# *Gofer*

A scalable stateless proxy for DBI

# Gofer, *logically*

- Gofer is
  - A scalable stateless proxy *architecture* for DBI
  - Transport independent
  - Highly configuable on client and server side
  - Efficient, in CPU time and minimal round-trips
  - Well tested
  - Scalable
  - Cachable
  - Simple and reliable

# Gofer, *structurally*

- Gofer is
  - A simple stateless request/response protocol
  - A DBI proxy driver: DBD::Gofer
  - A request executor module
  - A set of pluggable transport modules
  - An extensible client configuration mechanism

- Development sponsored by Shopzilla.com

# Gofer Protocol

- DBI::Gofer::Request & DBI::Gofer::Response
- Simple blessed hashes
  - Request contains all required information to connect and execute the requested methods.
  - Response contains results from methods calls, including result sets (rows of data).
- Serialized and transported by transport modules like DBI::Gofer::Transport::http

# *Using* DBD::Gofer

- Via DSN
  - By adding a prefix

```
$dsn = "dbi:Driver:dbname";
$dsn = "dbi:Gofer:transport=foo;dsn=$dsn";
```

- Via `DBI_AUTOPROXY` environment variable
  - Automatically applies to all DBI connect calls

```
$ export DBI_AUTOPROXY="dbi:Gofer:transport=foo";
```

  - No code changes required!

# Gofer Transports

- DBI::Gofer::Transport::**null**
  - The 'null' transport.
  - Serializes request object,
    transports it nowhere,
    then deserializes and passes it to
    DBI::Gofer::Execute to execute
  - Serializes response object,
    transports it nowhere,
    then deserializes and returns it to caller
  - Very useful for testing.

```
DBI_AUTOPROXY="dbi:Gofer:transport=null"
```

# Gofer Transports

- DBD::Gofer::Transport::**stream** (ssh)
  - Can ssh to remote system to self-start server

    ```
    ssh -xq user@host.domain \
    perl -MDBI::Gofer::Transport::stream \
    -e run_stdio_hex
    ```

  - Automatically reconnects if required
  - ssh gives you security and optional compression

```
DBI_AUTOPROXY='dbi:Gofer:transport=stream
;url=ssh:user@host.domain'
```

# Gofer Transports

- DBD::Gofer::Transport::**http**
  - Sends requests as http POST requests
  - Server typically Apache mod_perl running DBI::Gofer::Transport::http
  - Very flexible server-side configuration options
  - Can use https for security
  - Can use web techniques for scaling and high-availability. Will support web caching.

```
DBI_AUTOPROXY='dbi:Gofer:transport=http
;url=http://example.com/gofer'
```

# Gofer Transports

- DBD::Gofer::Transport::**gearman**
  - Distributes requests to a pool of workers
  - Gearman a lightweight distributed job queue http://www.danga.com/gearman
  - Gearman is implemented by the same people who wrote memcached, perlbal, mogileFS, & DJabberd

```
DBI_AUTOPROXY='dbi:Gofer:transport=gearman
;url=http://example.com/gofer'
```

# Pooling via gearman *vs* http

- I haven't compared them in use myself yet
+ Gearman may have lower latency
+ Gearman spreads load over multiple machines without need for load-balancer
+ Gearman coalescing may be beneficial
+ Gearman async client may work well with POE
- Gearman clients need to be told about servers
- More gearman info http://danga.com/words/2007_04_linuxfest_nw/linuxfest.pdf (p61+)

# DBD::Gofer

- A proxy driver
- Accumulates details of DBI method calls
- Delays forwarding request for as long as possible
- Aims to be as 'transparent' as possible
- Policy mechanism allows fine-grained tuning to trade transparency for speed
- `execute_array()` is a single round-trip

