

Node.js What's Next?

Catalyzing change in the Node.js ecosystem

JSLou June 2023

About Michael



Node.js lead for Red Hat and IBM

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Active OpenJS Foundation member

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Agenda

- Following What's Next
- Recent Features
- Next-10
- New teams and initiatives
- How to get involved

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- Releases https://github.com/nodejs/release
- GitHub Notifications
- Working Groups and Teams
- Strategic Initiatives https://github.com/nodejs/node/blob/master/doc/guides/strategic-initiatives.md
- Next-10 https://github.com/nodejs/next-10

Releases

Last Major Release

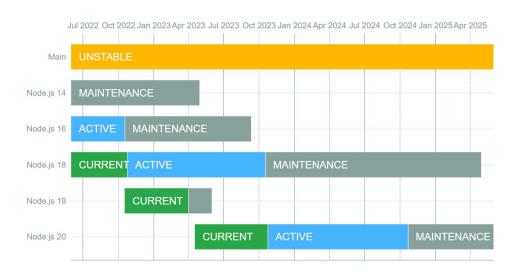
• 20.x in April 2023

Ongoing LTS Releases

- Node.js 14.x ended April 2023
- Node.js 16.x ends Sept 2023
- Node.js 18.x ends April 2025

Current

• 20.x in April



2022-04-19, Version 18.0.0 (Current), @BethGriggs

Node.js 18 is here! Highlights include the update of the V8 JavaScript engine to 10.1, global fetch enabled by default, and a core test runner module.

Initially, Node.js 18 will replace Node.js 17 as our 'Current' release line. As per the release schedule, Node.js 18 will be the 'Current' release for the next 6 months and then promoted to Long-term Support (LTS) in October 2022. Once promoted to long-term support the release will be designated the codename 'Hydrogen'. Node.js 18 will be supported until April 2025.

Notable Changes

Deprecations and Removals

- (SEMVER-MAJOR) fs: runtime deprecate string coercion in fs.write, fs.writeFileSync (Livia Medeiros) #42607
- (SEMVER-MAJOR) dns: remove dns.lookup and dnsPromises.lookup options type coercion (Antoine du Hamel) #41431
- (SEMVER-MAJOR) process: runtime deprecate multipleResolves (Benjamin Gruenbaum) #41896
- (SEMVER-MAJOR) stream: remove thenable support (Robert Nagy) #40773
- (SEMVER-MAJOR) tls: move tls.parseCertString to end-of-life (Tobias Nießen) #41479

fetch (experimental)

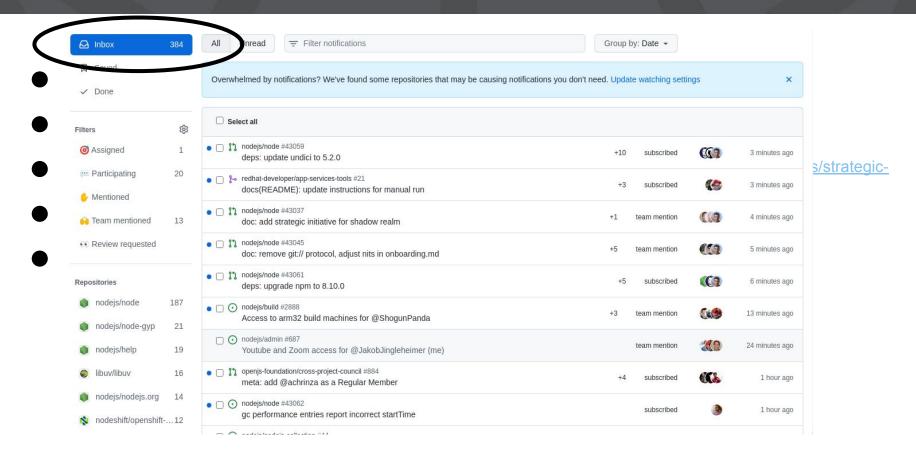
An experimental fetch API is available on the global scope by default. The implementation is based upon undici, an HTTP/1.1 client written for Node.js by contributors to the project.

