

What's new and what's next

PowerUp 2025

About Michael Dawson



Node.js lead for Red Hat and IBM

Active Node.js community member

Node.js Collaborator, Node.js Technical Steering Committee,

Active in a number of Working group(s)

Active OpenJS Foundation member

Voting Cross Project Council Member

Community Director 2021-2022

BlueSky: @mhdawson.bsky.social

Twitter: @mhdawson1

GitHub: @mhdawson

Linkedin: https://www.linkedin.com/in/michael-dawson-6051282





Overview

- What's Not New
- Recent survey
- What's new
 - Features
 - Trends
- What's next

What's not new

* Even after docker activities pushing people to cache

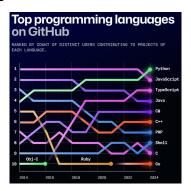
- Massive usage in last year
 - Over 1B downloads from node@.org
 - Almost 800M docker pulls*



Tops recent surveys



https://survey.stackoverflow.co/2024/technology/



- 2 JavaScript
- 3 typeScript

Notes that combined still higher than Python

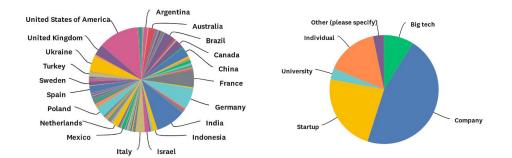
https://github.blog/news-insights/octoverse/octoverse-2024/

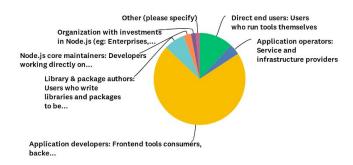
What's not new

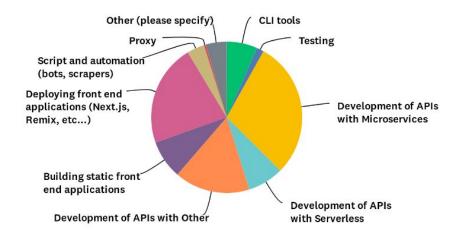
Active and vibrant project



- 2978 respondents, 81% more than last year
- Average of 6 years using Node.js

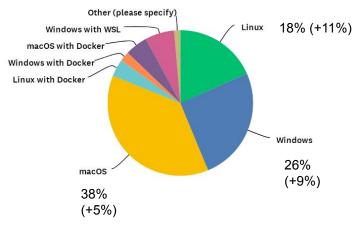




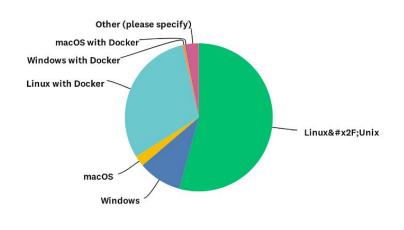


- 53% back end services
- 22% deploying front end apps
- 21% building, and scripting

Use Cases



Local Development

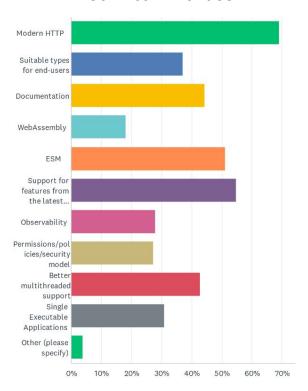


Production

x86 dominates but Arm is growing

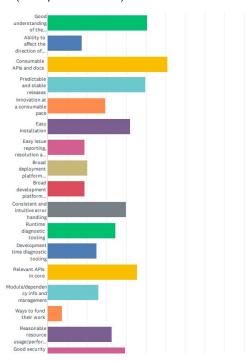
https://github.com/nodejs/next-10/blob/main/surveys/2024-04

Technical Priorities



What's important to you

(incomplete list shown)



- Key Takeaways
 - Most common pain points
 - ESM integration
 - TypeScript
 - Docs
 - Monitoring/Diagnostics
 - Performance
 - ESM widely used, 71% reported code with ES module syntax
 - New stable features well used
 - Experimental features well used

