- [Doc] Process ( )
- [Doc] Child Processes ( )
- [Doc] Cluster ( )
- [Basic]
- [Basic]

Process, , ① , ② Node.js Process . , ps -ef . .

UID	ID
PID	
PPID	
C	CPU
STIME	
TTY	
TIME	CPU
CMD	

APUE, Unix .

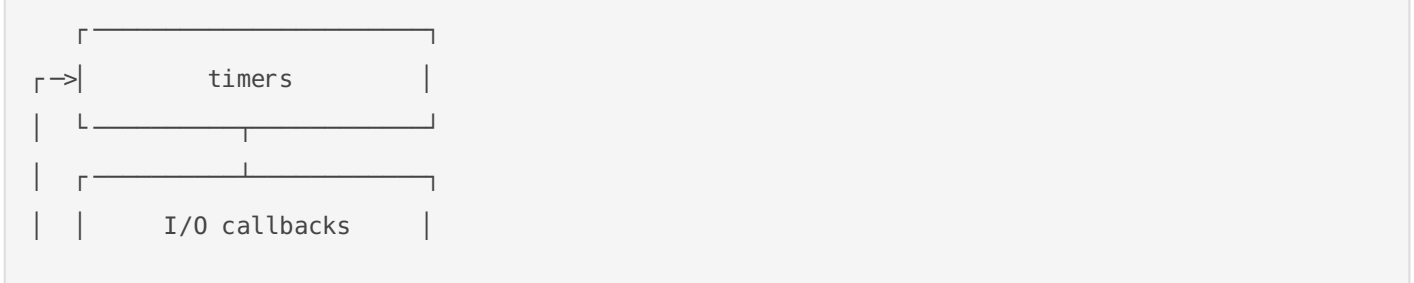
Process

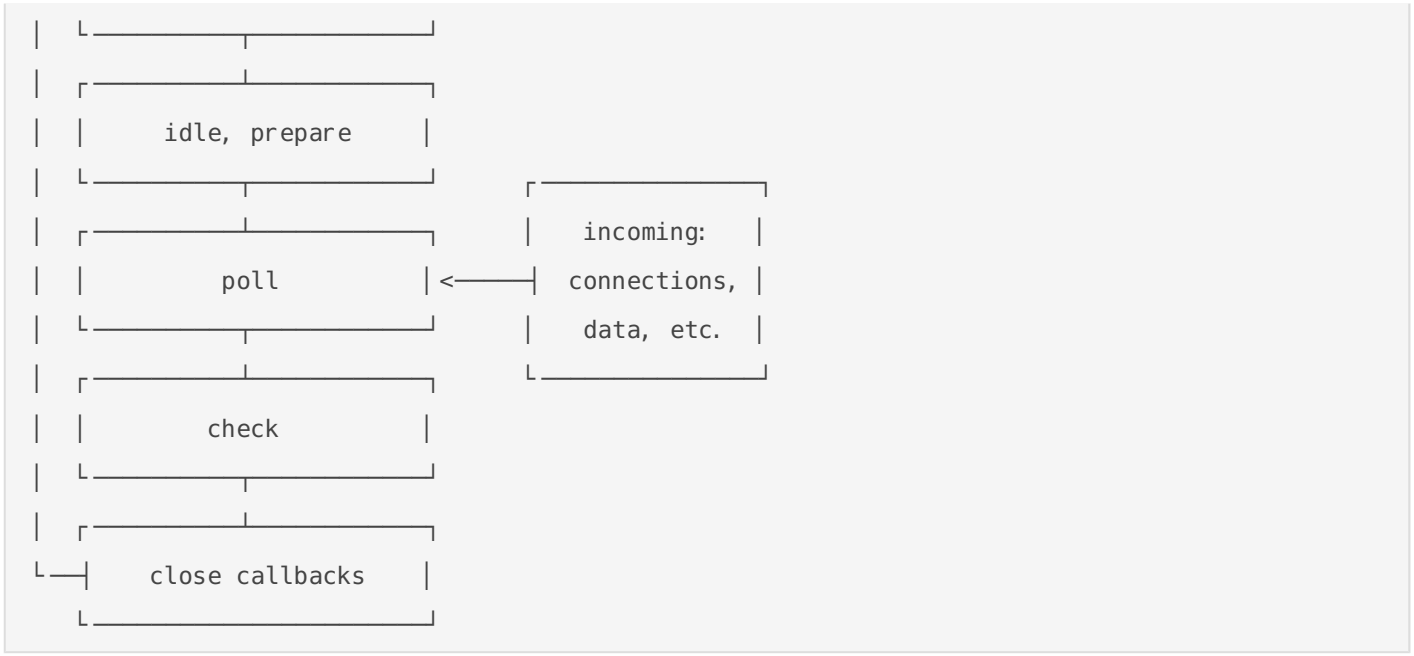
Nod process console.log(process) . ,process . : ,

- Usage
- /
- OS
-

process.nextTick

process.nextTick , , , .