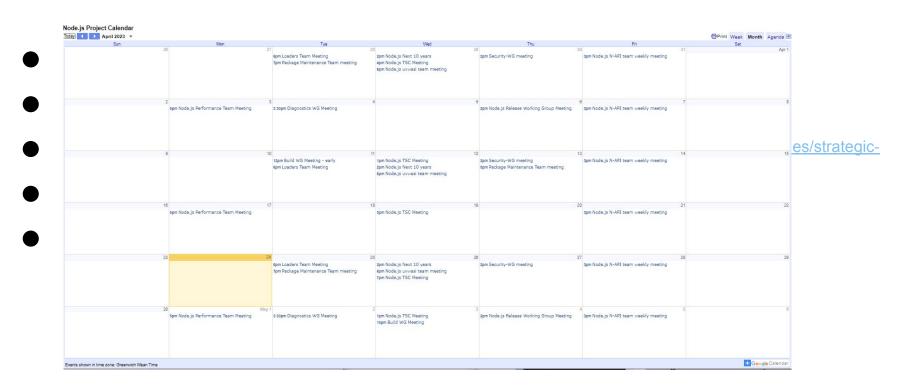
```
const res = await fetch('https://nodejs.org/api/documentation.json');
if (res.ok) {
  const data = await res.json();
  console.log(data);
}
```

Through this addition, the following globals are made available: fetch , FormData , Headers , Request , Response .

Disable this API with the --no-experimental-fetch command-line flag.

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Current initiatives

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Initiative	Champion	Links
Core Promise APIs	Antoine du Hamel	nodejs/TSC#1094
QUIC / HTTP3	James M Snell	https://github.com/nodejs/quic
Shadow Realm	Chengzhong Wu	#42528
Startup Snapshot	Joyee Cheung	#35711
V8 Currency	Michaël Zasso	
Next-10	Michael Dawson	https://github.com/nodejs/next-10
Single executable apps	Darshan Sen	#43432
Performance	Yagiz Nizipli	https://github.com/nodejs/performance

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Features - what's new/interesting?

- Major Releases
 - o Boring......
- SemVer Minor is where its at!
 - features (but not all) flow into Current/LTS lines
- Majors still a good time to party
 - Talk about recent new features
 - Promotion to LTS

Features - Old News - Keep in mind for upgrade to 18.x

- OpenSSL 3
- Default DNS Resolution

OpenSSL 3 (17.x)

- Biggest impact
 - Users of smaller key sizes
 - Legacy algs no longer available by default
 - Native modules Deprecation warnings

OpenSSL Migration Guide - https://www.openssl.org/docs/man3.0/man7/migration_guide.html



Default DNS resolution

- Node.js no longer prefers IPv4 over IPV6
- --dns-result-order=ipv4first

Features - Baking some likely to be stable in 20.x LTS

- Fetch
- WASI
- -- watch

Fetch - Experimental (Added in v17.5.0, no flag in 18.0.0)

https://fetch.spec.whatwg.org/

```
const resp = await fetch(url)
resp.text().then(text => console.log(text));
```

WASI - Experimental (Added in v13.3.0, v12.16.0)

```
import { readFile } from 'node:fs/promises';
import { WASI } from 'wasi';
import { argv, env } from 'node:process';
const wasi = new WASI({
 version: 'preview1',
 args: argv,
  env,
 preopens: {
    '/sandbox': '/some/real/path/that/wasm/can/access',
 },
});
const wasm = await WebAssembly.compile(
  await readFile(new URL('./demo.wasm', import.meta.url)),
);
const instance = await WebAssembly.instantiate(wasm, wasi.getImportObject());
wasi.start(instance);
```

WASI - Experimental (Added in v13.3.0, v12.16.0)

```
import { readFile } from 'node:fs/promises';
import { WASI } from 'wasi';
                                                         New in 20.0.0
import { argv, env } from 'node:process';
const wasi - new WASIL!
  version: 'preview1',
                                                                        Command line flag no longer
  args: argv,
                                                                        necessary
  env,
  preopens: {
    '/sandbox': '/some/real/path/that/wasm/can/access',
  },
});
const wasm = await WebAssembly.compile(
  await readFile(new URL('./demo.wasm', import.meta.url)),
);
const instance = await WebAssembly.instantiate(wasm, wasi.getImportObject());
wasi.start(instance);
```