What's new - Features

- 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

What's new - Features

- 2024 was Exciting year
- Some Highlights
 - Progress on ESM compatibility
 - Experimental Limited TypeScript Support
 - Experimental Web Storage API
 - Experimental SQLite API
 - Continued progress on performance
 - Node run
- Regular Releases

Most common pain points

- ESM integration
 - TypeScript
- Docs
- Monitoring/Diagnostics
- Performance V



Releases

Last Major Release

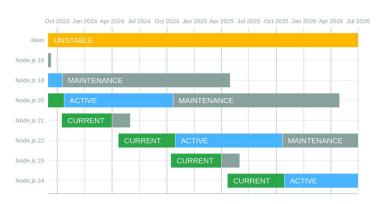
• 24.x in April 2024 (Curent)

Ongoing LTS Releases

- Node.js 18.x ends April 2025
- Node.js 20.x ends April 2026
- Node.js 22.x ends April 2027

Next current

25.x in Oct 2024



https://github.com/nodejs/Release

ESM Compatibility

hello.js

```
const greeter = require('./greeter.js').default;

const greeting = greeter('World');

console.log(greeting);
```

greeter.js

```
import util from 'node:util';
export default function (greeting) {
  return 'Hello ' + greeting;
};
```

ESM

It just works!

>node hello.js
Hello World



Backported to 22.x in 22.12.0

The Fine Print:

Depends on two features that are still experimental but stability is "release candidate", and no experimental warnings.

Options to turn of in case of issues

--no-experimental-require-module

-> ESM must be synchronous

--no-experimental-detect-module

- -> depends on syntax detection https://nodejs.org/api/packages.html#syntax-detection
- -> may load file twice
- -> recommended to use "type": "module" in package.json where possible

At a glance

- --experimental-strip-types (enabled by default in v23.6.0)
 - replaces TypeScript with whitespace
 - no need for source maps
 - .ts, .mts, .cts files supported
- --experimental-transform-types (not enabled by default)

Key limitations

- Only supports a subset of TypeScript
- Does not handle files in node_modules (design choice)
- Does not read tsconfig.json
- type keyword needed in imports

hello.ts

greeter.ts

```
export enum GreetOptions {
  Hello,
 Goodbye
export default function (helloType:
GreetOptions, greeting: string) : string {
  let world: string;
  if (helloType === GreetOptions.Hello) {
    world = 'Hello ' + greeting;
    return world:
 throw Error ('Unknown GreetOption');
};
```

Experimental Limited Typescript Support (before)

```
midawson@midawson-virtualbox:~/test-typescript-with-nodejs$ node hello.ts
node:internal/modules/esm/get_format:218
  throw new ERR_UNKNOWN_FILE_EXTENSION(ext, filepath);
TypeError [ERR_UNKNOWN_FILE_EXTENSION]: Unknown file extension ".ts" for /home/midawson/test-typescript-with-no
dejs/hello.ts
    at Object.getFileProtocolModuleFormat [as file.] (node:internal/modules/esm/get_format:218:9)
  code: 'ERR UNKNOWN FILE EXTENSION'
Node.is v22.9.0
```

```
midawson@midawson-virtualbox:~/test-typescript-with-nod is$ node --experimental-strip-types hello.ts
 Use `node --trace-warnings ...` to show where the warn as was created)
node:internal/process/promises:392
      new UnhandledPromiseRejection(reason);
UnhandledPromiseRejection: This error originated either by throwing inside of an async function without a catch
 block, or by rejecting a promise which was not handled with .catch(). The promise rejected with the reason "
x TypeScript enum is not supported in strip-only mode
   ,-[1:1]
     ,-> export enum GreetOptions {
          Hello,
           Goodbye
         export default function (helloType: GreetOptions, greeting: string) : string {
           let world: string;
  code: 'ERR UNHANDLED REJECTION'
Node.js v22.9.0
```

```
node --experimental-strip-types --experimental-transform-types hello.ts
node:1215195) ExperimentalWarning: Type Stripping is an experimental feature and might change at any time
(Use `node --trace-warnings ...` to show where the warning was created)
Hello World
```

