



Our Journey to Open Source Software

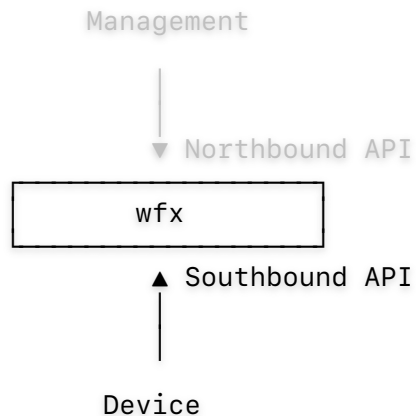
2024-05-15 / Open Source @ Siemens

What is wfx?

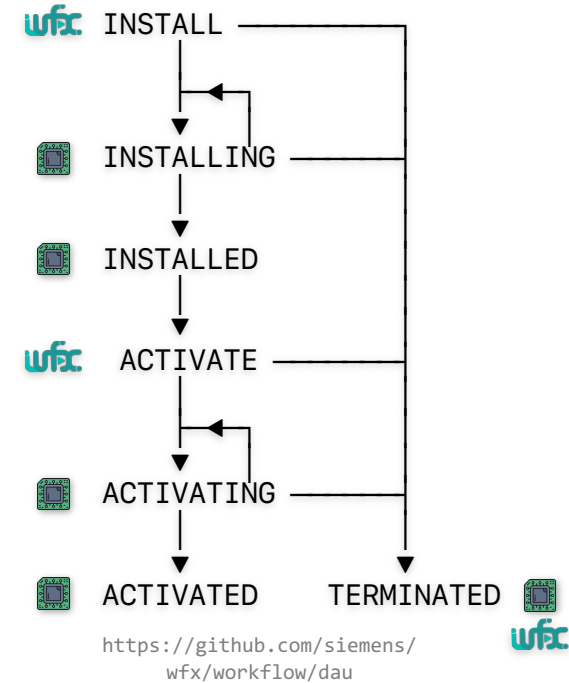
wfx is a lightweight, generic and versatile **workflow executor** with workflows being modeled as **finite state machines** that describe, e.g., software updates, container image management, or even a Kanban process.



<https://github.com/siemens/wfx/>





Workflow-specific clients communicate with a wfx instance through a REST API so that both execute the workflow in a (remote-) **coordinated, lock-step** manner.



What is **wfx** good for ?



Software Update Backend as a lightweight alternative to  hawkBit,  MENDER.io



Fleet Management



Configuration Deployment



Remote Access



... you name it!

A Very Short History of wfx so far: From Proprietary to Inner Source* to Open Source

Conceived a **flexible update state machine**,
+ on-device prototype
+ backend prototype



MindSphere Firmware Deployment Service

- Hm, wfx could do more than "just" firmware updates
- It could be made generic to drive **any workflow** – formulated as a finite state machine
- Client and wfx process workflows in **lock-step**
... realizing **remote-controlled** workflow execution



2018

2020

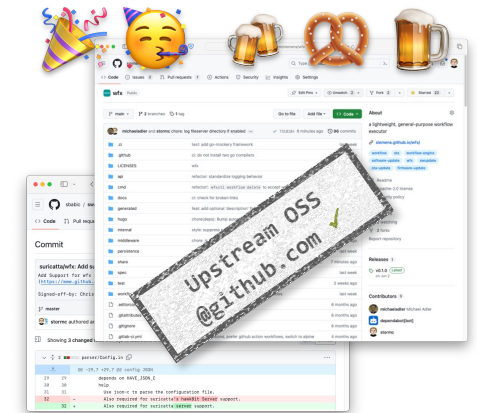
2022

2023

Adopted by Industrial Edge as firmware update backend



Industrial Edge Management System



<https://github.com/siemens/wfx/>
<https://github.com/sbabic/swupdate>

* Inner Source is like Open Source but within SIEMENS.

Why Open Source?