--watch - Experimental (Added in v18.11.0, v16.19.0)

- Variants
 - --watch
 - --watch-path
 - --watch-preserve-output
- Changes in watched files -> process restarts
- macOS/Windows only

Features - Hot off the press

- Argument parser
- Test Runner stable
- Single Executable Applications
- Permissions Model
- Diagnostic Channel
- Support for ARM64 Windows

Argument Parser (added in v18.30, v16.17.0, stable in 20)

- Higher level API for command-line versus process.argv
- Collaboration from yargs and Commander maintainers

Argument Parser (Stable in 20)

```
import { parseArgs } from 'node:util';
const args = ['-f', '--bar', 'b'];
const options = {
  foo: {
    type: 'boolean',
    short: 'f',
  bar: {
   type: 'string',
  },
};
const {
  values,
 positionals,
} = parseArgs({ args, options });
console.log(values, positionals);
```

{ foo: true, bar: 'b' }

https://nodejs.org/api/util.html#utilparseargsconfig

Test Runner (Stable in 20)

- Mocks added in v18.13.0, v19.1.0
- Reporters added in v19.6.0
- Coverage added in v19.7.0

Test Runner (Added in 18.0.0, stable in 20)

```
const test = require('node:test');
const assert = require('node:assert');
test('test1', (test) => {
   assert.strictEqual('yes', 'no');
});
```

https://nodejs.org/api/test.html

```
Tap Output
[midawson@drx-hemera pres]$ node --test testit.is
TAP version 13
 not ok 1 - /home/mide/wson/pres/testit.is
 duration ms: 0.069108223
 failureType: 'subtestsFailed'
 exitCode: 1
  TAP version 13
  not ok 1 - test1
   duration ms: 0.002767144
   failureType: 'testCodeFailure'
    Expected values to be strictly equal:
    'yes' !== 'no'
   code: 'ERR ASSERTION'
     TestContext.<anonymous> (/home/midawson/pres/testit.is:5:10)
     Test.runInAsyncScope (node:async hooks:202:9)
     Test.run (node:internal/test runner/test:340:20)
     Test.start (node:internal/test_runner/test:292:17)
    Test.test (node:internal/test_runner/hamess:126:18)
     Object.<anonymous> (/home/midawson/pres/testit.js:4:1)
     Module. compile (node:internal/modules/cjs/loader:1105:14)
     Module, extensions..is (node:internal/modules/cis/loader:1159:10)
    Module.load (node:internal/modules/cjs/loader:981:32)
    Module, load (node:internal/modules/cis/loader:827:12)
 1.1
  # tests 1
 # pass 0
  # fail 1
  # skipped 0
  # todo 0
 # duration_ms 0.055707066
 (node:3039014) ExperimentalWarning: The test runner is an experimental feature. This feature could change at any time
  (Use 'node --trace-warnings ...' to show where the warning was created)
 code: 'ERR_TEST_FAILURE'
1..1
# tests 1
# pass 0
# fail 1
# skipped 0
# todo 0
# duration_ms 0.133823902
```

Technical Value - Developer experience

Single Executable Applications (Experimental Added in v19.7.0)

- Wins
 - Easier distribution
 - Reduced surface area
- Bundles app into Existing Node.js binary
 - Fuse to eliminate overhead when not used
 - Looks for a segment within the executable that holds bundled code.
 - Runs the bundled code when such a segment is found.
- Injection done though https://github.com/nodejs/postject
- Details in https://github.com/nodejs/node/blob/main/doc/contributing/maintaining-single-executable-application-support.md

Process Based Permissions (Experimental, added in v19.7.0)

```
node --experimental-permission app.js
```

- Limits some features by default
 - file system access (read/write)
 - spawning processes
 - use of node:worker_threads
 - Native modules
- Runtime API to check

Tracing Channel - Experimental (Added in v19.9.0)

