Ur/Web:
A Simple Model for Programming the Web

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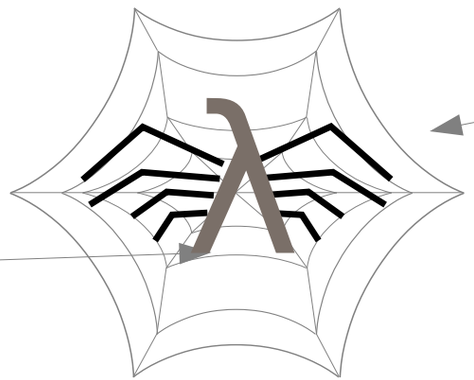
Ur / Web

Ur
A new general-purpose typed functional language



Web
Tools for implementing modern three-tier web applications

Motto: “the compiler understands the structure of your web app.”

Focuses on:
- Programmer productivity
- Security
- Performance (especially server-side, for scaling)

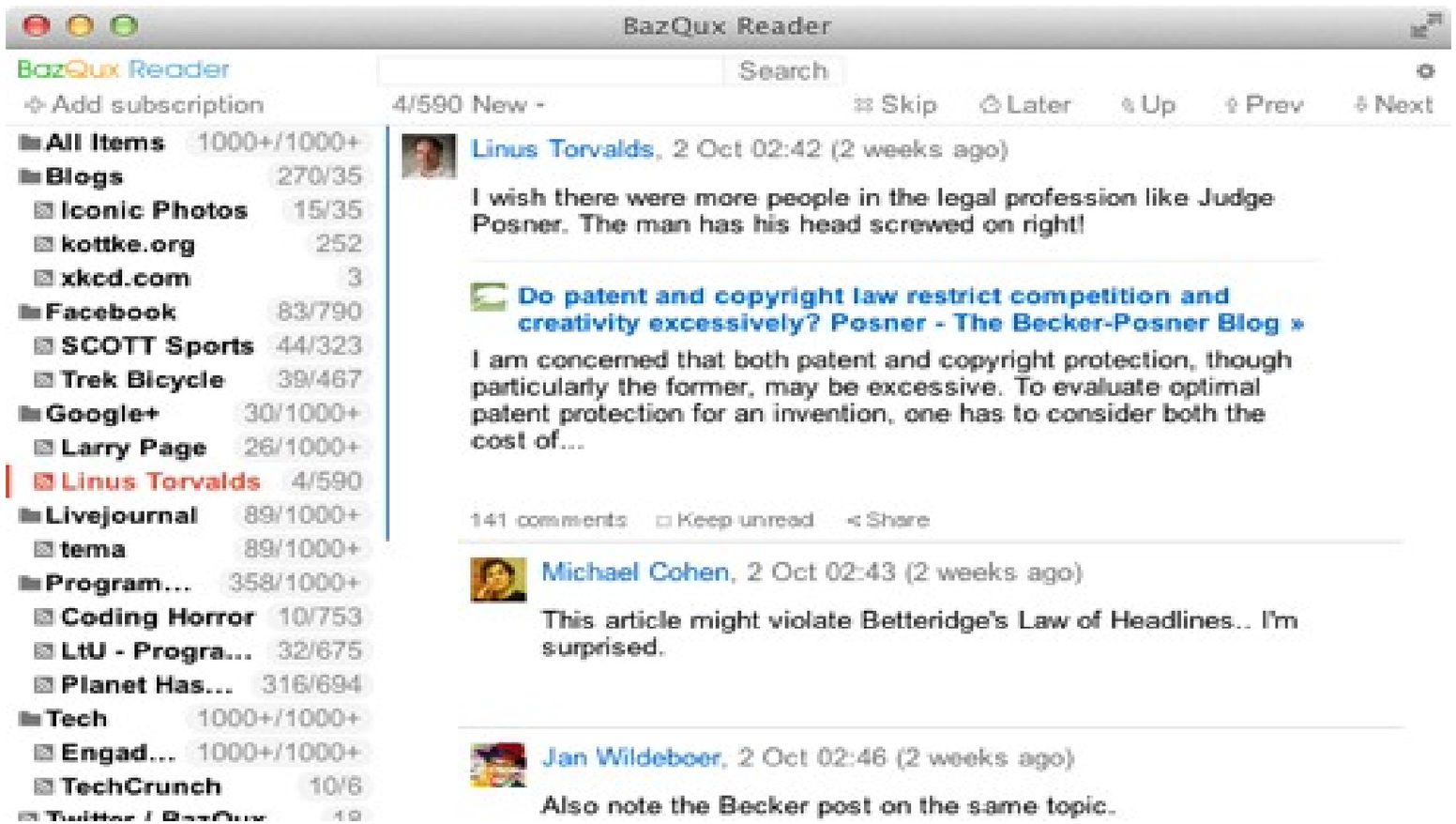
There are at least several users whom I have never met!

