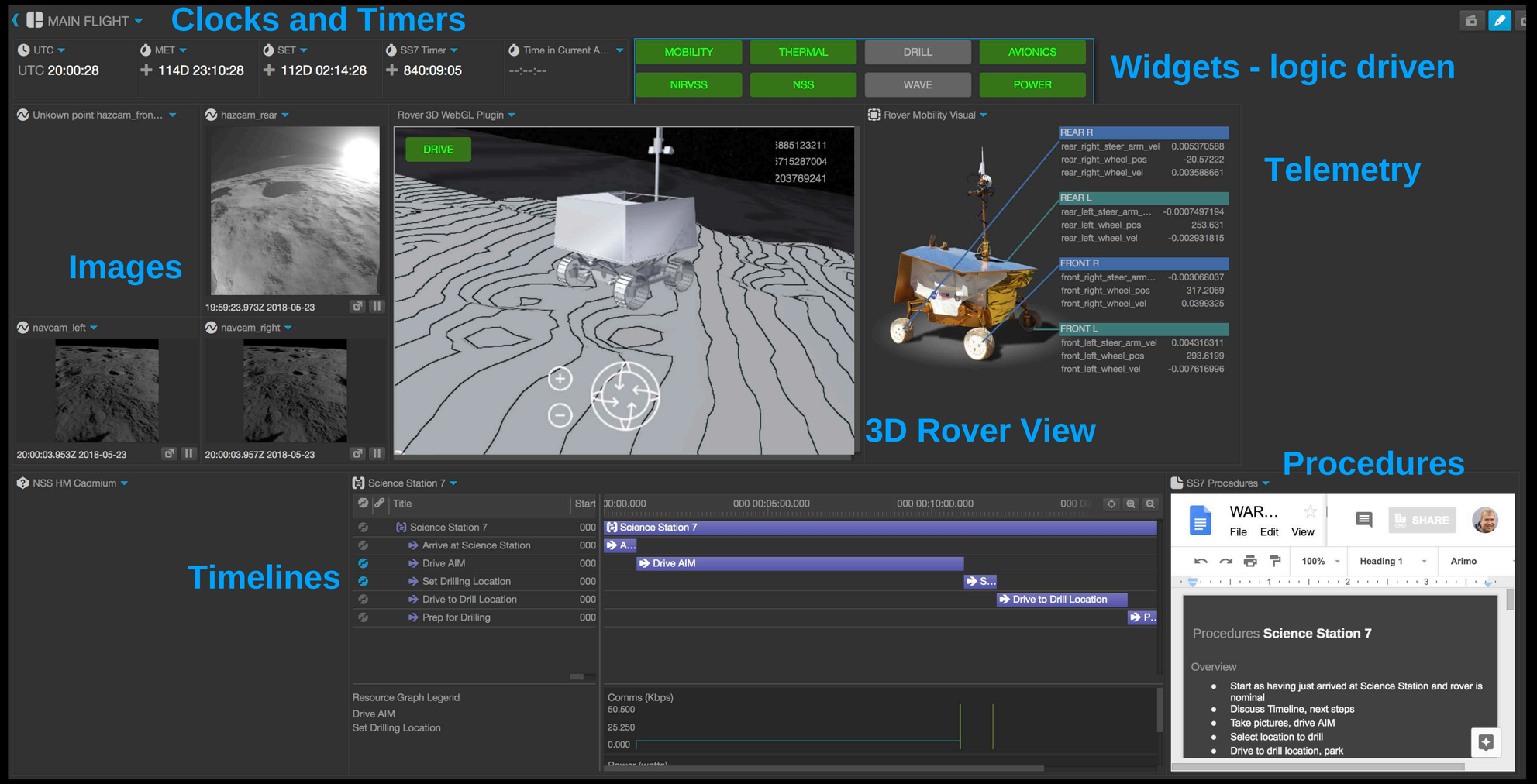



**All your data here**

**Data Visualizations, cross domain**

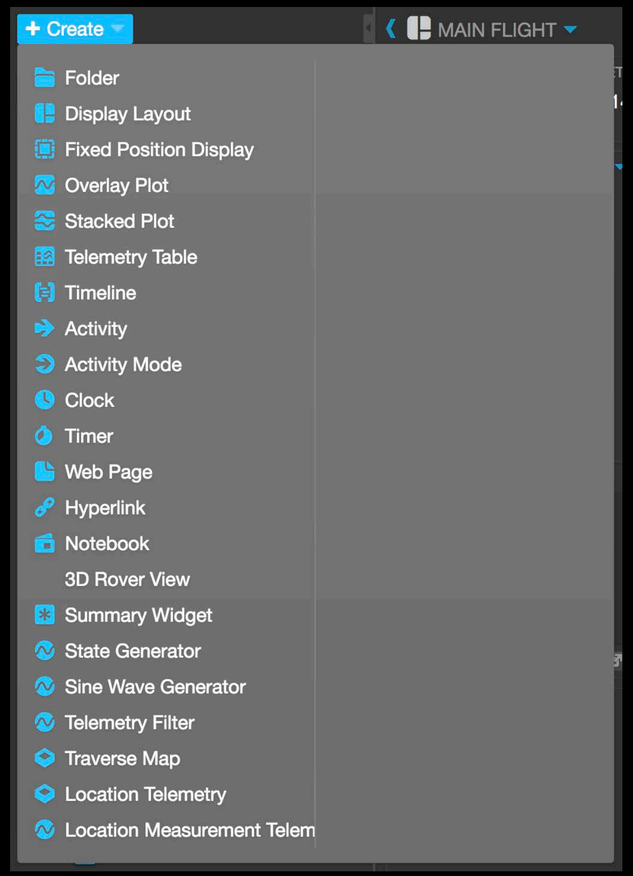
**Inspector**

# Mix Data Across Domains

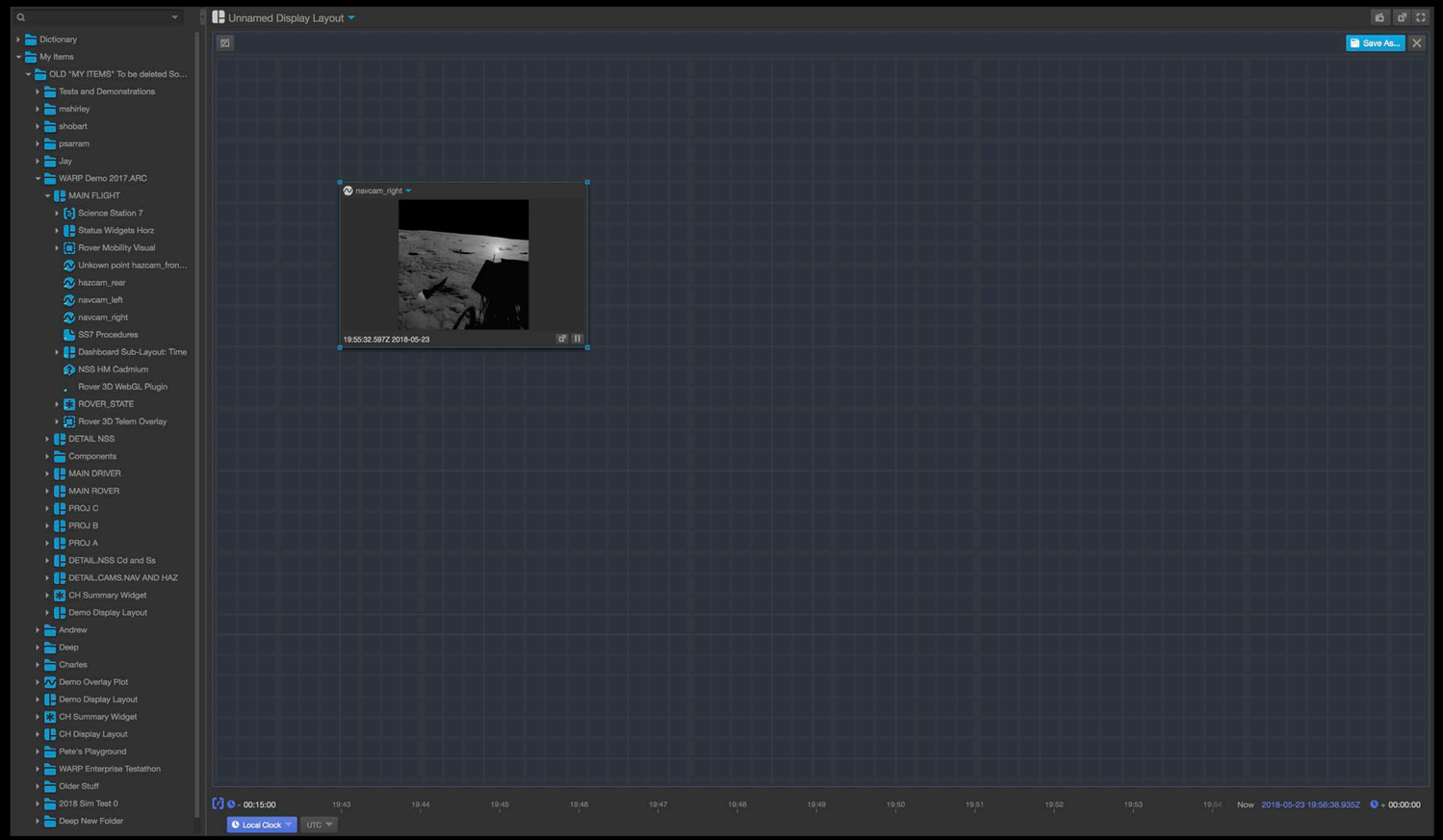



**Add capabilities with plugins**

# Make Your Own Displays




Create