- Why?
 - Simplify generation/consumption of Diagnostic Channel info
- Generating info
 - tracingChannel.traceSync(fn[, context[, thisArg[, ...args]]])
 - tracingChannel.tracePromise(fn[, context[, thisArg[, ...args]]])
 - tracingChannel.traceCallback(fn[, position[, context[, thisArg[, ...args]]]])
- Consuming info
 - tracingChannel.subscribe(subscribers)
 - tracingChannel.unsubscribe(subscribers)

Tracing Channel - Experimental (Added in v19.9.0)

```
const diagnostic channel = require('node:diagnostics channel');
const channels = diagnostic channel.tracingChannel('my-package-info');
// info consumer
channels.subscribe({
  start(message) { console.log('start:' + message.ctx data) },
  end(message) { console.log('end:' + message.ctx data) },
  error(message) { console.log('error:' + message.ctx data) },
});
// info source
channels.traceSync(() => {
  console.log('function ran');
}, { ctx data: 'data' });
[midawson@drx-hemera channel]$ node test.js
start:data
function ran
end:data
```

ARM64 support for Windows (Added in 19.9.0)

Downloads

Latest Current Version: 20.0.0 (includes npm 9.6.4)

Download the Node.js source code or a pre-built installer for your platform, and start developing today.



Additional Platforms

 Docker Image
 Official Node js Docker Image

 Linux on Power LE Systems
 64-bit

 Linux on System z
 64-bit

 AIX on Power Systems
 64-bit

- · Signed SHASUMS for release files (How to verify)
- · All download options
- · Installing Node.js via package manager
- Previous Releases
- Nightly builds
- Unofficial builds
- · Building Node.js from source on supported platforms
- · Installing Node.js via binary archive
- Install on Windows Subsystem for Linux (WSL)

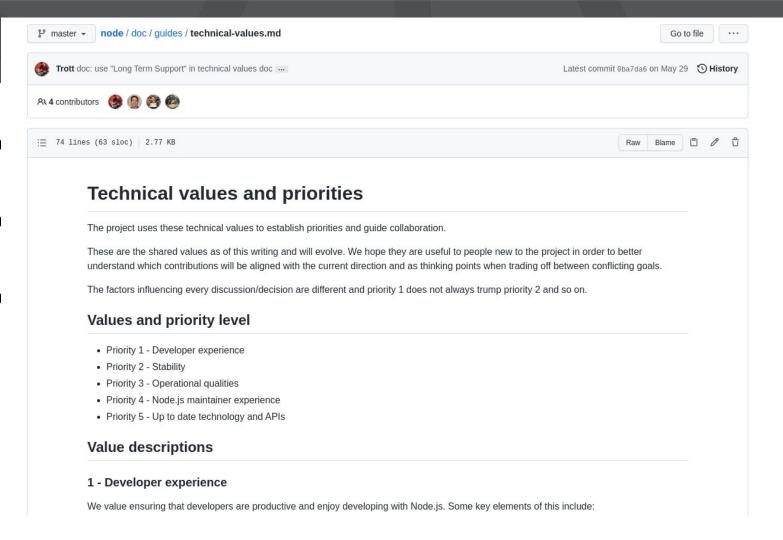
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Next 10 - Foundation

- Technical Values and Priorities https://github.com/nodejs/node/blob/master/doc/guides/technical-values.md
- Constituencies https://github.com/nodejs/next-10/blob/main/CONSTITUENCIES.md
- Constituencies Needs https://github.com/nodejs/next-10/blob/main/CONSTITUENCY-NEEDS.md





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Next 10

- Tech
- Cons
- Cons

List of constituencies

- Direct end users
 - Users who run tools themselves (install Node.js, run tool, deal with errors including writing/using scripts)
- · Application operators
 - Users who interact with existing, running applications (regardless if they wrote the application or not)
 - Service and infrastructure providers
- · Application Developers
 - · Front-end tool consumers
 - · Back-end server authors
 - · Hobby developers
 - o Professional developers
 - Tool authors
- · Library/package authors
 - Users who write libraries and packages to be included on other applications
- · Node.js contributors
 - o Developers working directly on nodejs/node
 - o Individuals participating in Working Groups and teams
- · Organizations with investments in Node.js (eg: Enterprises, Government bodies, startups, non-profits, standards groups like TC39)
 - o C level executives (CTO, CEO, etc.)
 - · Planning/program offices
 - Managers
- Education
 - Teachers
 - Students
 - o Organizations who help people learn Node.js (colleges, University, boot camps, online learning resources, etc.)
 - o Programs to help people demonstrate capability (certification programs, etc.)
- · Security Practitioners
 - People involved in the life-cycle of handling security issues including:
 - · Penetration testing
 - Incident response
 - CVE scanning/remediation,
 - Legal, Public relations