# DBD::Gofer::Policy::*

- Three policies supplied: pedantic, classic, and rush. Classic is the default.
- Policies are implemented as classes
- Currently 22 individual items within a policy
- Policy items can be dynamic methods
- Policy is selected via DSN:

```
DBI_AUTOPROXY="dbi:Gofer:transport=null
;policy=pedantic"
```

# Round-trips per Policy

| | pedantic | classic | rush |
|---|---|---|---|
| `$dbh = DBI->connect_cached` | connect() | ✓ | |
| `$dbh->ping` | ✓ | | |
| `$dbh->quote` | ✓ | *if not default* | *if not default* |
| `$sth = $dbh->prepare` | ✓ | | |
| `$sth->execute` | ✓ | ✓ | ✓ |
| `$sth->{NUM_OF_FIELDS}` | | | |
| `$sth->fetchrow_array` | | | |
| `$dbh->tables` | ✓ | ✓ | *cached after first* |

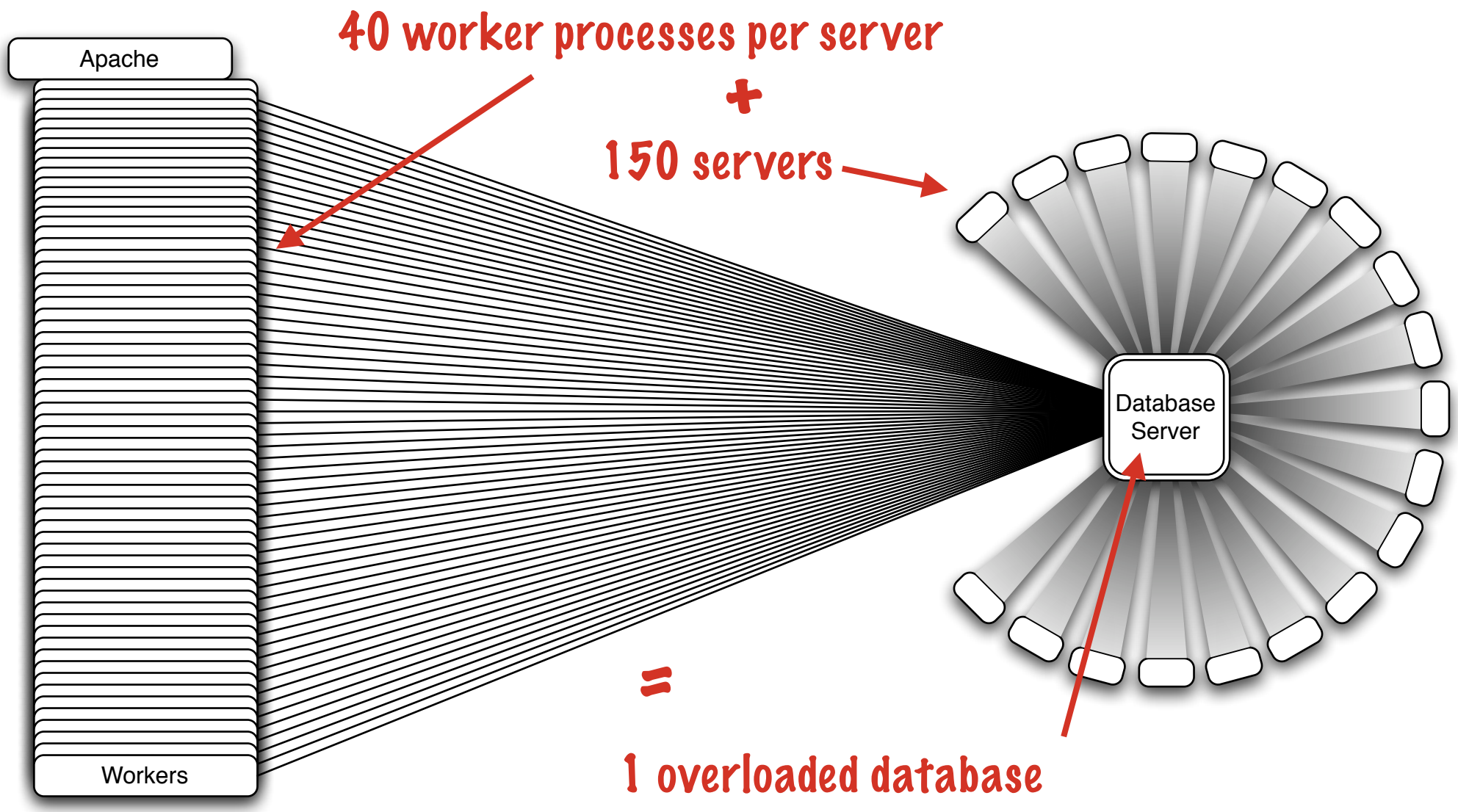
# Gofer *Caveats*

- State-less-ness has implications
  - No transactions. AutoCommit only.
  - Can't alter `$dbh` attributes after `connect`
  - Can't use temp tables, locks, and other per-connection persistent state, except via stored procedures
  - Code using `last_insert_id` needs a (simple) change
  - See the docs for a few other very obscure caveats