Build a display layout

**https://github.com/nasa/openmct**

# Who has Open MCT in NASA

**More…**

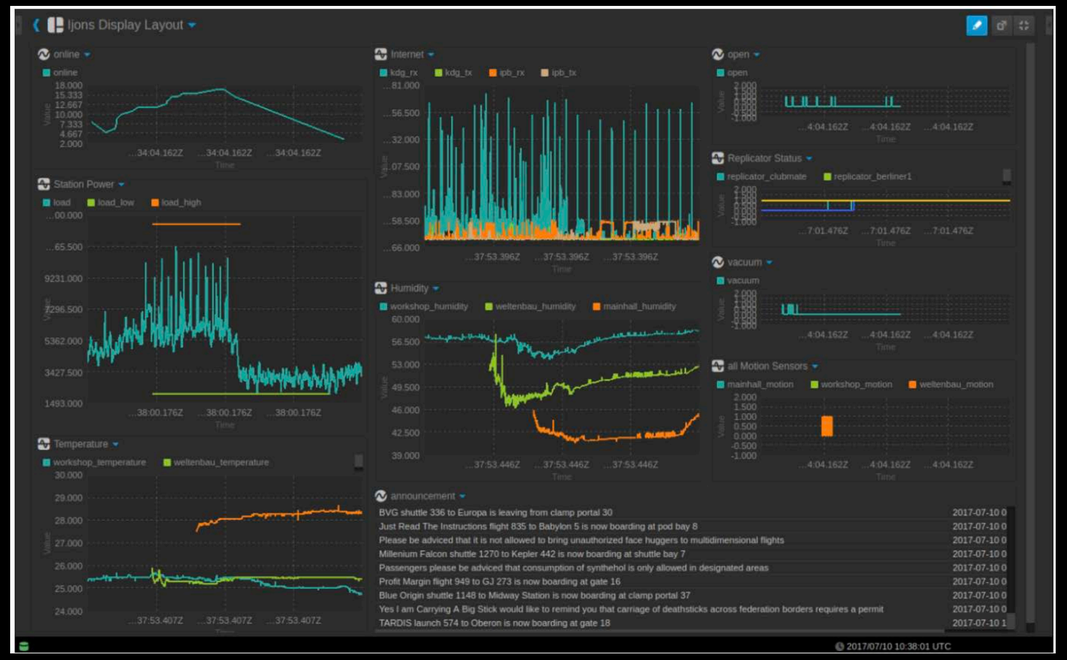
**https://github.com/nasa/openmct**

# Open MCT in ESA

- ?

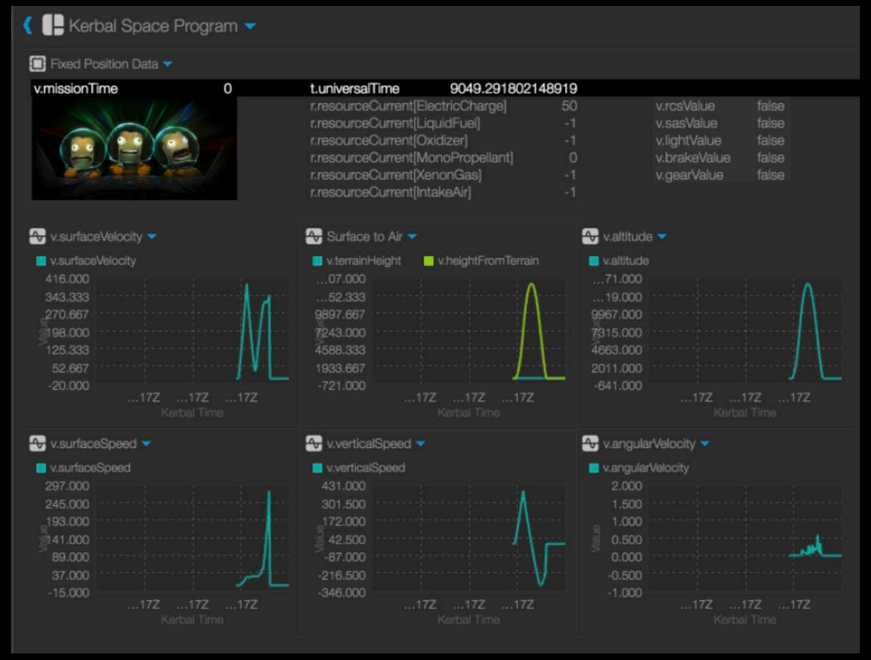
# Samples from the community outside NASA

**C-base backspace