TSC has/had trouble with .ts extensions in imports

```
>npx -p typescript tsc *.ts --declaration --allowJs --allowImportingTsExtensions --outDir
types
error TS5096: Option 'allowImportingTsExtensions' can only be used when either 'noEmit' or
'emitDeclarationOnly' is set.
```

- Node.js Typescript team nodejs / typescript
 - Members from typescript, Node.js collaborated on issue
 - O PR landed to handle https://github.com/microsoft/TypeScript/pull/59767
 - --rewriteRelativeImportExtensions

- TypeScript 5.8 Option to target only subset enabled by default
 - --erasableSyntaxOnly
 - https://devblogs.microsoft.com/typescript/announcing-type script-5-8-beta/#the---erasablesyntaxonly-option

Experimental Web Storage API

```
// persistent
localStorage.setItem('RuleToLiveBy', 'Never bet against Node.js');
console.log(localStorage.getItem('RuleToLiveBy'));

// in memory 10MB max
sessionStorage.setItem('RuleToLiveBy', 'I told you never bet against Node.js');
console.log(sessionStorage.getItem('RuleToLiveBy'));
```

```
>node --experimental-webstorage --localstorage-file=data.bin test-local-storage.js
Never bet against Node.js
I told you never bet against Node.js
(node:1267359) ExperimentalWarning: Web Storage is an experimental feature and might change at any time
(Use `node --trace-warnings ...` to show where the warning was created)
>
```

Experimental SQLite API

```
const { DatabaseSync } = require ('node:sqlite');
const db = new DatabaseSync(':memory:');
db.exec(`
 CREATE TABLE data( key TEXT PRIMARY KEY, value TEXT) STRICT
const insertStmt = db.prepare( 'INSERT INTO data (key,value)    VALUES (?, ?)');
const readStmt = db.prepare( 'SELECT * FROM data ORDER BY key');
insertStmt.run('RULE TO LIVE BY 2', 'I told you never bet against Node.js');
insertStmt.run('RULE TO LIVE BY 1', 'Never bet against Node.js');
console.log(readStmt.all());
```

Experimental SQLite API

```
>node --experimental-sqlite test-sqlite.js
  [Object: null prototype] {
    key: 'RULE TO LIVE BY 1',
    value: 'Never bet against Node.js'
  [Object: null prototype] {
    key: 'RULE TO LIVE BY 2',
    value: 'I told you never bet against Node.js'
```

Continued progress on performance

- Newer versions of V8
- On-disk caching to improve startup
 - NODE_COMPILE_CACHE, NODE_DISABLE_COMPILE_CACHE
- Buffer improvements
- FS improvements

Node --run

```
Package.json
{
    "name": "my-great-app",
    "version": "0.0.1",
    "scripts": {
        "start": "node doit.js"
    }
}
```

>node --run start

Node.js 24 specific highlights

- V8 13.4
 - Atomics.pause A new API to pause execution for a specified duration
 - <u>WebAssembly Memory64</u> Support for 64-bit memory in WebAssembly
 - Explicit resource management The new 'using' and 'await using' declarations
 - Error.isError A new static method to check if a value is an Error object
- Npm 11.0.0
- More efficient AsyncLocalStorage
- URL Pattern global
- Permission model improvements
- Test runner enhancements
- Undici 7.0.0

What's new - Trends

- <u>node-addon-api</u> overtakes Nan
- Node.js/JavaScript support in Al libraries
- TypeScript usage

Node-api/Node-addon-api

- ABI stable
 - No code changes needed for new Node.js versions
 - Build once, run with later Node.js versions
- Concepts and operations generally map to ideas specified in the ECMA262 Language Specification.
 - Cross runtime compatibility
 - Cross language support
 - Separation from Node.js itself