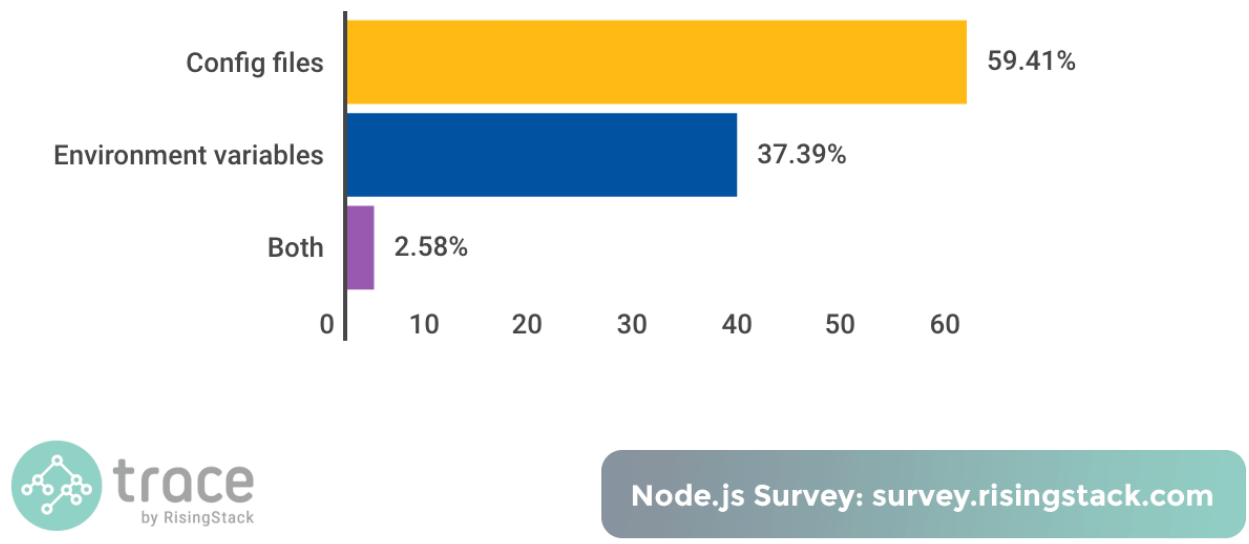
`process.nextTick` Event loop , `nextTickQueue` "Tick", Queue . (doge

```
function test() {
  process.nextTick(() => test());
}
```

, ? ?

```
function test() {
  setTimeout(() => test(), 0);
}
```

. , , .



`process.env` `dotenv`, `node-config` , , , .

> “ ? ?

, process.cwd() (current working directory), ( ), `process.chdir()` . . , .

process `process.stderr`, `process.stdout` `process.stdin` , C/C++/Ja **console.log** . **?** , **console.log?**

C/C `scanf`, C++ `cin`, Python `raw_input`).

, top, ps, pstree .

Child Process

(Child Process) `child_process` e.js pomelo , `cluster`) . .js .

> child_process.fork POSIX fork ?

Node.js `child_process.fork()` Unix fork(2), POSIX POSIX fork (waitpid), child_pro
Node.js , option .

- spawn()
  - options.detached
  - options.stdio
- spawnSync() spawn, ,
- exec() , ,
- execSync() exec(), , (stdout)
- execFile() ,
- execFileSync() execFile(), , exit code 0, throw Error
- fork() spawn(), ChildProcess

exec/execSync bash , , .

child.kill child.send

`child.kill` `child.send` . , IPC.

> ? ?

1, init `wait()` `waitpid()` "`PCB`" . , ,

Cluster

Cluster Node. `child_process.fork()` , cluster IPC , fork, . clus

```
const cluster = require('cluster');            // | |
const http = require('http');                  // | |
const numCPUs = require('os').cpus().length;   // | |
                                               // | |
if (cluster.isMaster) {                        // |-|-----------------
  // Fork workers.                             //   |
  for (var i = 0; i < numCPUs; i++) {          //   |
    cluster.fork();                            //   |
```

```
  }                                         //   |       (a.js)
  cluster.on('exit', (worker) => {          //   |
    console.log(`${worker.process.pid} died`); //   |
  });                                       //   |
} else {                                    // |-------------------
  // Workers can share any TCP connection   // |
  // In this case it is an HTTP server      // |
  http.createServer((req, res) => {         // |
    res.writeHead(200);                     // |         (b.js)
    res.end('hello world\n');               // |
  }).listen(8000);                          // |
}                                           // |-------------------


                                            // | |
console.log('hello');                       // | |
```

numCPUs , , , . , .

`a.js`, `b.js`, `node a.js` cluster.fork`node b.js`. cluster , cluster ,

How It Works

worker child_process.fork() , IPC .

cluster .

(, windows), round-robin . , , socket

socket , socket worker, , worker .

, , 70% 8 2 , .

IPC (Inter-process communication) . :

PIPE	N	Y	Y	N
PIPE	N	Y	Y	N
	N	Y	Y	N
	N	Y	Y	Y
	N	Y	Y	Y
UNIX SOCKET	N	Y	Y	N

UNIX SOCKET	Y	Y	N	N

Node.js IPC libuv , windows named pipe , *nix UDS (Uni

socket , , IPC socket , , encode/decode

Node.js IPC ,

> IPC , ? , IPC ?

, . child_process , `NODE_CHANNEL_FD` Node.js , , fd IPC

(IPC) , IPC , IPC, IPC .

, . pm2 , , . ,

`&` , . session . tty , .

```
//       (C   )
void init_daemon()
{
    pid_t pid;
    int i = 0;

    if ((pid = fork()) == -1) {
        printf("Fork error !\n");
        exit(1);
    }

    if (pid != 0) {
        exit(0);        //
    }

    setsid();           //       ,
    if ((pid = fork()) == -1) {
        printf("Fork error !\n");
        exit(-1);
    }
    if (pid != 0) {
        exit(0);        //       ,
```

```
                        //         tty
    }
    chdir("/tmp");      //
    umask(0);           //
    for (; i < getdtablesize(); ++i) {
       close(i);        //
    }

    return;
}
```

Node.js

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