Berlin**




https://bergie.iki.fi/blog/nasa-openmct-iot-dashboard/

**Kerbal Space Program**




https://github.com/nasa/openmct

# Contributors

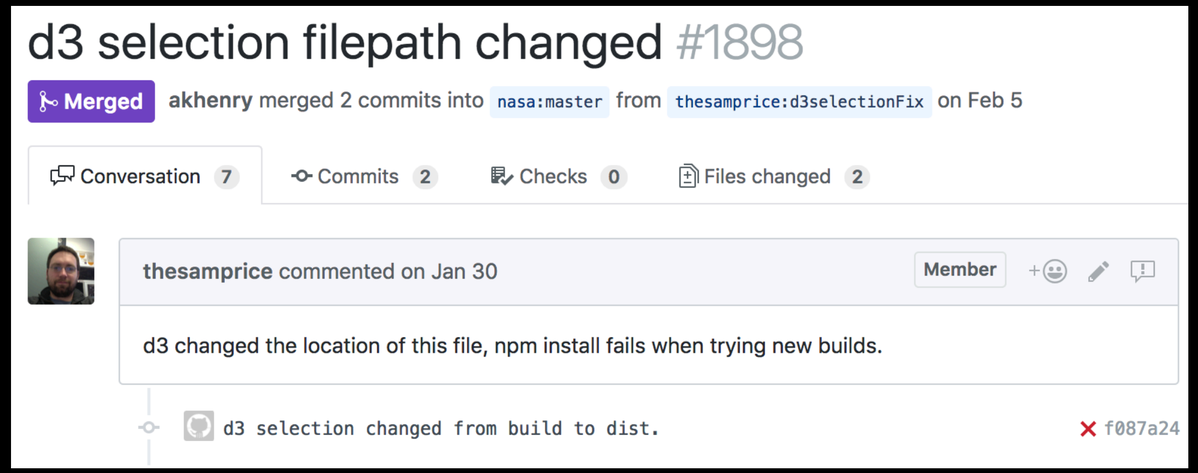
- 50+ registered contributors, who have submitted:
  - New features
  - Improvements to Documentation
  - Suggestions