The first commercial Ur/Web application: **BazQux Reader**, by Vladimir Shabanov

Feed reader with comments

http://www.bazqux.com/

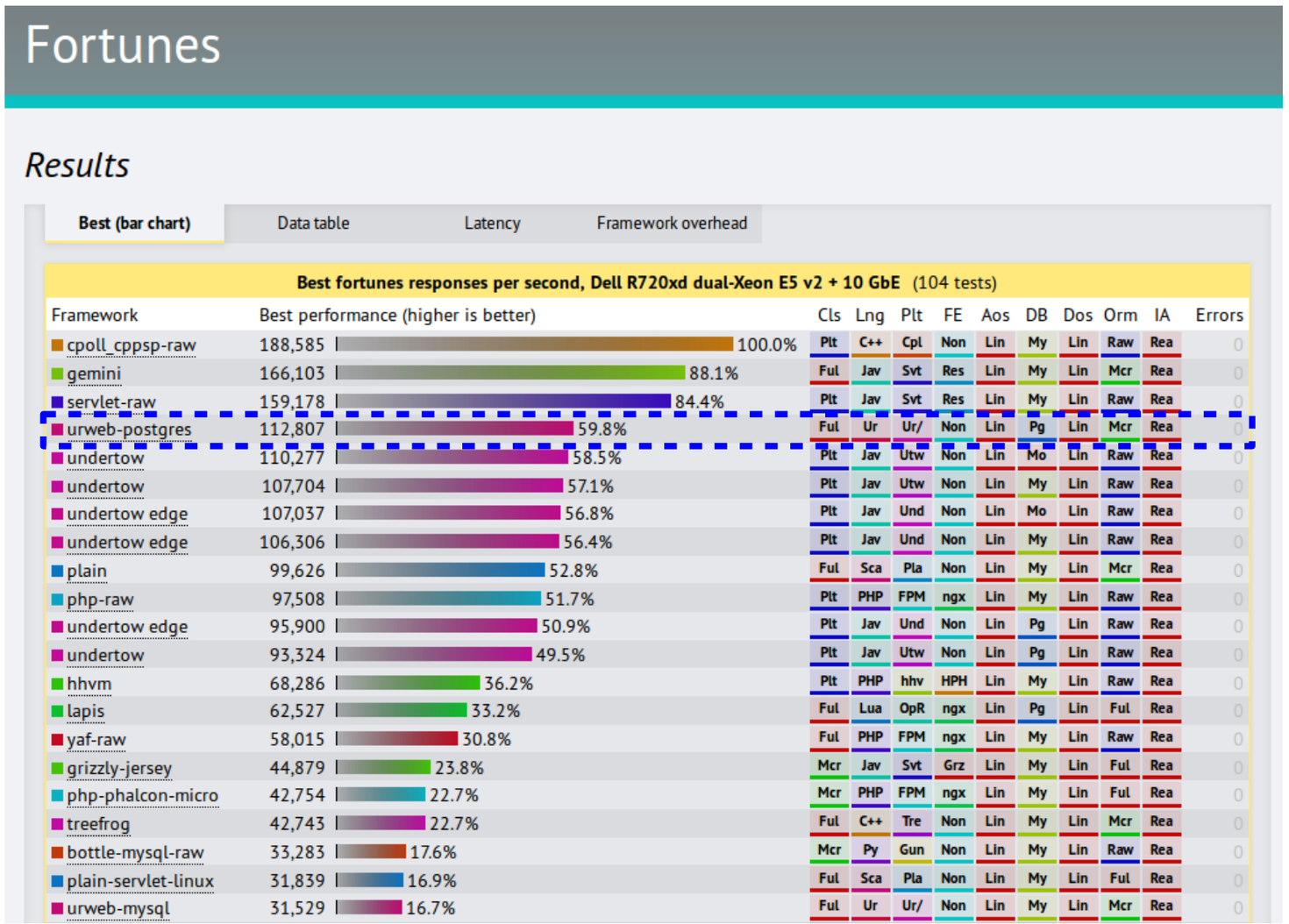
On the order of 1000 paying users daily



TechEmpower Web Framework Benchmarks

<http://www.techempower.com/benchmarks/>

- 3rd-party benchmarking initiative
- 93 frameworks in test to the right
- Ur/Web's performance:
  - 4th best throughput (~100 krps)
  - Best latency (2.1 ms)
- At the top of the chart in the preview results for the next round



