PostgreSQL

The RDBMS with the Elephant Logo

Database Management System (DBMS)

- How to define records (Data Definition)
- CRUD, in a performant way (B-Trees, etc.)
- Administration

Progression of Databases

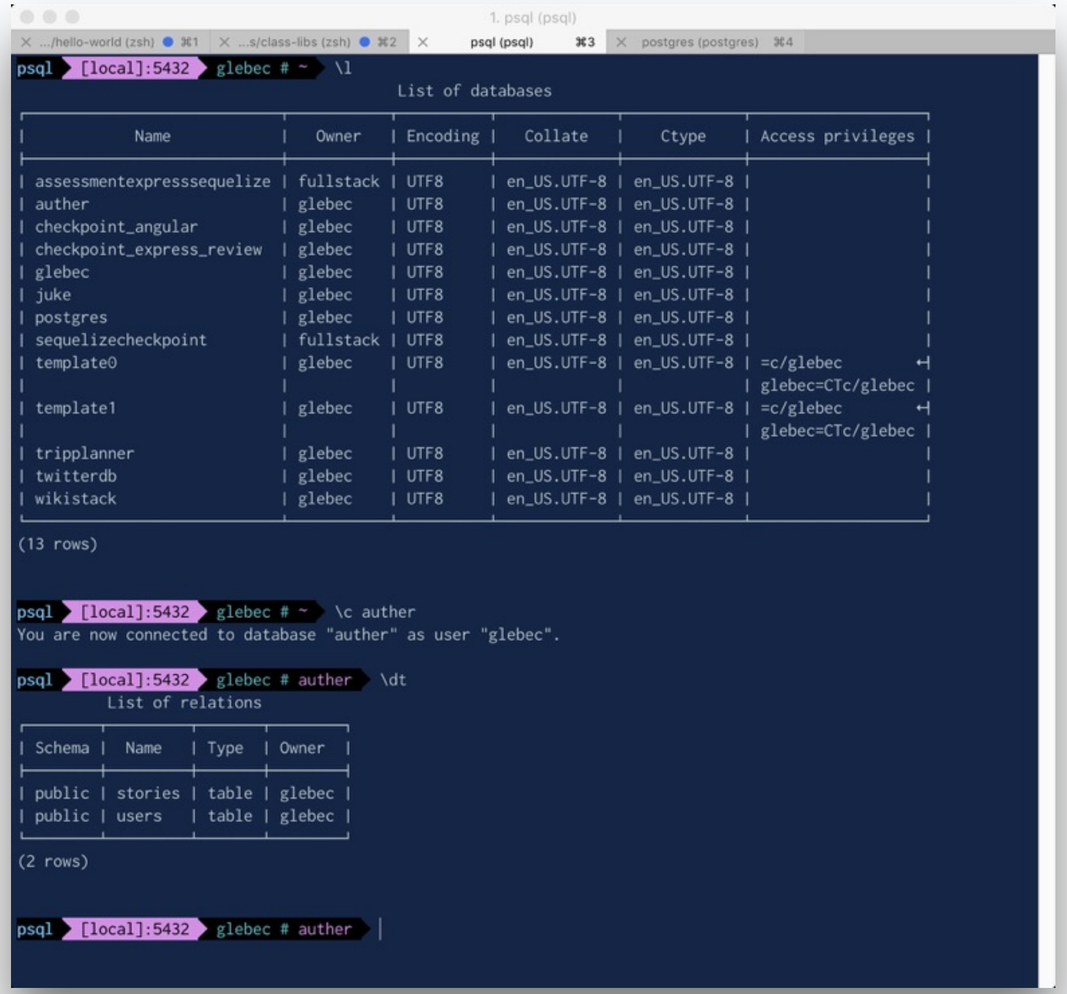
- Navigational (< 1970s)
- Relational (> 1970s)
- NoSQL (> 2000s)

History of Postgres

- 1970s at UC Berkley:
  INteractive **G**raphics **RE**trieval **S**ystem (INGRES)
- 1980s: POSTGRES ("Post-Ingres")
- 1995: POSTQUEL and Postgres95. monitor -> psql
- 1996: Open source community adopts it
- Ongoing: stability, testing, documentation, new features
- PostgreSQL