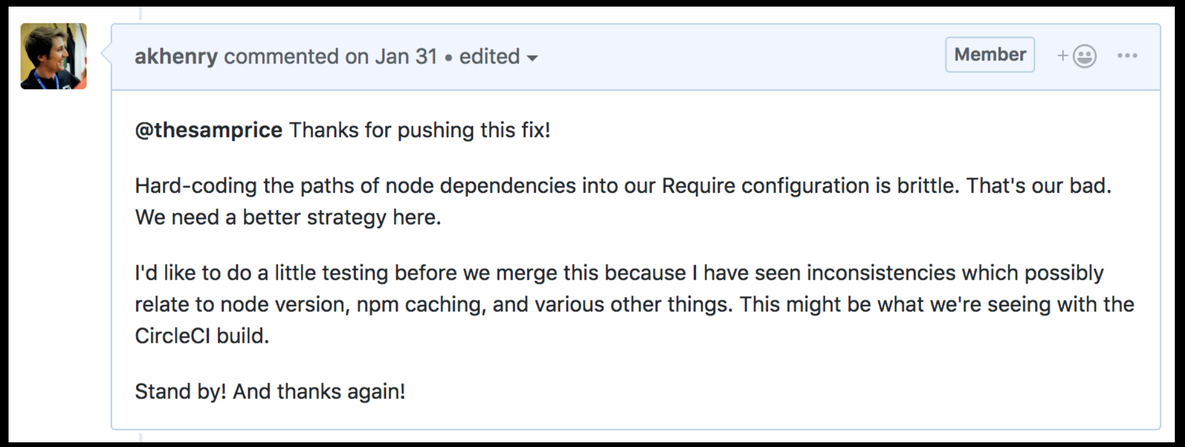
**https://github.com/nasa/openmct**

# Example Contribution 1

- User of Open MCT found an issue that caused new builds to fail

- They had submitted a PR to fix it before we had even started looking into it

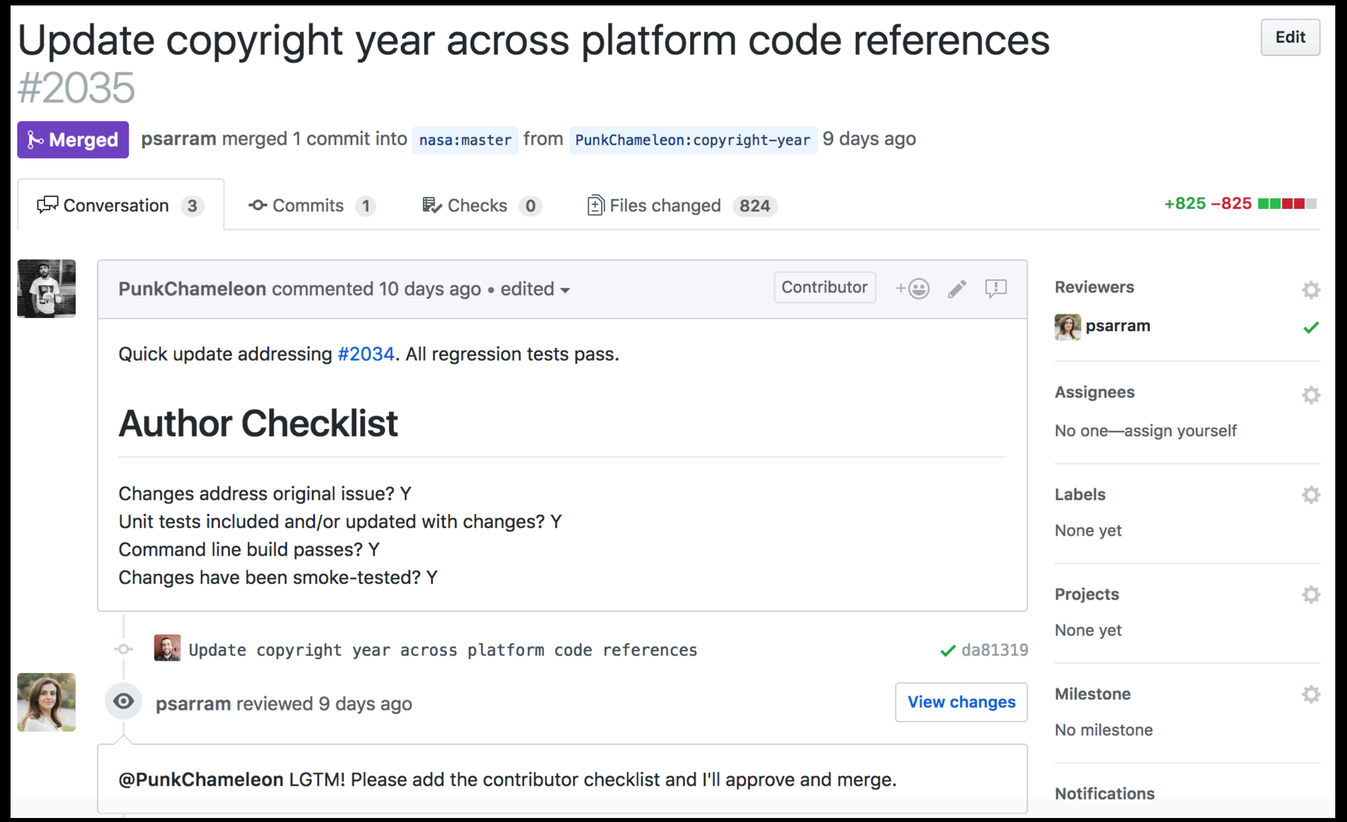



**https://github.com/nasa/openmct**

# Example Contribution 2

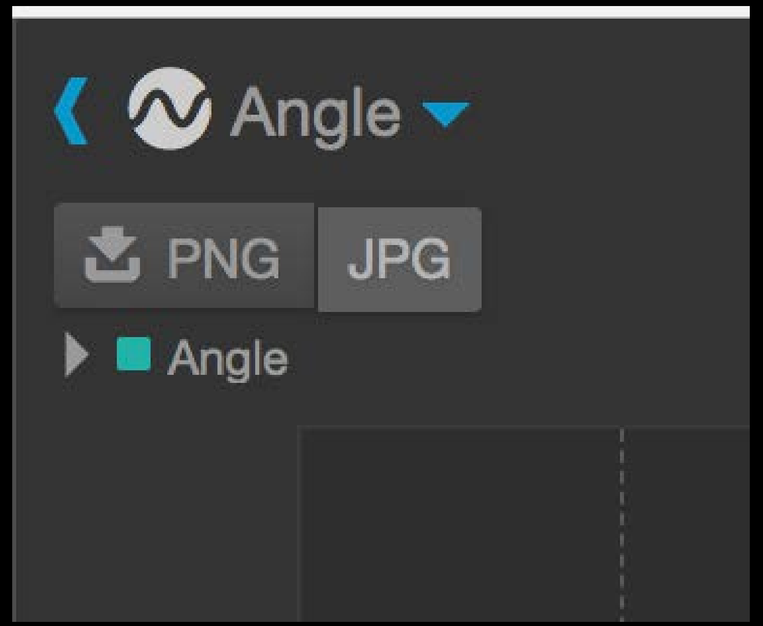
- Contributor updated all of our copyright statements
- Important tasks, but other priorities meant we hadn't done it yet




**https://github.com/nasa/openmct**

# Example Contribution 3

- Export plot as image
- Based on user requests
- Implemented by open source contributor




**https://github.com/nasa/openmct**

# Statistics

- 2015
  - Unknown
- 2018
  - Over 140,000 visitors

| | |
|---|---|
| **GitHub - Favorites** | 4925 |
| **GitHub - Forks** | 512 |
| **GitHub - Watches** | 224 |