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Needs of the Node.js Constituencies

Need	Users	Ops	AppDev	LibDev	Orgs	NodeMaint
Good understanding of the direction of the project	X	Х	Х	Х	Х	Х
Ability to affect the direction of the project	X	Х	X	X	X	Х
Consumable APIs and docs	X		Х	Х		Х
Predictable and stable releases	Х	Х	Х	Х	Х	
Innovation at a consumable pace	Х		Х	Х	Х	Х
Easy Installation	X					
Easy issue reporting, resolution and collaboration	Х	Х	Х	Х	Х	
Broad deployment platform support	X	Х			Х	
Broad desktop platform support	X		Х	Х		Х
Consistent and intuitive error handling	Х	Х	Х	X		

/nodejs/node/blob/master/doc/gu Jes.md

STITUENCIES.md

b/main/CONSTITUENCY-NEEDS.md

Ability to embed and bundle the Node.js runtime		Х			
A well maintained and secure standard library		X	Х	Х	
Assets that show Node.js is a good choice	Х	X	Х	Х	

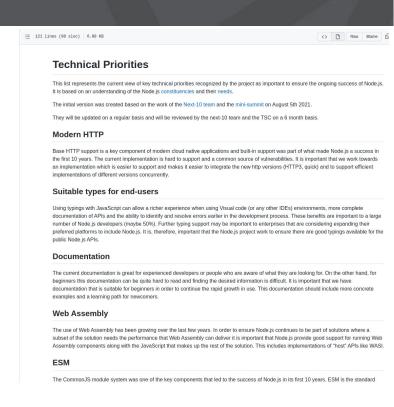
Good understanding of the direction of the project

• An understanding of the work happening in the Node.js project (what features do I have to look forward to, what's the project direction). Changes between releases. Info on how new changes affect end users/developers

Technical Priorities

https://github.com/nodejs/node/blob/master/doc/contributing/te chnical-priorities.md

- Modern HTTP
- Suitable types for end-users
- Documentation
- Web Assembly
- ESM
- Observability
- Permissions/policies/security model
- Better multithreaded support
- Single Executable Applications
- Support for features from the latest ECMAScript spec

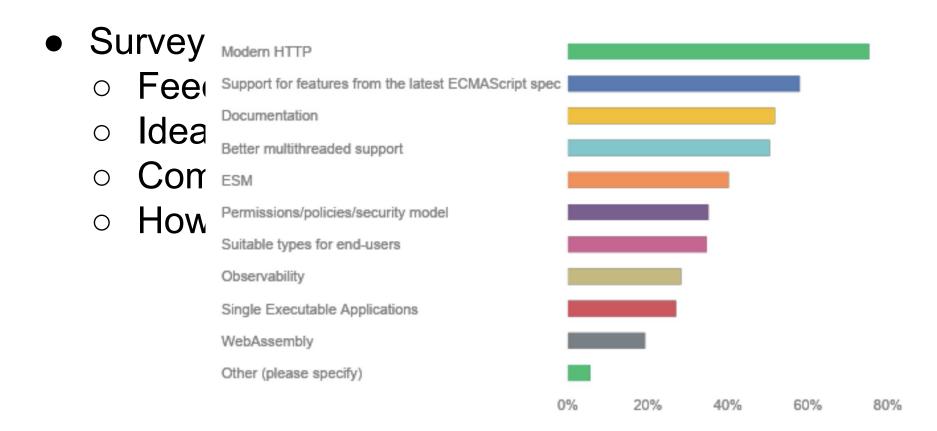


Mini Summits/Collaborator Summits

- Nov 2021 Suitable types/Single executable applications
- Jan 2022 Modern HTTP/Documentation
- Apr 2022 WASM/Security model and permissions
- June 2022 (collab summit)
 ESM/Observability
- June 2023 Serverless