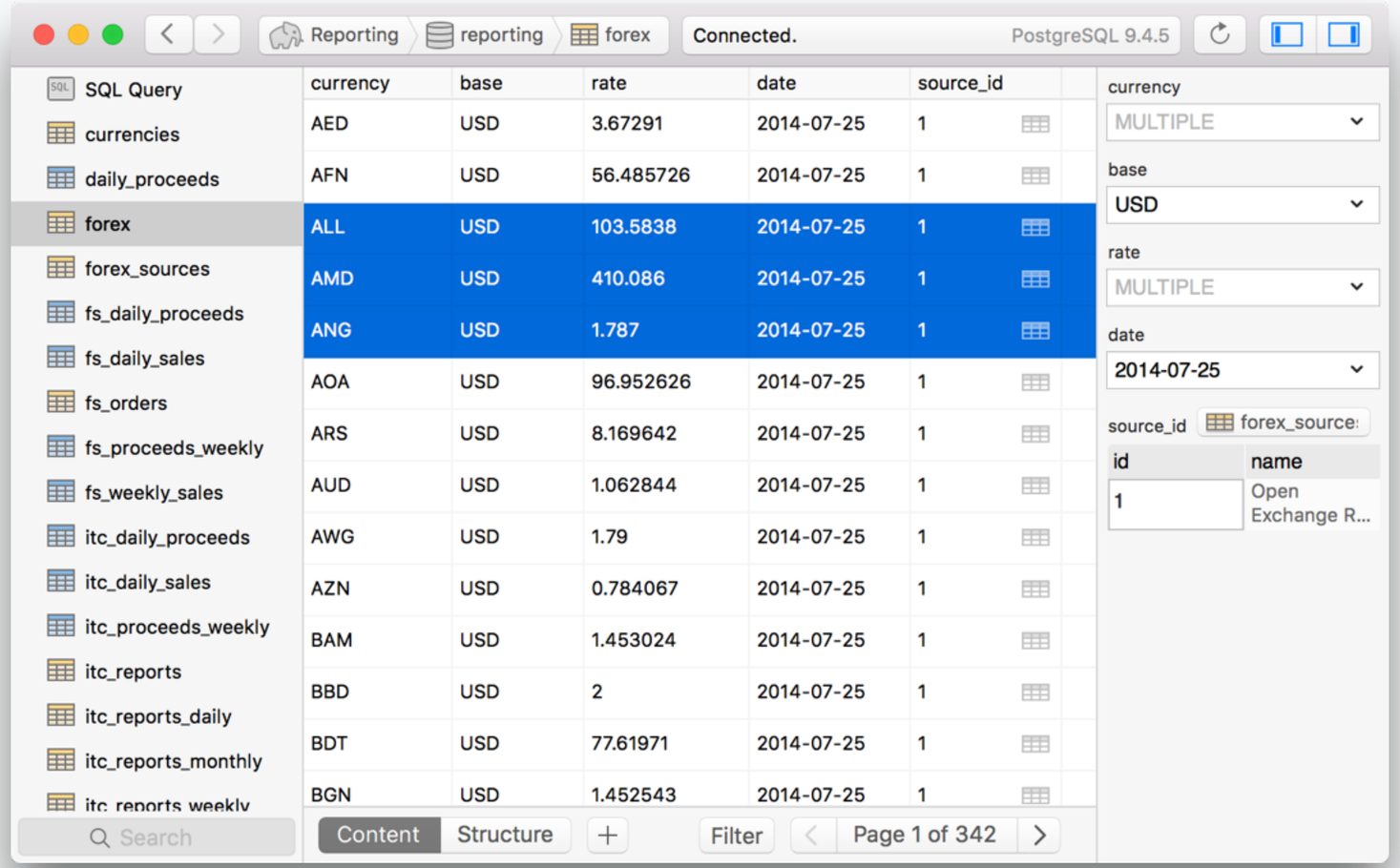
Tooling

- psql
- CLI