| **GitHub - Average Daily Visitors** | ~80 |
| **Website - Page Views** | 1,214,368 |
| **Website - Unique Visitors** | 148,380 |
| **Website - Average Daily Visitors** | ~100 |
| **Signed Contributor License Agreements** | 51 |
| **Code Contributions** | 34 |

**https://github.com/nasa/openmct**

# Contribution Process

- Sign Contributor License Agreement
- Make changes
- Submit Pull Request (PR)
- Circle CI runs unit tests, enforces code standards through tooling
- Code review by core team member
- Feedback or Merge

**https://github.com/nasa/openmct**

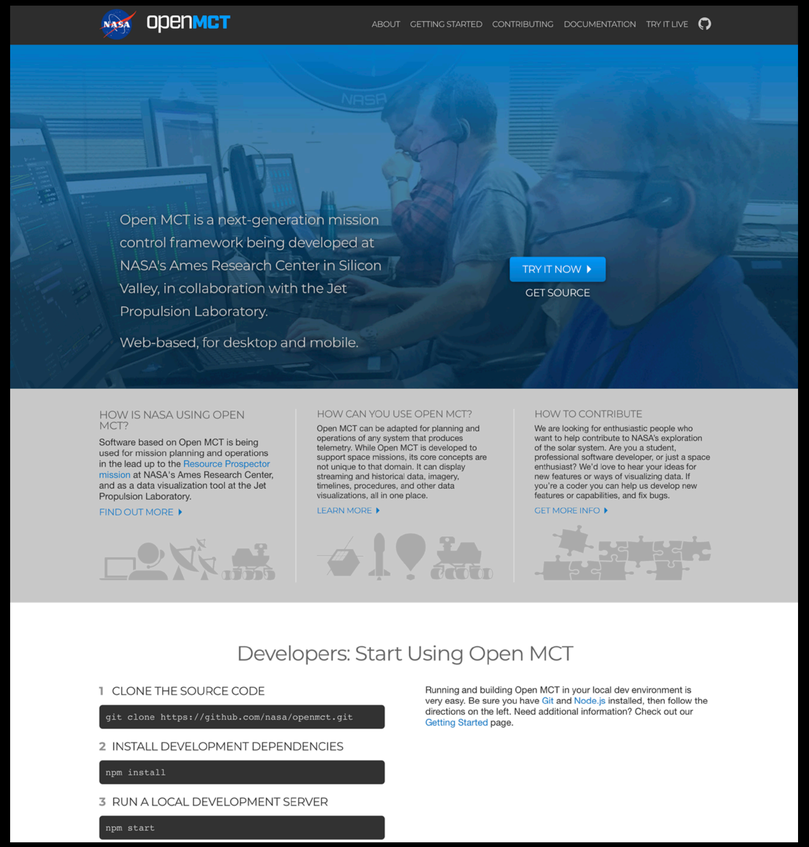
# Developing Software in the Open

- As well as our software being open source, our process is as well
- Software process documentation available from GitHub repository
- GitHub Projects used as “Kanban” board for each sprint
- All open source bugs and new features tracked as GitHub issues
- Intra-team code reviews via PRs