Fortunes

Results

Best (bar chart) | Data table | Latency | Framework overhead

Best fortunes responses per second, Dell R720xd dual-Xeon E5 v2 + 10 GbE (104 tests)

Framework	Best performance (higher is better)	Cls	Lng	Plt	FE	Aos	DB	Dos	Orm	IA	Errors
cpoll_cppsp-raw	188,585 100.0%	Plt	C++	Cpl	Non	Lin	My	Lin	Raw	Rea	0
gemini	166,103 88.1%	Ful	Jav	Svt	Res	Lin	My	Lin	Mcr	Rea	0
servlet-raw	159,178 84.4%	Plt	Jav	Svt	Res	Lin	My	Lin	Raw	Rea	0
urweb-postgres	112,807 59.8%	Ful	Ur	Ur/	Non	Lin	Pg	Lin	Mcr	Rea	0
undertow	110,277 58.5%	Plt	Jav	Utw	Non	Lin	Mo	Lin	Raw	Rea	0
undertow	107,704 57.1%	Plt	Jav	Utw	Non	Lin	My	Lin	Raw	Rea	0
undertow edge	107,037 56.8%	Plt	Jav	Und	Non	Lin	Mo	Lin	Raw	Rea	0
undertow edge	106,306 56.4%	Plt	Jav	Und	Non	Lin	My	Lin	Raw	Rea	0
plain	99,626 52.8%	Ful	Sca	Pla	Non	Lin	My	Lin	Mcr	Rea	0
php-raw	97,508 51.7%	Plt	PHP	FPM	ngx	Lin	My	Lin	Raw	Rea	0
undertow edge	95,900 50.9%	Plt	Jav	Und	Non	Lin	Pg	Lin	Raw	Rea	0
undertow	93,324 49.5%	Plt	Jav	Utw	Non	Lin	Pg	Lin	Raw	Rea	0
hhvm	68,286 36.2%	Plt	PHP	hhv	HPH	Lin	My	Lin	Raw	Rea	0
lapis	62,527 33.2%	Ful	Lua	OpR	ngx	Lin	Pg	Lin	Ful	Rea	0
yaf-raw	58,015 30.8%	Ful	PHP	FPM	ngx	Lin	My	Lin	Raw	Rea	0
grizzly-jersey	44,879 23.8%	Mcr	Jav	Svt	Grz	Lin	My	Lin	Ful	Rea	0
php-phalcon-micro	42,754 22.7%	Mcr	PHP	FPM	ngx	Lin	My	Lin	Ful	Rea	0
treefrog	42,743 22.7%	Ful	C++	Tre	Non	Lin	My	Lin	Mcr	Rea	0
bottle-mysql-raw	33,283 17.6%	Mcr	Py	Gun	Non	Lin	My	Lin	Raw	Rea	0
plain-servlet-linux	31,839 16.9%	Ful	Sca	Pla	Non	Lin	My	Lin	Ful	Rea	0
urweb-mysql	31,529 16.7%	Ful	Ur	Ur/	Non	Lin	My	Lin	Mcr	Rea	0

This is reasonably real.