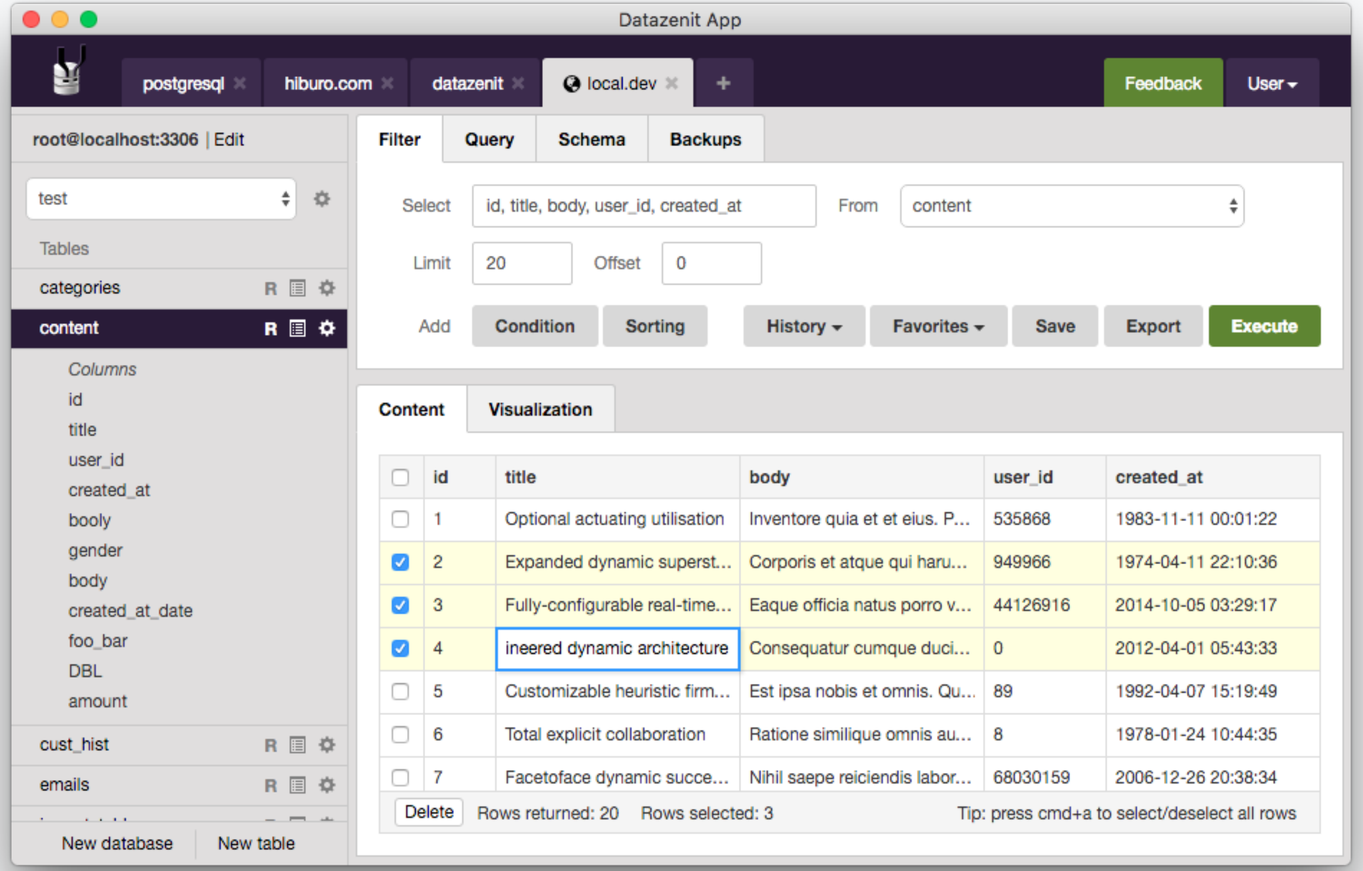
Tooling

- Postico
- Free