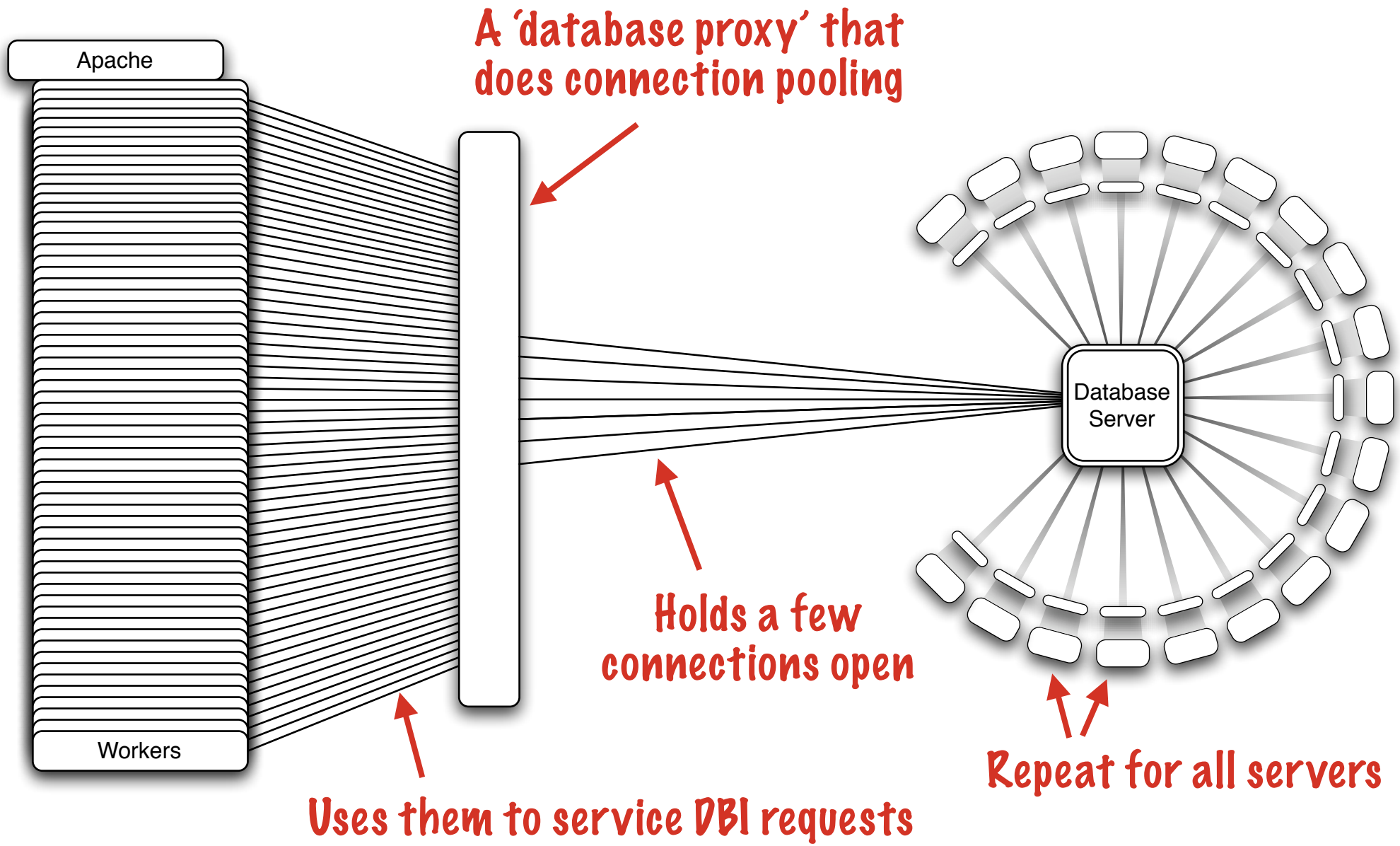
# *An Example*

Using Gofer for Connection Pooling

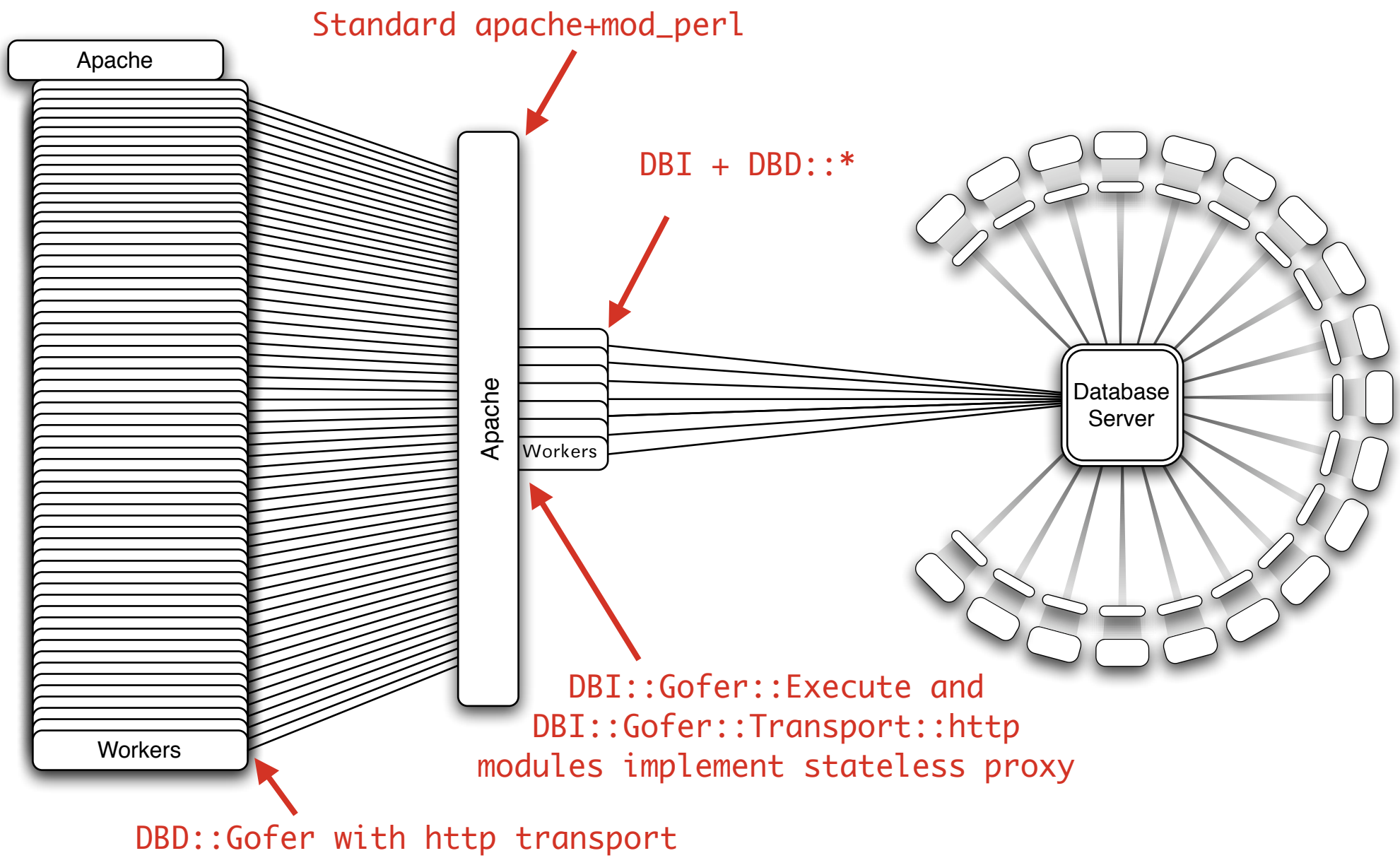
# The Problem


40 worker processes per server
+
150 servers
Apache
Workers
Database Server
=
1 overloaded database