Pro

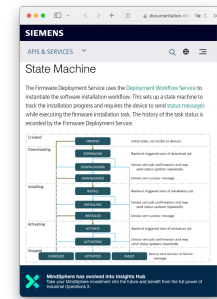
- Shared development & **Quality** Assurance
- Easy **collaboration** with customers, suppliers, competitors, and even within Siemens!
- OSS is also a **strategic** company consideration
- Doing the right thing™: meaningful / impactful work in the open

Contra

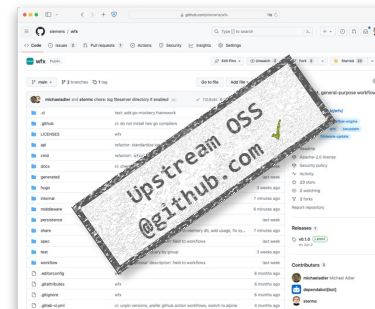
- It takes time and effort (community, maintenance, promotion, ...)
- Being a OSS Maintainer has some effort attached

Company-sponsored Open Source

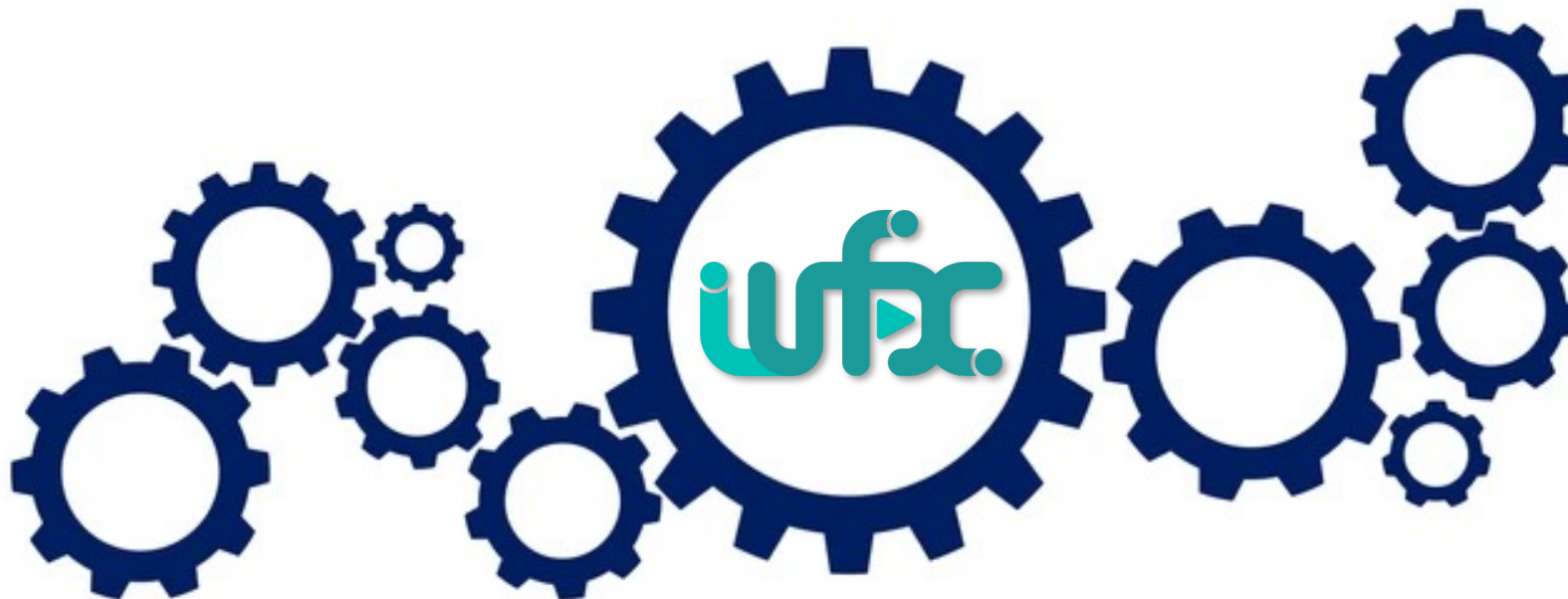
- Ensure sustainable funding and utility for the company
- Know the stakes: your and your company's reputation
- Good™ quality (code, documentation, automation, ...)
- Build-up & Interaction with the OSS community



MindSphere Firmware
Deployment Service



<https://github.com/siemens/wfx/>



Preparations

- Choose appropriate OSS license
- Polish code and have it peer reviewed (again)
- Remove any trademarks
- Squash / clean up (git) history

Follow state-of-the art best-practices and adapt (existing) CI pipelines:

- Linter & Static code analysis
- Code coverage
- Release Process Automation
- Changelog
- CI / CD
- Documentation

SIEMENS Legal Stuff to be done

- Get sign-offs from:
 - 3rd party software manager
 - Legal representative
 - IP department
- Clarify whether you need:
 - CLA (Contributor License Agreement):
often requires a formal signature process, hinders contributions
 - DCO (Developer Certificate of Origin):
less formal, standard practice, e.g., for the Linux kernel
- Clarify ECC (Export Control Classification)

Developer's Certificate of Origin 1.1

By making a contribution to this project, I certify that:

- (a) The contribution was created in whole or in part by me and I have the right to submit it under the open source license indicated in the file; or
- (b) The contribution is based upon previous work that, to the best of my knowledge, is covered under an appropriate open source license and I have the right under that license to submit that work with modifications, whether created in whole or in part by me, under the same open source license (unless I am permitted to submit under a different license), as indicated in the file; or
- (c) The contribution was provided directly to me by some other person who certified (a), (b) or (c) and I have not modified it.
- (d) I understand and agree that this project and the contribution are public and that a record of the contribution (including all personal information I submit with it, including my sign-off) is maintained indefinitely and may be redistributed consistent with this project or the open source license(s) involved.

SIEMENS Specifics in Execution

1. Obtain "Publication Approval Document" (pdf)

Title:	Open Source Release of wfx	
Publication Number:	5864	
Initiated:	Adler, Michael	09.05.23
Approval Technical Manager:		10.05.23
Comments Technical Manager:		
Confirmation IP:		10.05.23
Approval White List:		
Host/Publisher White List:		
Comments White List:		
Approval ECC:		
Comments ECC:		
Approval OSS / Inner Source:	OSS / Inner Source ()	10.05.23
Comments OSS / Inner Source:	Approval performed on code state 'wfx' as of May 10th, 2023. DE, May 10th, 2023	
Additional approval 1:		
Comments:		
Additional approval 2:		
Comments:		
Additional approval 3:		
Comments:		

2. Create MR on our [internal Gitlab instance](#):

feat(repos): add wfx repository

Merged Michael Adler requested to merge (removed):feat/wfx into main 11 months ago

Overview 9 Pipelines 0 Changes 1

Request for a new public repository on github.com/siemens

Once merged, a CI pipeline automatically creates a new GitHub repo

3. Push your code to the new GitHub home

Quality Assurance – Making your life easier

- **Automation is key!**
- Extensive unit- and integration-tests ($\geq 80\%$ coverage): e.g., Database bindings, old and new Go compilers, ...
- Load Testing (manual)
- Code Coverage powered by codecov.io
 - Updated with every CI pipeline
 - Pull Requests are checked to ensure code coverage never decreases
- Static analysis/linters (golangci-lint, staticcheck)
- 3rd party dependencies are kept up-to-date using GitHub's dependabot
- Automated testing for race conditions



Quality Assurance – cont'd.

- Git commit messages are checked as well:
 - Must adhere to the Conventional Commits format
 - Must be Signed-off
 - A CI job enforces policy when a new PR is created
- Code generation:
 - ca. 1k LoC
 - Checked in so that `go build` just works
 - CI ensures that checked in code is kept in sync with the generating tools





Release Process

- Versioning scheme follows Semantic Versioning
- Creating a new release is trivial:

```
$ git tag v0.2.0
```

```
$ git push origin v0.2.0
```

- Triggers a new CI pipeline
 - CI pipeline publishes a GitHub release (including binary and .deb artifacts)
 - A changelog will be auto-generated and attached to the GitHub release

Summary & What's New

- A versatile and general-purpose workflow executor engine
- Extensible, compact, scalable and lightweight
- Major new features since OSS release (motivated by business use-cases):
 - Job Event Notifications (no more polling)
 - Dynamic Plugins (e.g., for authentication purposes, URL rewriting)
- New proof-of-concepts:
 - Remote Terminal Access (using WebSockets)
 - Remote Configuration Management (pre-/postinstall scripts + artifact deployment)



<https://github.com/siemens/wfx>

Contact

Dr. Christian Storm

T CED OES-DE
GCH FL, Garching, DE

E-mail: christian.storm@siemens.com

Michael Adler

T CED OES-DE
GCH FL, Garching, DE

E-mail: michael.adler@siemens.com