Building C/C++ addons - node-addon-api

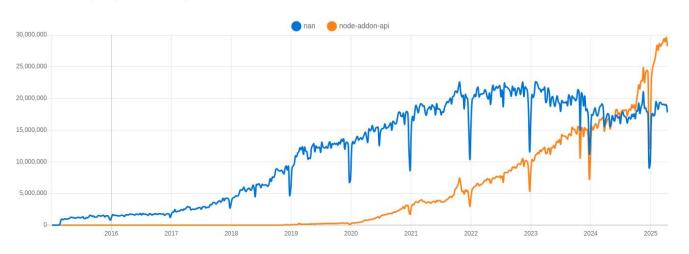
```
#include <napi.h>
    Napi::String Method(const Napi::CallbackInfo& info) {
      Napi::Env env = info.Env();
      return Napi::String::New(env, "world");
 6
    Napi::Object Init(Napi::Env env, Napi::Object exports) {
      exports.Set(Napi::String::New(env, "hello"),
 9
10
                  Napi::Function::New(env, Method));
11
      return exports;
12
13
    NODE API MODULE(hello, Init)
```

```
var addon = require('bindings')('hello');

console.log(addon.hello()); // 'world'
```

Building addons like its 2025





80% use case ~ 61% use

Stats

	Stars	Issues	Version	Updated ②	Created ②	Size
nan um 🔘	3 ,312	72	2.22.2	2 months ago	12 years ago	install size 434 kB
node-addon-api	E) 2,251	11	8.3.1	2 months ago	8 years ago	install size 394 kB

https://npmtrends.com/nan-vs-node-addon-api

Trends - Al developer libraries

 JavaScript/Typescript 2nd language supported











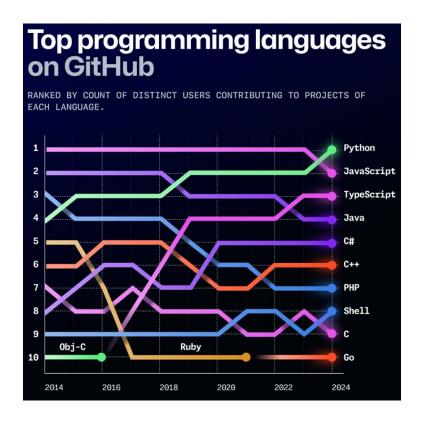


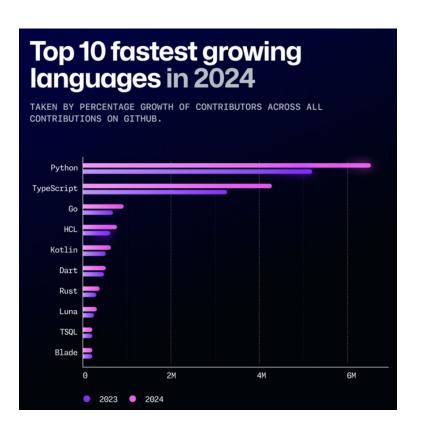
Trends - Al developer libraries

```
import {fileURLToPath} from "url";
      import path from "path";
      import { ChatPromptTemplate } from "@langchain/core/prompts";
      // GET THE MODEL
      const __dirname = path.dirname(fileURLToPath(import.meta.url));
      const modelPath = path.join(__dirname, "models", "mistral-7b-instruct-v0.1.Q5_K_M.gguf")
      const { LlamaCpp } = await import("@langchain/community/llms/llama cpp");
      const model = await new LlamaCpp({ modelPath: modelPath });
10
11
      12
13
      // CREATE CHAIN
14
      const prompt =
        ChatPromptTemplate. from Template ('Answer the following question if you don't know the answer say so:
15
16
17
      Question: {input}`);
18
19
      const chain = prompt.pipe(model);
20
      21
22
      // ASK QUESTION
23
      console.log(new Date());
      let result = await chain.invoke({
24
       input: "Should I use npm to start a node.js application",
25
      });
26
      console.log(result);
27
      console.log(new Date()):
28
```

https://developers.redhat.com/blog/2024/11/20/essential-ai-tutorials-nodeis-developers

Trends - TypeScript usage





What's Next?