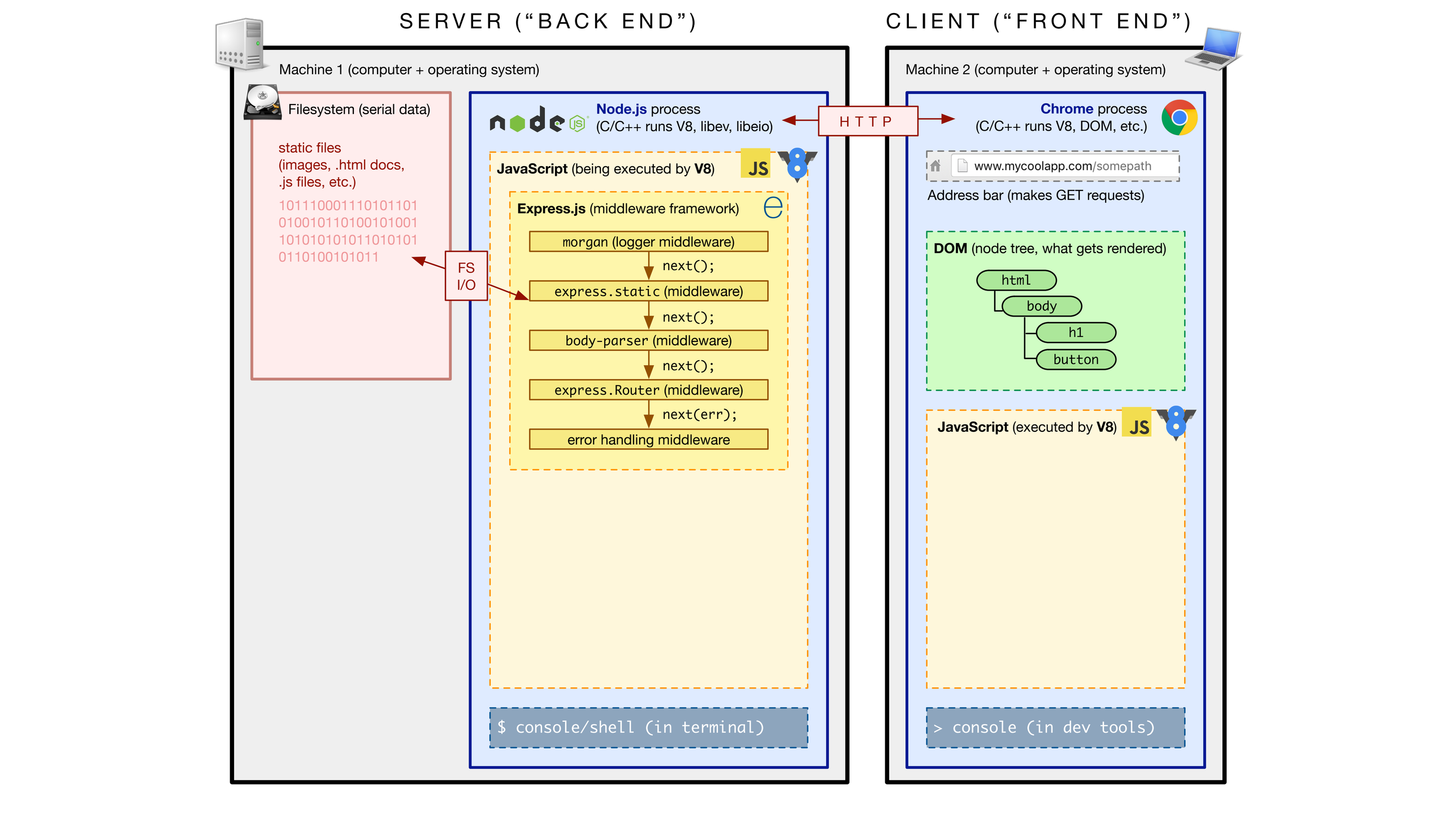


Tooling

- Datazenit
- $$$



Etc.


