

9 Challenges in Node.js

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Node is gaining popularity.

To encourage contributors I want to highlight what I see as the biggest problems facing Node

Problem 1: TLS / SSL

TLS is increasingly important. “Infrastructural” protocol. Needs very good support.

Current bindings to OpenSSL are

- ▶ Incomplete (E.G. No sessions)
- ▶ Buggy
- ▶ Tied into socket code – should be independent.

Ultimately unusable.

Problem 1: TLS / SSL

Would like to have with *really* good support for both the client and server for:

- ▶ Server Name Indication
- ▶ Sessions
- ▶ OCSP stapling
- ▶ False Start
- ▶ Snap start (!)

<http://www.imperialviolet.org/2010/06/25/overclocking-ssl.html>

Problem 2: Continuous Integration Perf Testing

Development is mostly blind with respect to performance.

HTTP hello world server is tested regularly and sometimes start up time.

Mostly performance is unknown.

Problem 3: Debugging

Not all is sunshine in the world of callbacks:

```
1 function f () {  
2   throw new Error('foo');  
3 }  
4  
5 setTimeout(f, 10000*Math.random());  
6 setTimeout(f, 10000*Math.random());
```

From which line does the error arise?

Problem 3: Debugging

```
1 % node x.js
2
3 x.js:2
4   throw new Error('foo');
5         ^
6 Error: foo
7     at Timer.f [as callback] (x.js:2:9)
8     at node.js:266:9
```

No reference to either of the `setTimeout` lines in the stack trace.

Hard to debug when you're always destroying your stack. Often difficult to discover which path lead you to an exception.

Problem 3: Debugging

Would like to dynamically turn on the V8 debugger (via a signal?).

- ▶ Must have zero performance impact when off
- ▶ Useful for LiveEdit features

Similarly: I would like to be able to trigger heap profiles at anytime.

Problem 3: Debugging

DTrace probes all over Node:

- ▶ Function calls in V8 (getting args impossibly hard?)
- ▶ Settle for an is-enabled probe?
- ▶ EventEmitter firing (at least off the event loop)
- ▶ Thread pool queue size

Problem 4: Windows

Currently there is a CYGWIN port, but that's not very satisfying.

Would like to compile on MinGW or MSVC but much work needs to be done.

Problem 4: Windows

A lot of **libev** will not work on Windows. (E.G. **ev_async**—AKA the pipe trick—probably needs to be rewritten.)

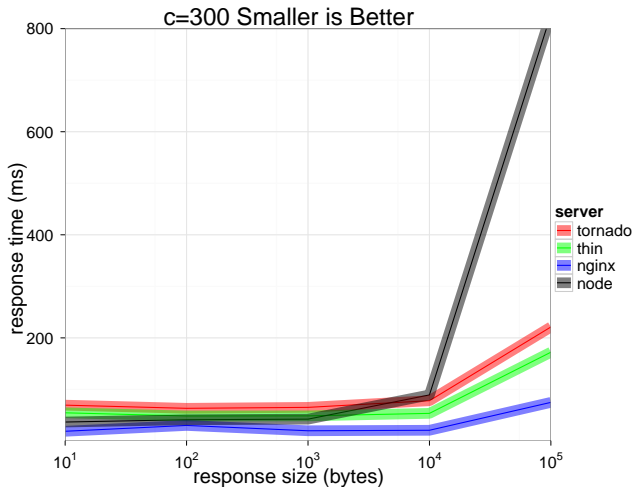
Desirable to use IOCP instead of **select ()** ... (AFAICT Impossible to do on libev...)

Perhaps porting **libev** is not impossible—but it will use **select ()**.

Problem 5: V8 on x64 limited to 1 GB heap

Somewhat unreasonable to expect all server-side processes to run under 1 gig.

Problem 6: Copying Strings out of V8 heap



(Warning: dated benchmark - but behavior should still hold)

Problem 6: Copying Strings out of V8 heap

Writing strings to a socket or file currently requires two copies:

1. copying the data out of the V8 heap into an externally allocated buffer.
2. moving the data to the device on the **write** syscall

This needs to be faster for at least a few common cases - writing out a JSON string for example.

Problem 7: Bunching Writes

In many cases, multiple `write()` calls are being made in a single iteration of the event loop (for a single file descriptor.)

Leads to smaller packets.

Outgoing data should be queued during the iteration until just before Node goes to sleep (`kevent`, `epoll`, etc) and sent out at once.

Problem 8: File System Event Notification

`fs.watchFile` uses `inotify` on Linux but polls with `stat ()` on all other operating systems.

This could be much better. Almost every OS has some FS event notification mechanism—Node should take advantage of it.

Problem 9: Kernel AIO

libeio uses pthreads to execute blocking system calls. Where possible, it would be useful to write a new **libeio** backend for kernel AIO (e.g. on Solaris).

Contributions Welcome

New low-traffic mailing list for Node development:

<http://groups.google.com/group/nodejs-dev>

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`http://nodejs.org/`

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