- Who decides what's next?
- Following what's next
- Next-10

Who Decides what's next?





Artindividual contributor

Who Decides what's next?

All collaborators

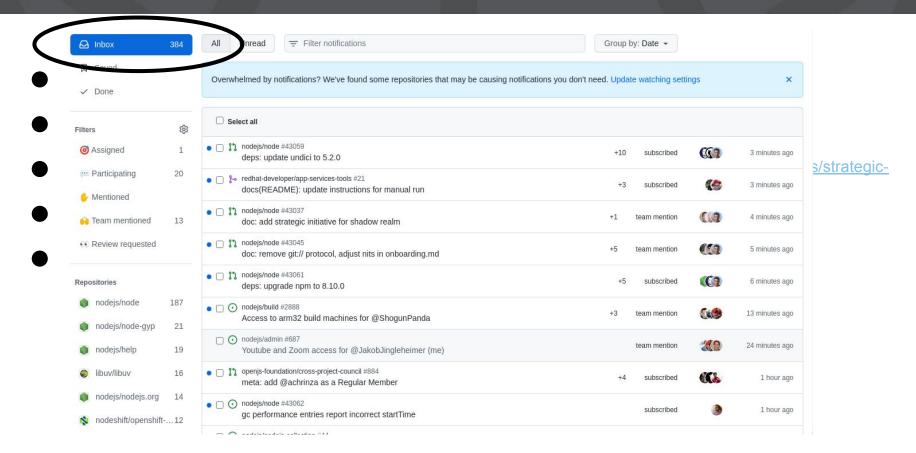
Who Decides what's next?

- All collaborators
 - Together
 - Real time
 - No pre-defined roadmap
- Driven by
 - Doer's
 - Reviewers/Approvers
 - Supported by Project's documented Priorities

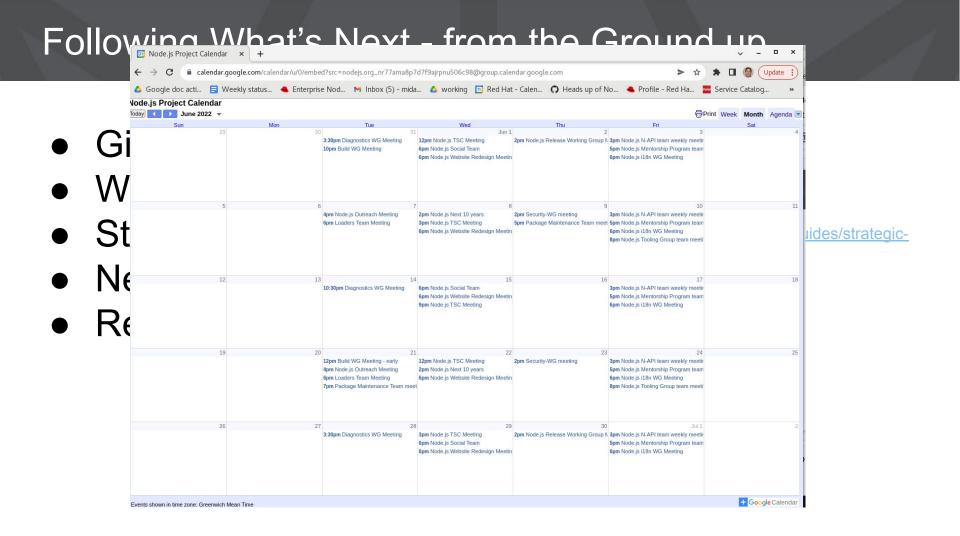


- GitHub Notifications
- Working Groups and Teams
 https://nodejs.org/calendar
- Strategic Initiatives https://github.com/nodejs/node/blob/master/doc/guides/strategic-initiatives.md
- Next-10 https://github.com/nodejs/next-10
- Releases https://github.com/nodejs/release
- Node.js news feed https://nodejs.github.io/nodejs-news-feeder/feed.xml