SERVER ("BACK END")
CLIENT ("FRONT END")
Machine 1 (computer + operating system)
Machine 2 (computer + operating system)
Filesystem (serial data)
static files
(images, .html docs,
.js files, etc.)
10111000111010110101001010011010010101010110101010110100101011
FS
I/O
Node.js process
(C/C++ runs V8, libev, libeio)
HTTP
Chrome process
(C/C++ runs V8, DOM, etc.)
JavaScript (being executed by V8)
JS
Express.js (middleware framework)
morgan (logger middleware)
next();
express.static (middleware)
next();
body-parser (middleware)
next();
express.Router (middleware)
next(err);
error handling middleware
www.mycoolapp.com/somepath
Address bar (makes GET requests)
DOM (node tree, what gets rendered)
html
body
h1
button
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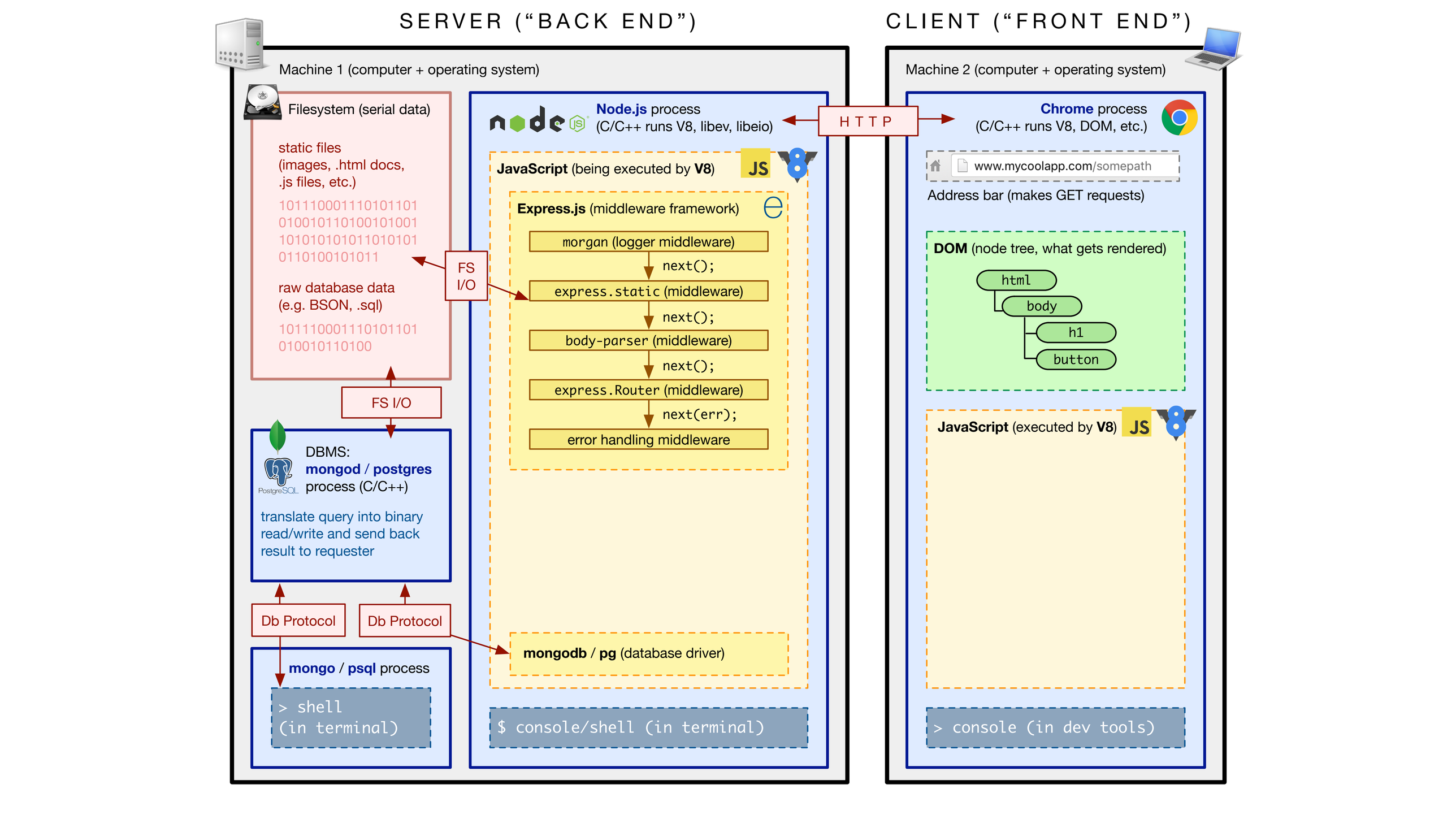
JS
$ console/shell (in terminal)
> console (in dev tools)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raw database data
(e.g. BSON, .sql)
101110001110101101
010010110100
FS I/O
FS I/O
DBMS:
mongod / postgres
process (C/C++)
PostgreSQL
translate query into binary
read/write and send back
result to requester
Db Protocol
Db Protocol
mongo / psql process
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postgres process

- Waiting for incoming SQL
- Knows how to read/write to disk in an organized, performant way
- Sends back results

Where does the "incoming SQL" come from?

Query sources

- psql CLI (human input as text)
- GUI like Postico, Datazenit (human actions turned into SQL queries)
- ...and other applications

How to transmit SQL text to app?

How can postgres be "waiting for SQL"?

And how do the results get "sent back"?

Postgres is a TCP server!

- Listening on a TCP port (5432 by default) for *requests*
- Does disk access
- Sends back a TCP *response* to the *client* that made the requests

OK, Postgres is a TCP server. Is it… HTTP?

Postgres uses the postgres:// protocol

	Transport Protocol	Message Protocol	Content Type
Node + Express	TCP/IP	http://	Anything: HTML, JSON, XML, TXT, etc.
Postgres	TCP/IP	postgres://	SQL

For HTTP clients, the TCP/IP was handled for you by the browser or Node. How can our JS app communicate with the postgres server?

“Let's implement the postgres protocol in JavaScript ourselves!”