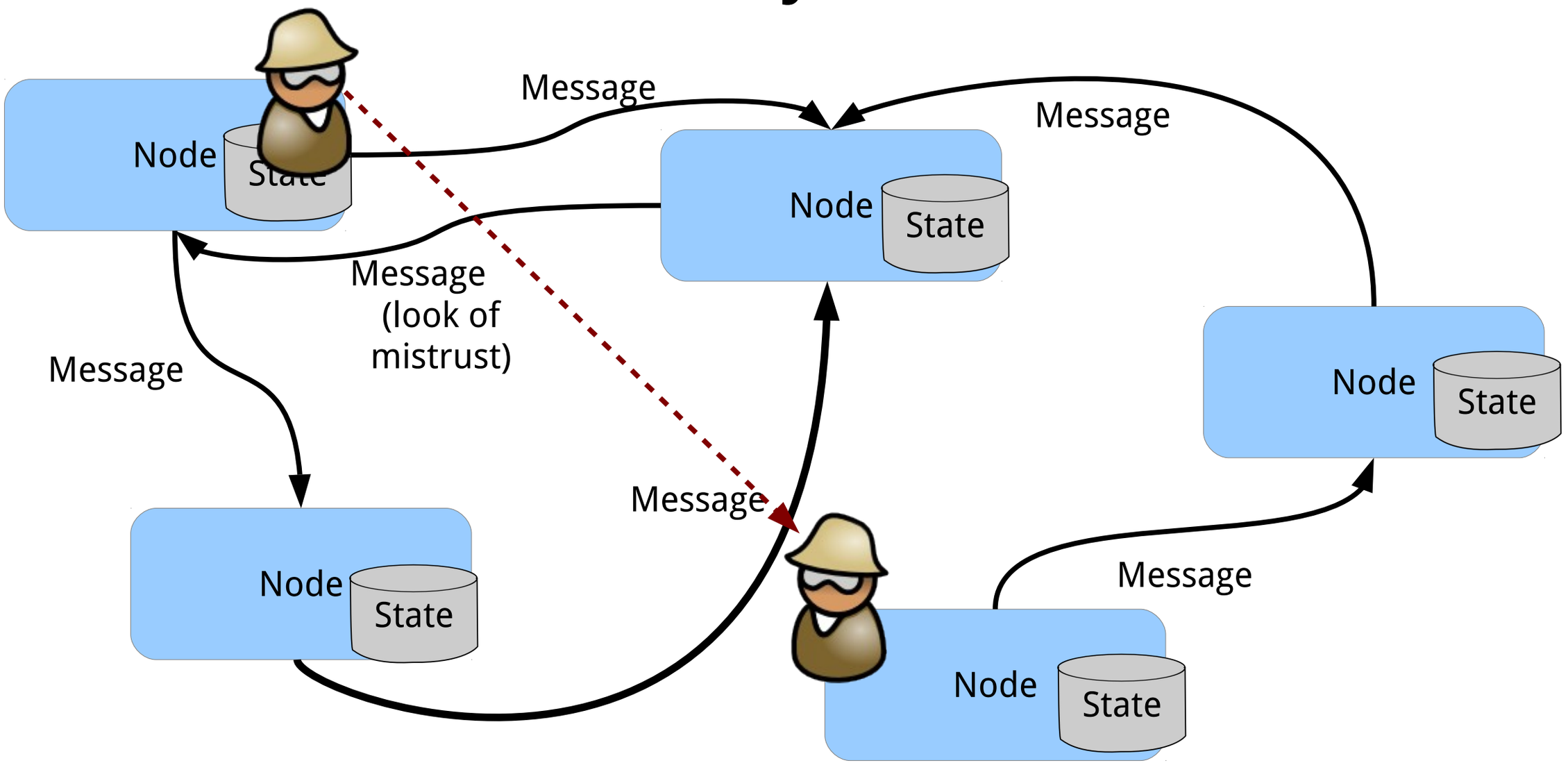
You can download it and build some nifty Web apps.

Open source at:
`http://www.impredicative.com/ur/`

Bonus talk content:

1) Background: a general model for programming distributed applications
2) Background: the mess that is today's mainstream Web development techniques
3) Ur/Web's simpler model for programming Web apps, with 2 big ideas:
   a) Encapsulation that crosses nodes of a distributed system
   b) A simple concurrency model for distributed systems
4) Code demo

Distributed Systems (Hard)



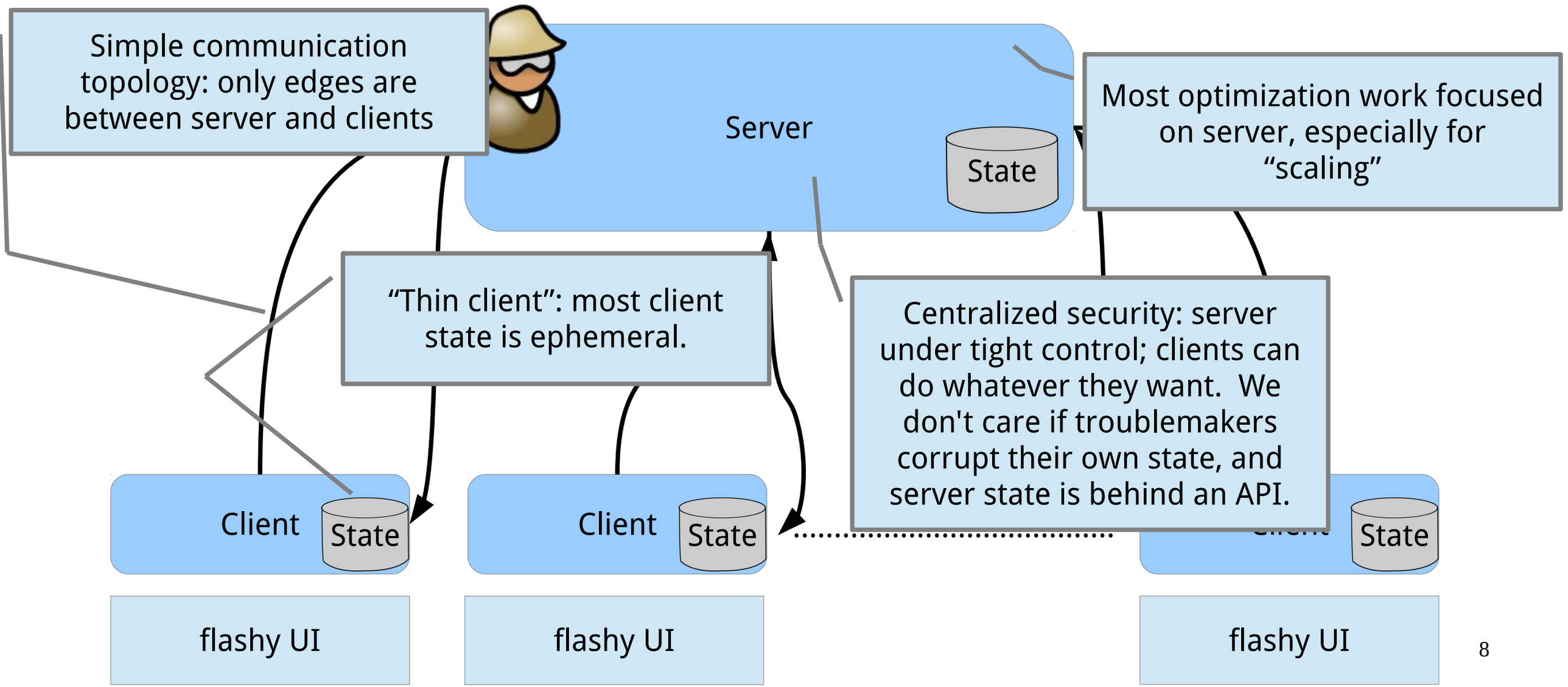
Why Distributed Systems?