- Future mini-summits
 - Serverless
 - o HTTP
 - TypeScript / Hooks

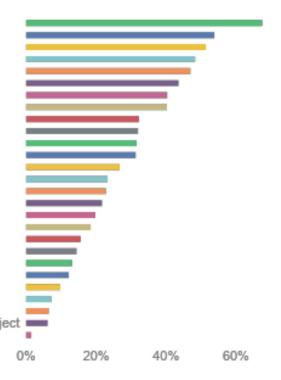
- Survey
 - Feedback from the community (~1700)
 - Idea for new initiatives
 - Community needs
 - How is Node.js used
 - Data https://github.com/nodejs/next-10/pull/215



Survey

- Fee
- o Idea
- Con
- How

Consumable APIs and docs Predictable and stable releases A well maintained and secure standard library Relevant APIs in core Good understanding of the direction of the project Runtime diagnostic tooling Consistent and intuitive error handling Easy Installation Reasonable resource usage/performance Module/dependency info and management Development time diagnostic tooling Good security and CVE practices in the project Good CI infrastructure and experience in the project Innovation at a consumable pace Broad deployment platform support
Assets that show Node.js is a good choice
Ability to embed and bundle the Node.js runtime
Easy issue reporting, resolution and collaboration Ability to affect the direction of the project Easy contribution workflow Better CVE management in the ecosystem Broad desktop platform support Better ways to build consensus in the project Ways to fund work Ability to assess impact of changes they make Supportive Collaborators and Environment in the project Other (please specify)



80%

100%

- Documentation proposal
 - Easier to use
 - Easier to maintain
 - Searchable
 - Generation of JSON structured data

Sharing project news

- The project aims to make it easy to share project news with those who publish newsletters that cover Node.js.
- The next-10 team will be reaching out to periodicals like Node.js weekly to point them at discussion item created in core and issues created by teams across the project.

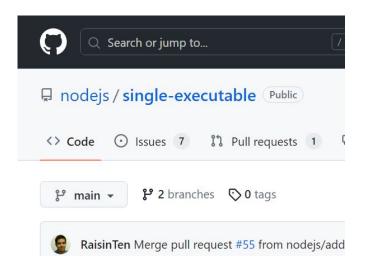
https://github.com/nodejs/node/blob/main/doc/contributing/sharing-project-news.md

Agenda

- How to follow what's going on in the project
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- Single Executable Applications
 - Package Node.js into existing Node.js binary

Many thanks to: Darshan Joyee

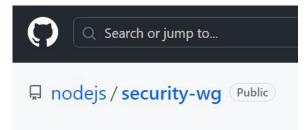


- Security
 - Funding from OSSF
 - Some current initiatives
 - Scorecards related to security
 - Automation of dependency updates
 - Automation of security releases
 - Continued work on permission model



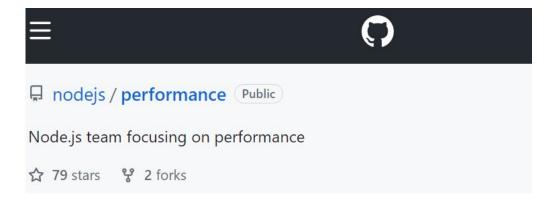
https://openssf.org/

Many thanks to: Rafael



- Performance
 - Improvements to URL, fetch() and EventTarget
 - Ada fast spec compliant URL parser

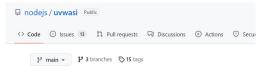
Many thanks to: Yagiz Nizipli Node.js Core Collaborator, OpenJS Foundation Member

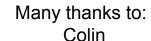


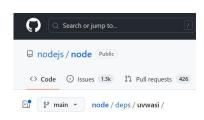
uvwasi

- Web assembly system interface (WASI) implementation in Node.js
- Used in other runtimes like grain

- Current focus
 - Complete socket functions in preview1
 - Planning for preview2
 - Refactoring to ease use as shared library







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How to get Involved

- Documentation
- Tests
- Scratch your own itches
- Find a working group with similar interests

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