–Ambitious McOverkill

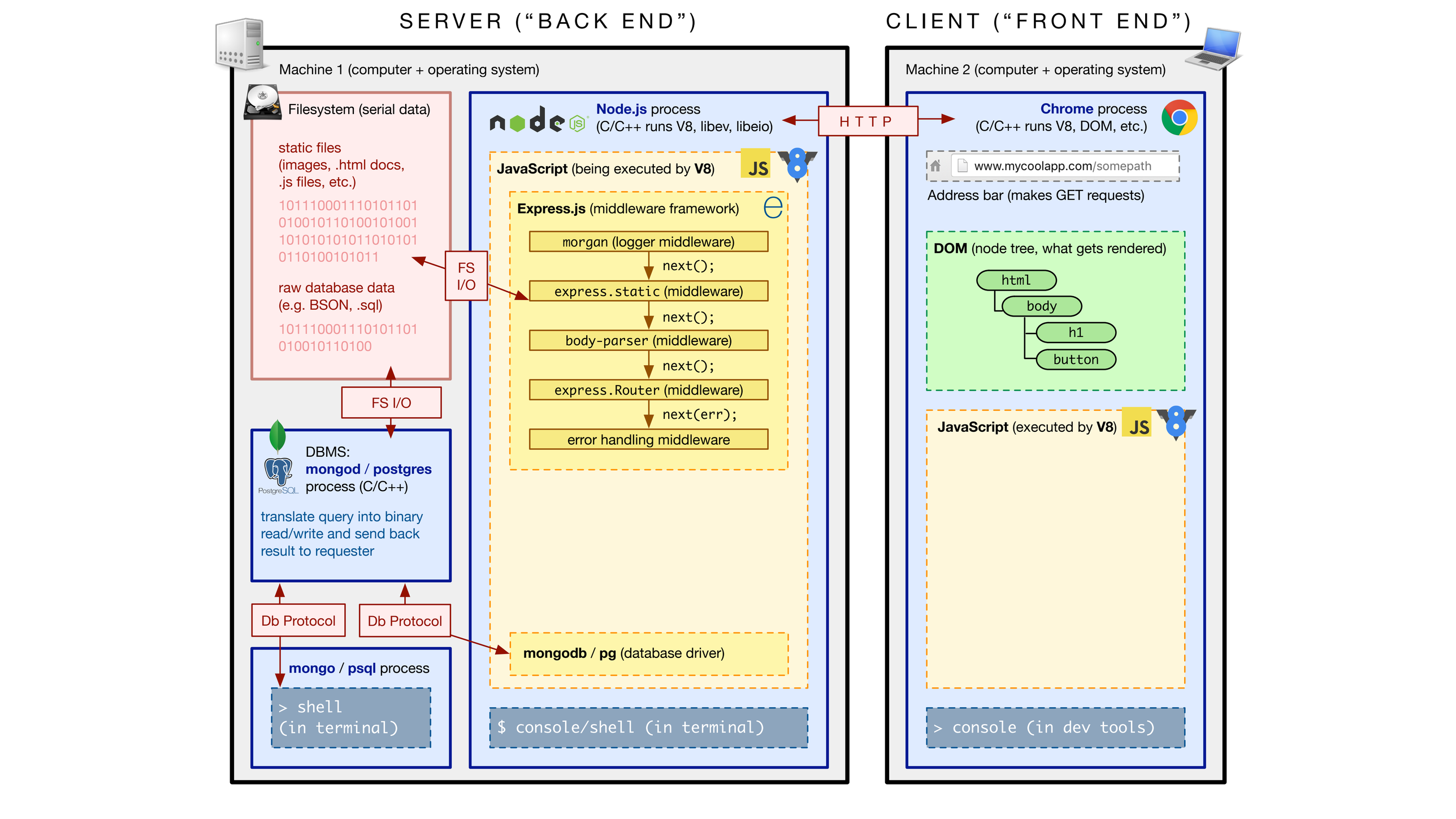
https://www.postgresql.org/docs/current/static/protocol.html

“On second thought…
has anyone done this for us?”

–Saney McReasonable

Node-postgres

- npm library: `npm install pg --save`
- *database driver*
- implements the postgres protocol in a Node module (JS!)
- Gives us a `client` object that we can pass SQL to
- Asynchronously talks via postgres protocol over TCP to postgres
- gives us a callback with `rows` array of resulting table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Final note: `returning`

- SQL comes in slightly different "dialects" depending on your RDBMS of choice (SQLite, MySQL, PostgreSQL etc.)
- PostgreSQL has a very convenient keyword `returning`
- Used during INSERT, UPDATE
- Returns the row(s) inserted/updated
- May come in handy during workshop, so check it out!