**https://github.com/nasa/openmct**

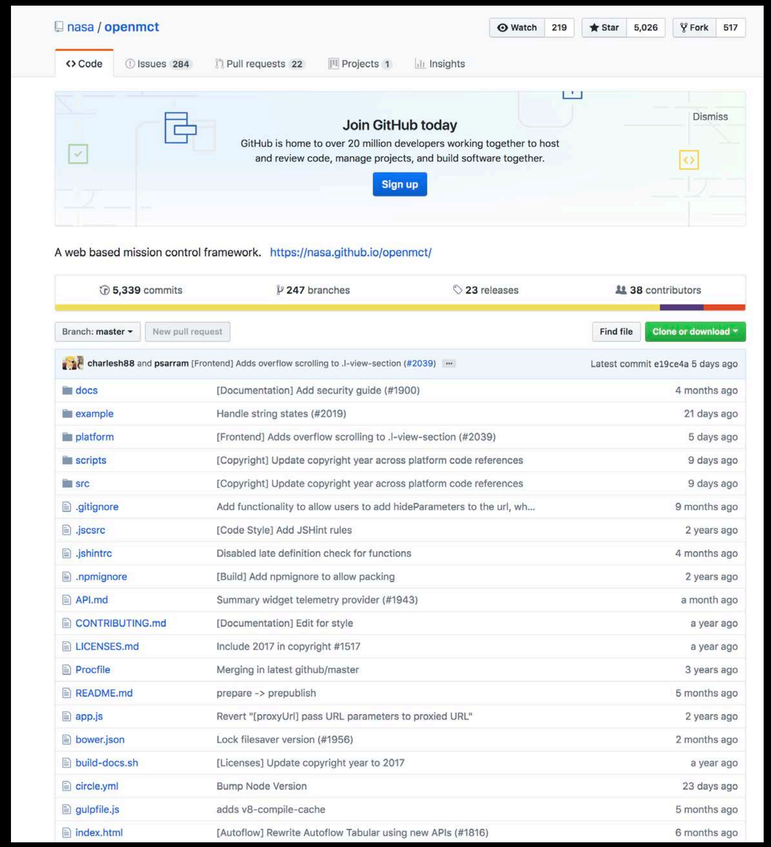
# Building a Community 1

## Active Web Presence




https://nasa.github.io/openmct/

## Active Repository

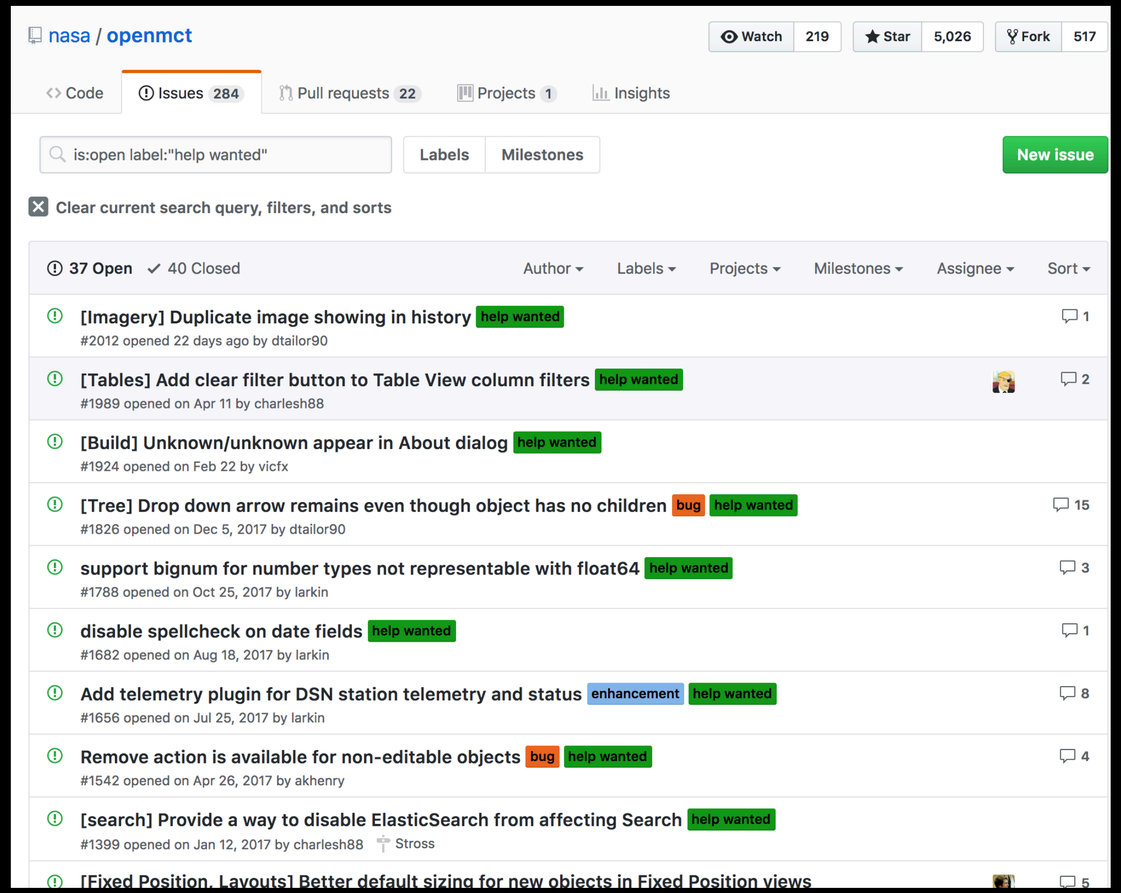



https://github.com/nasa/openmct

https://github.com/nasa/openmct

# Building a Community 2

- Provide a codebase that is clean, and fun to develop for
- Provide clear and comprehensive developer documentation
- Provide a simple and powerful Application Programming Interface (API)
- Tutorials for extending Open MCT with a focus on common use-cases.
- “Help-wanted” issues that cater to a range of abilities

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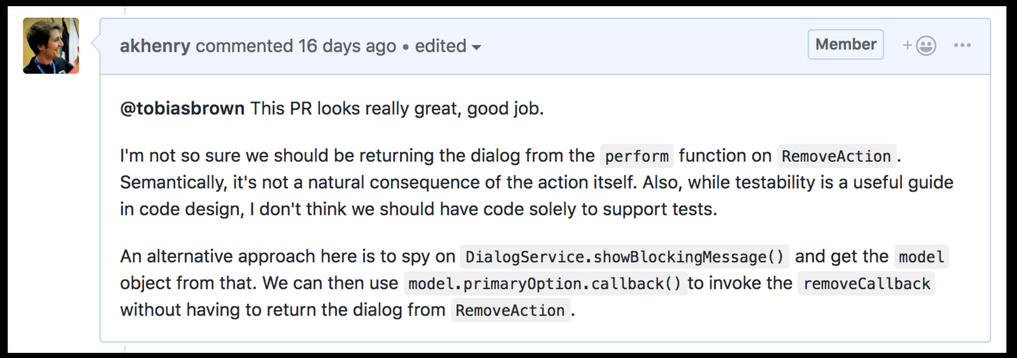
# Supporting a Community

- Be responsive to comments and questions from the community