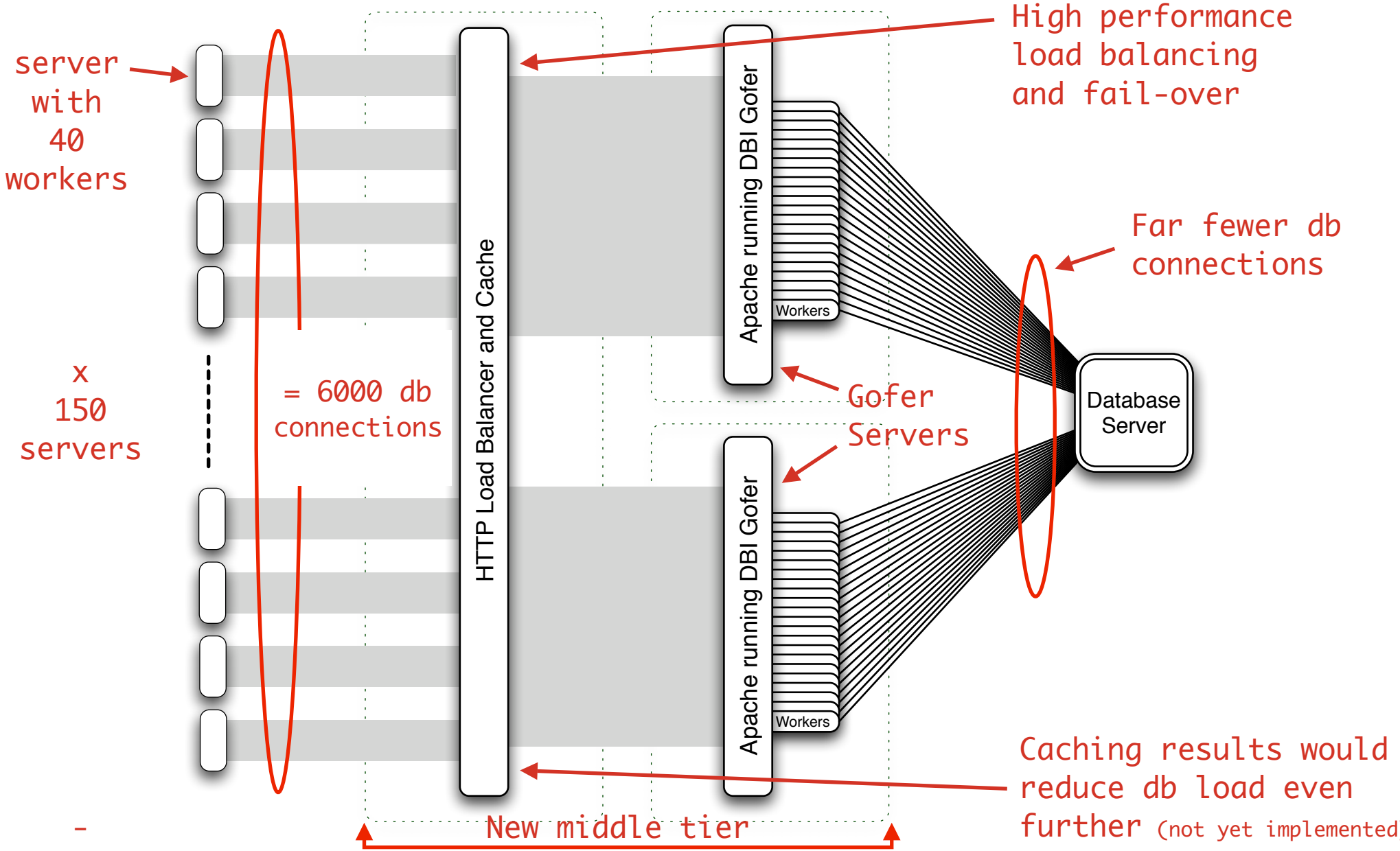
# A Solution


A 'database proxy' that does connection pooling
Apache
Workers
Database Server
Holds a few connections open
Uses them to service DBI requests
Repeat for all servers

# An Implementation



# Load Balance and Cache



# Error Handling

- DBD::Gofer can automatically retry on failure

```
DBI_AUTOPROXY="dbi:Gofer:transport=null
;retry_limit=3"
```

- Default behaviour is to retry if
  - `$request->is_idemponent` is true
  - looks at SQL returns true for most SELECTs
- Default is retry_limit=0, so disabled
- You can define your own behaviour:

```
DBI->connect(..., {
    go_retry_hook => sub { ... },
});
```

# DBD::Proxy *vs* DBD::Gofer

| | DBD::Proxy | DBD::Gofer |
|---|---|---|
| Supports transactions | ✓ | ✗ (not yet) |
| Supports very large results | ✓ | ✗ (memory) |
| Automatic retry on error | ✗ | ✓ |
| Large test suite | ✗ | ✓ |
| Minimal round-trips | ✗ | ✓ |
| Modular & Pluggable classes | ✗ | ✓ |
| Tunable via Policies | ✗ | ✓ |
| Scalable | ✗ | ✓ |
| Connection pooling | ✗ | ✓ |
| Can support client and web caches | ✗ | ✗ (not yet) |

# Gofer's Future

- Caching for http transport
- Optional JSON serialization
- Caching in DBD::Gofer
- Make state-less-ness optional
- Patches welcome!

# Future: http caching

- Potential big win
- DBD::Gofer needs to indicate cache-ability
  - via appropriate http headers
- Server side needs to agree
  - and respond with appropriate http headers
- Caching then happens just like for web pages
  - if there's a web cache between client and server
- Patches welcome!

# Future: JSON

- Turns DBI into a web service!
  - Service Oriented Architecture anyone?
- Accessible to anything
  - that can talk JSON
- Clients could be JavaScript, Java, ...
  - and various languages that begin with P or
- Patches welcome!

# Future: Client Caching

- DBD::Gofer could access a cache
  - Use serialized request as key to cache
  - If entry found then return that response
- Plug-able caching
  - Would include memcached to give a distributed shared cache
- Patches welcome!

# Future: Transactions

- State-less-ness could be made optional
  - If transport layer being used agrees
  - For http that means KeepAlive
  - Easiest to implement for stream / ssh
- Would be enabled by

```
AutoCommit => 0
$dbh->begin_work
```

- Patches welcome!

*Questions?*