- Physics forces distribution in space to scale performance.
- Mutually distrusting users controlling distinct resources

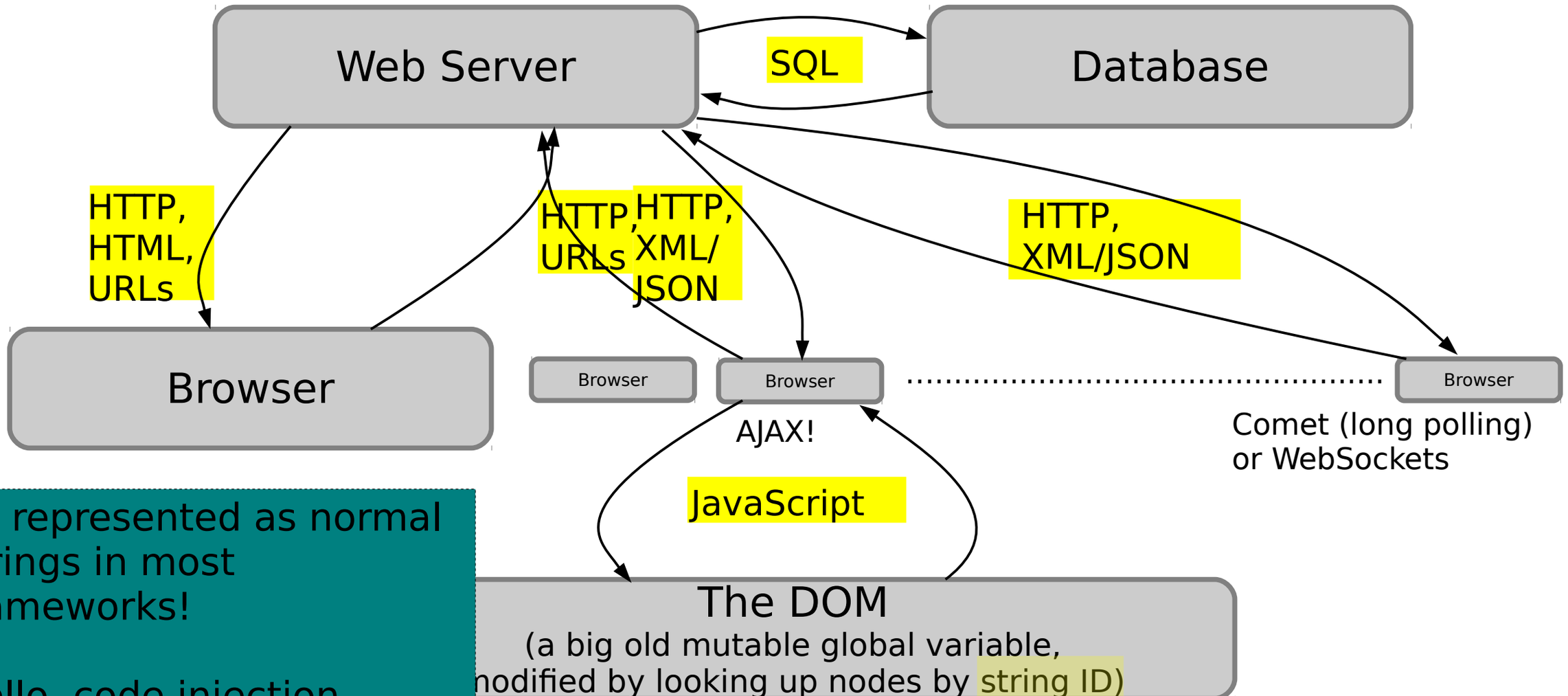
Challenges:

- Mutable state
- Concurrency
- Security

The Restricted Model of Many Web Apps



What Web programmers expect today

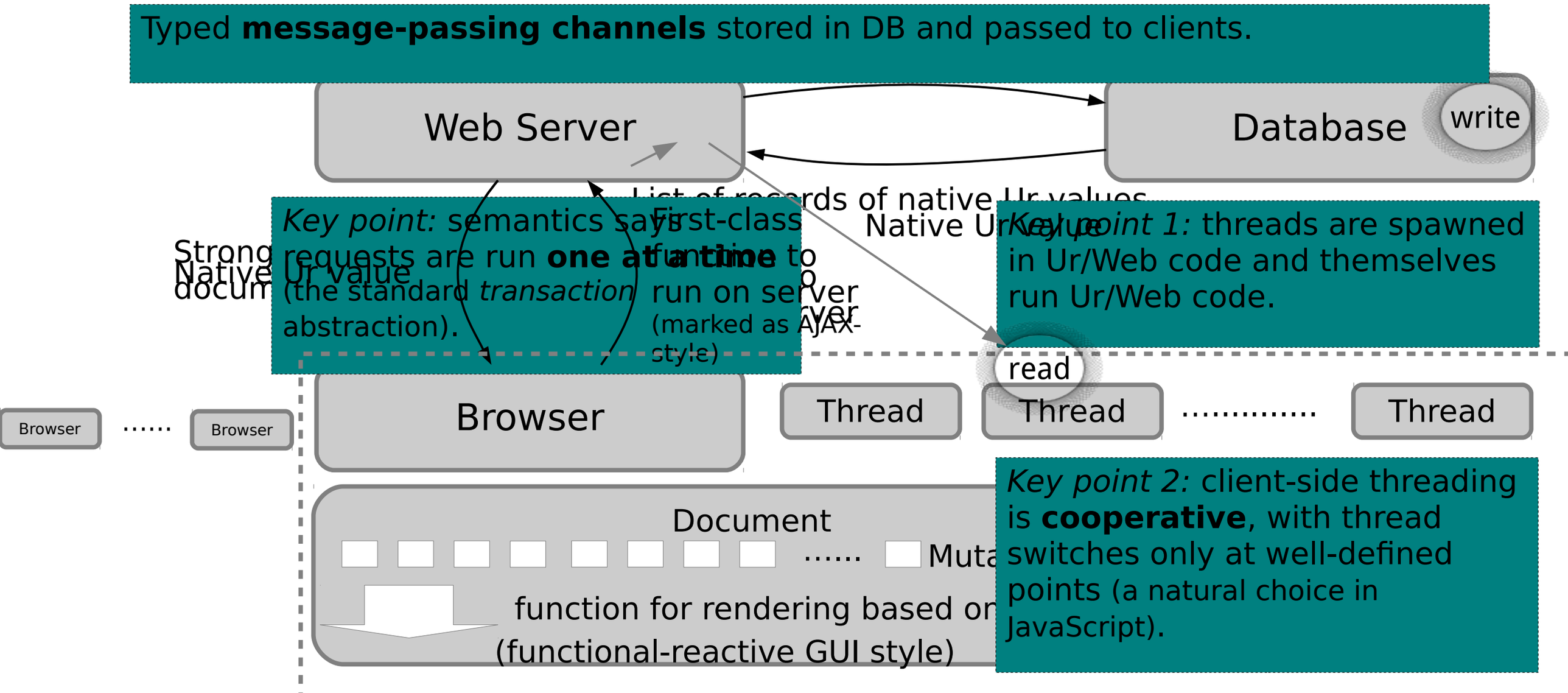


All represented as normal strings in most frameworks!