- Friendly, supportive environment with constructive developer feedback
- Dedicate the time to support the community

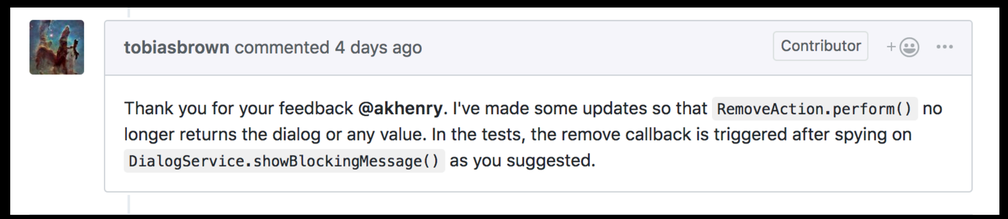


**akhenry** commented 16 days ago • edited — Member

**@tobiasbrown** This PR looks really great, good job.

I'm not so sure we should be returning the dialog from the `perform` function on `RemoveAction`. Semantically, it's not a natural consequence of the action itself. Also, while testability is a useful guide in code design, I don't think we should have code solely to support tests.

An alternative approach here is to spy on `DialogService.showBlockingMessage()` and get the `model` object from that. We can then use `model.primaryOption.callback()` to invoke the `removeCallback` without having to return the dialog from `RemoveAction`.