Following What's Next - from the Ground up



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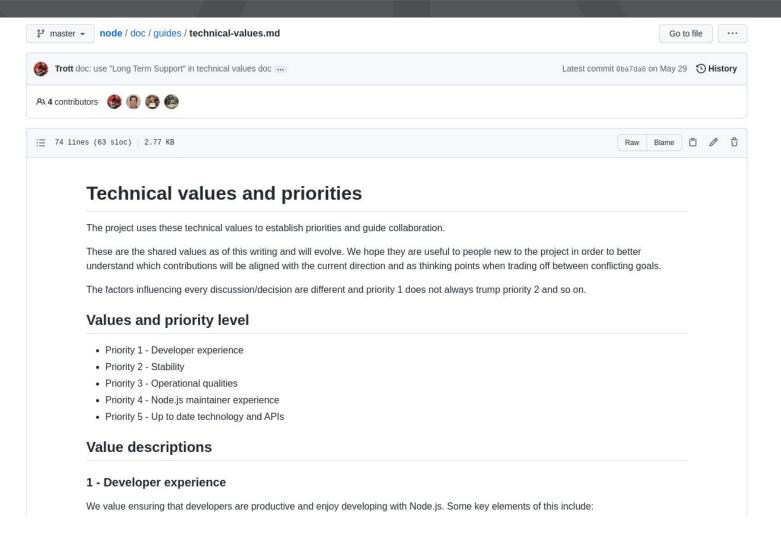


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Next 10 - Foundation

- Technical Values and Priorities https://github.com/nodejs/node/blob/main/doc/contributing/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

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.)
 - Programs to help people demonstrate capability (certification programs, etc.)
- Security Practitioners
 - o 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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TUENCY-NEEDS.md

Needs of the Node.js Constituencies

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

/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		×	Х	×	
Assets that show Node.js is a good choice	X	X	Х	X	

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
- WebAssembly
- ES Modules (ESM)
- Support for features from the latest ECMAScript spec
- Observability
- Better multithreaded support
- Single Executable Applications
- Serverless
- Small footprint
- Developers-first DX
- Package management

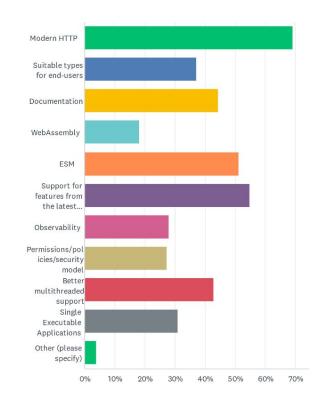
Next 10 team

- Technical priorities well defined
 - Aligned based on survey results
- Current focus areas less technical
 - Advocacy and promotion
 - Ambassador program

https://github.com/nodejs/node/blob/main/doc/contributing/advocacy-ambasador-program.md

- Corporate usage stories
- News Feed https://nodejs.github.io/nodejs-news-feeder/feed.xml
- Funding
- Collaborator Health

- Continued work on
 - ESM
 - Typescript
 - Performance
 - QUIC
 - 0 ...



- What about other pain points?
 - Docs Initiative https://github.com/nodejs/next-10/issues/166
 - Monitoring/Diagnostics
 - diagnostics team
 - AsyncLocalStorage rewritten not to use Async Hooks
 - Key components moved into org
 - nodejs / import-in-the-middle
 - require-in-the middle ?

Most common pain points

- ESM integration
- TypeScript
- Docs
- Monitoring/Diagnostic
- Performance

Thank You

Questions?

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