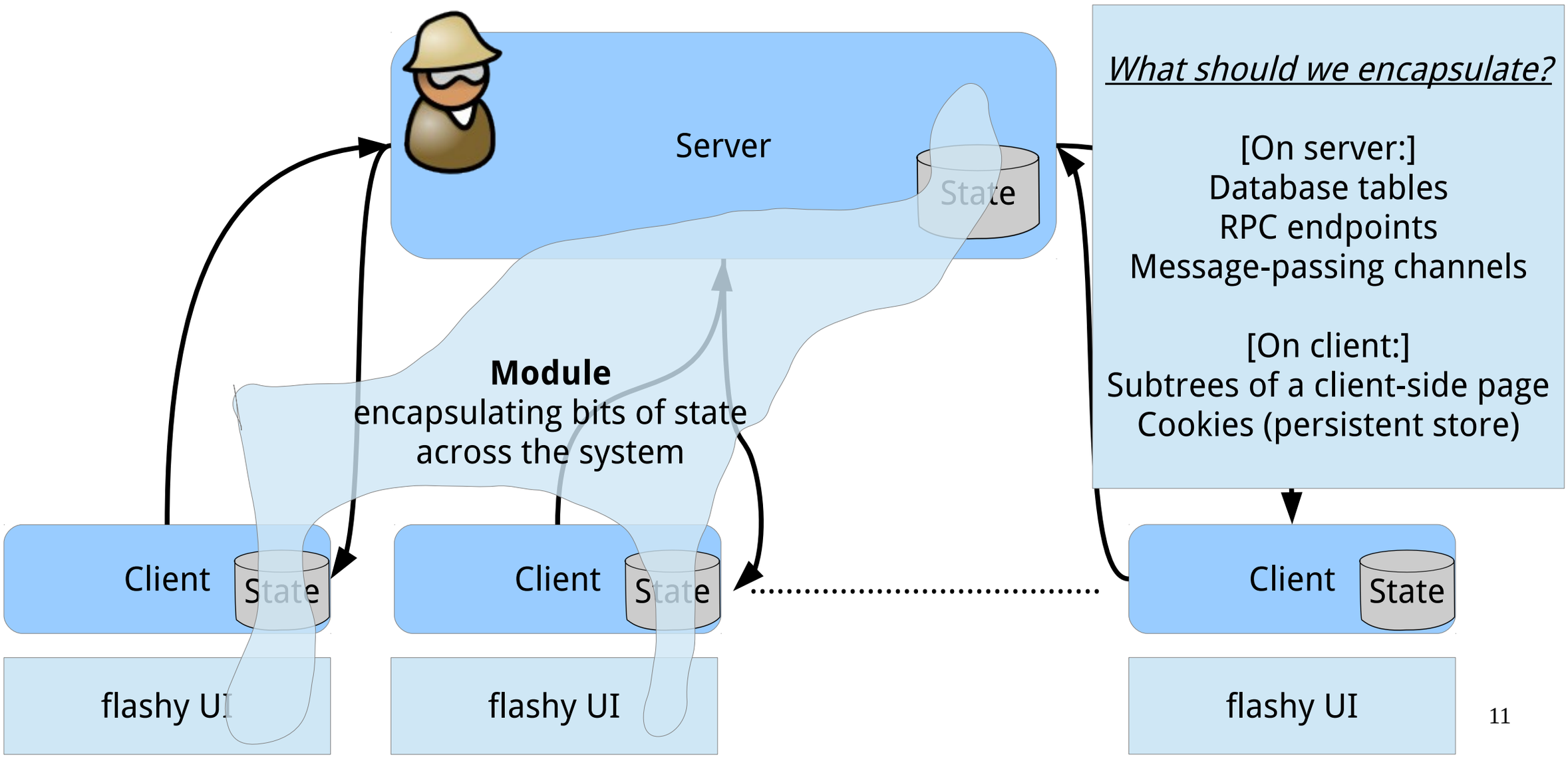
Hello, code injection attacks!