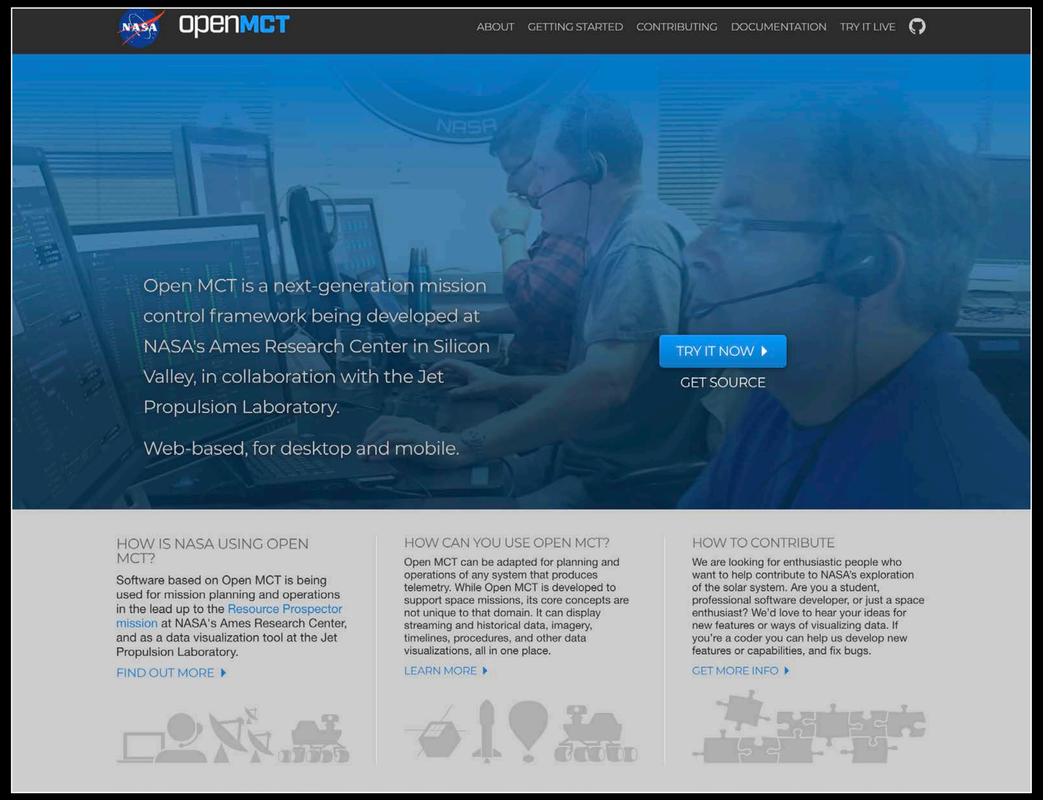


**tobiasbrown** commented 4 days ago — Contributor

Thank you for your feedback **@akhenry**. I've made some updates so that `RemoveAction.perform()` no longer returns the dialog or any value. In the tests, the remove callback is triggered after spying on `DialogService.showBlockingMessage()` as you suggested.

**https://github.com/nasa/openmct**

# Try it

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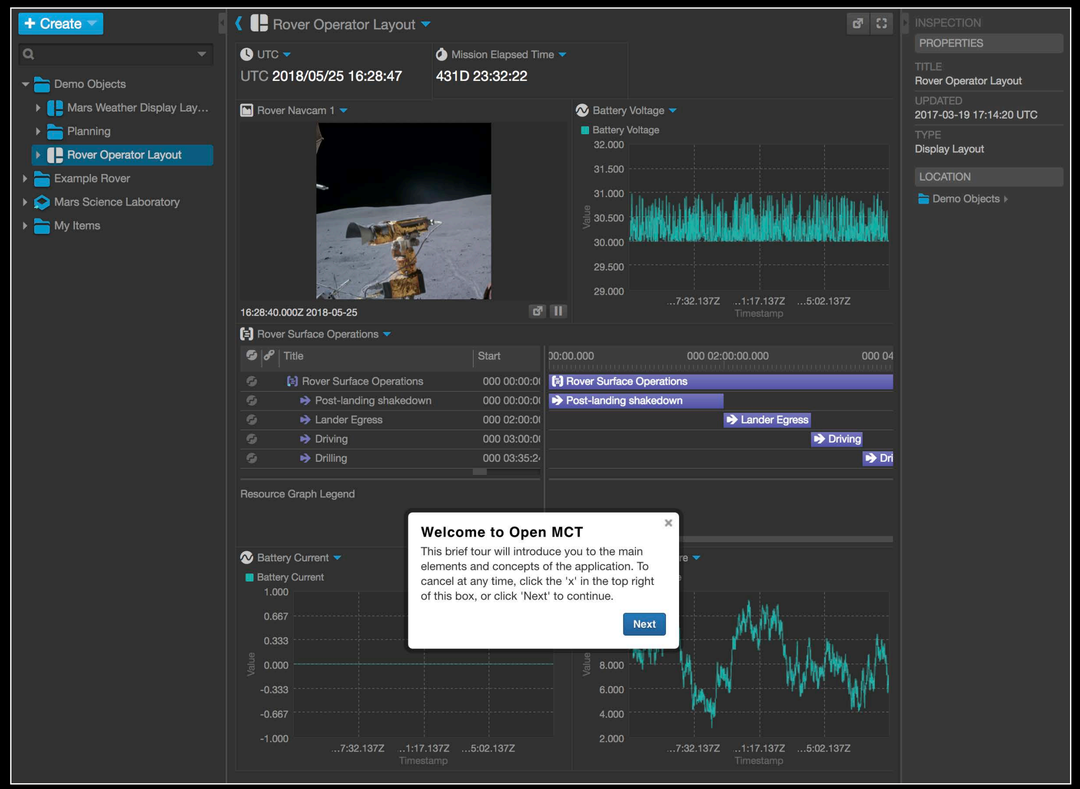


On Line Demo

# Lessons Learned

- Supporting Open Source requires time
- Our code contributions have been of high quality on the whole
- Once a project is open-source and online you do not control the profile of the project. Someone submitted us to Reddit and we hit 20,000 visitors a day
- Substantial code contributions are made by a small number of contributors, who tend to make multiple contributions
- Help contributors to help you - documentation, tutorials
- Still a lot of work to do to improve our API, but we’re making progress

**https://github.com/nasa/openmct**

# Status & What’s Next

- Open source is a proven means to enhance collaboration and adoption of mission operations software
- It is possible to build an “outside” community of contributors who add value to the software through contributions and feedback
- Future goals
  - Build an active community of mission contributors building on each other’s work
  - Use open source as a vehicle for advancing techology

**https://github.com/nasa/openmct**