The Ur/Web model

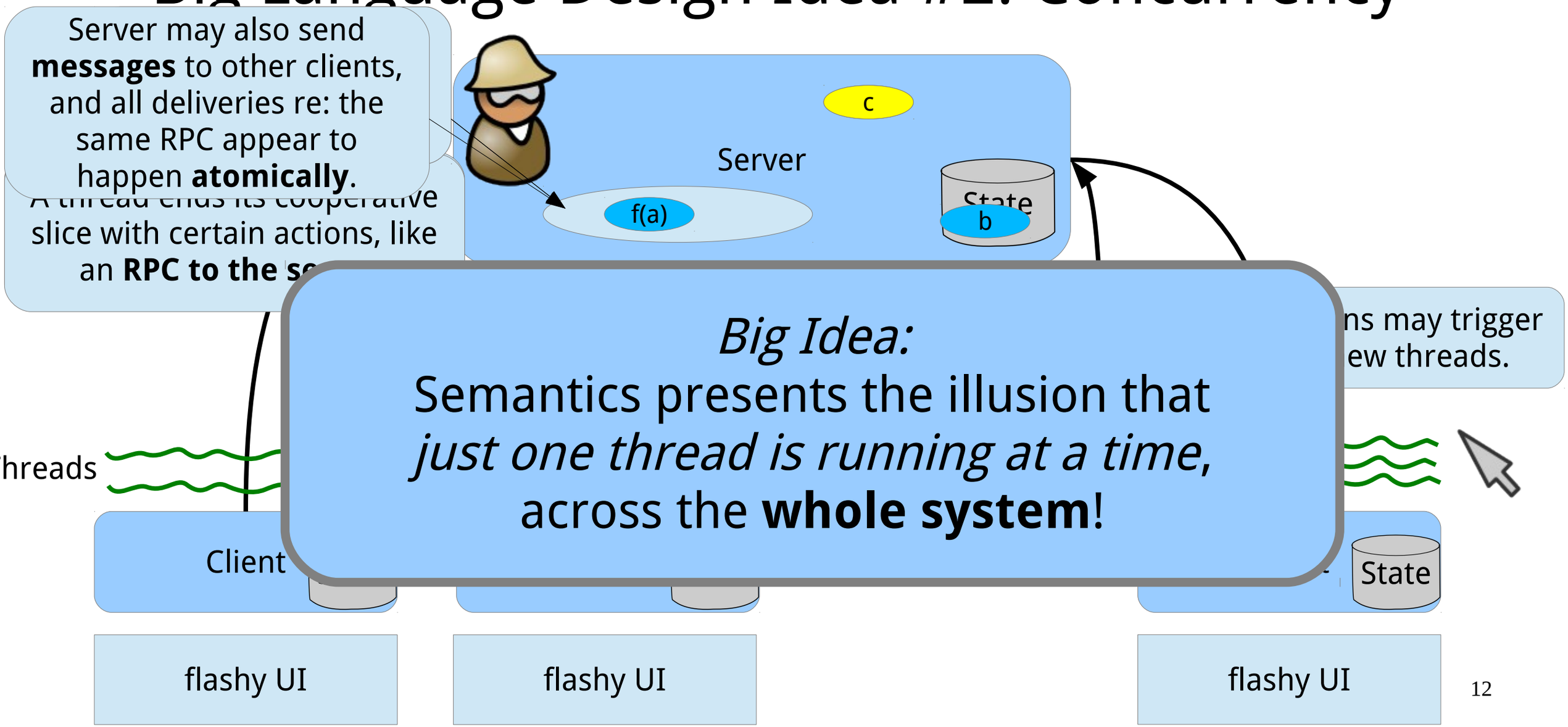
An application is written entirely in Ur/Web source code, exposing this view:



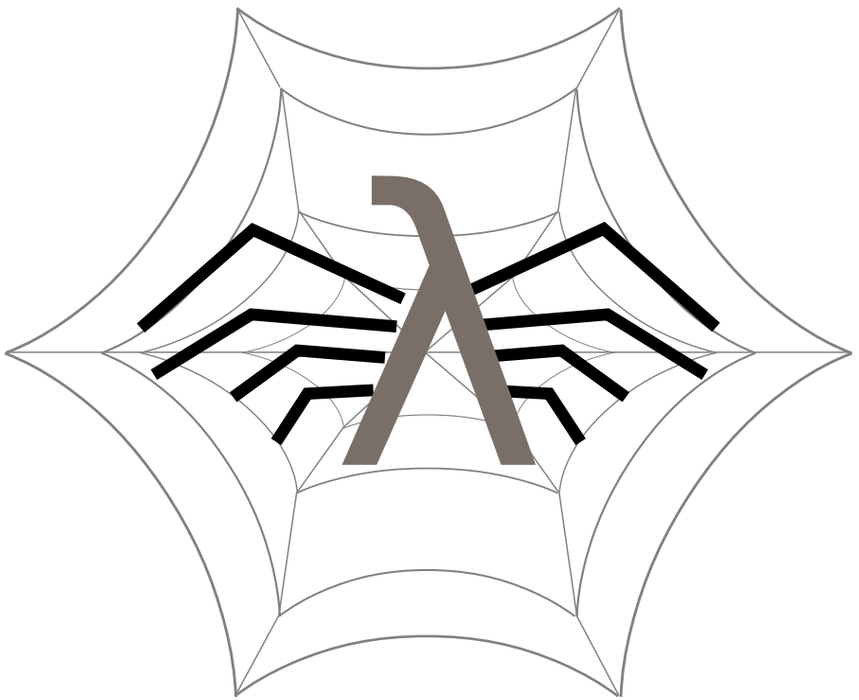
Big Language Design Idea #1: Encapsulation



Big Language Design Idea #2: Concurrency



Demo time!



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