The fog of SPA

Seven hard-won lessons for developing SPAs at scale

Single Page Web Applications
http://manning.com/mikowski

The fog of war

What "**the fog of war**" means is: war is so complex it's beyond the ability of the human mind to comprehend all the variables. Our judgment, our understanding, are not adequate. **And we kill people unnecessarily.**

— Robert Strange McNamara
"The Fog of War," 2003

The fog of SPA

What "**the fog of SPA**" means is: we can unwittlingly make SPA development so complex it's beyond the ability of the human mind to comprehend all the variables. Our judgment, our understanding, are not adequate. **And we kill projects unnecessarily.**

— me

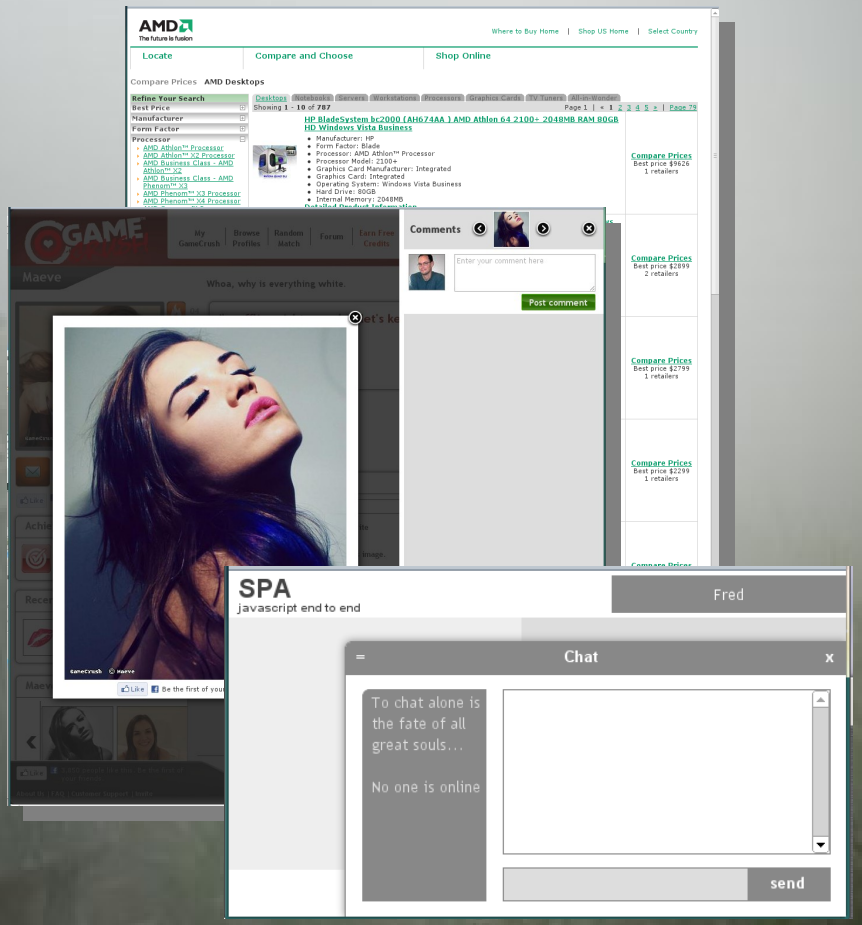
My goal today

break through the fog

- Minimize complexity
- Maximize effectiveness

A bit about SPAs

- SPAs are web applications that don't reload during a user session
- Increasingly popular, as users are now expecting desktop-like behavior
- Flash games, Java office suites, Javascript calculators have been around for a long time
- We are considering **Native** JavaScript SPAs here

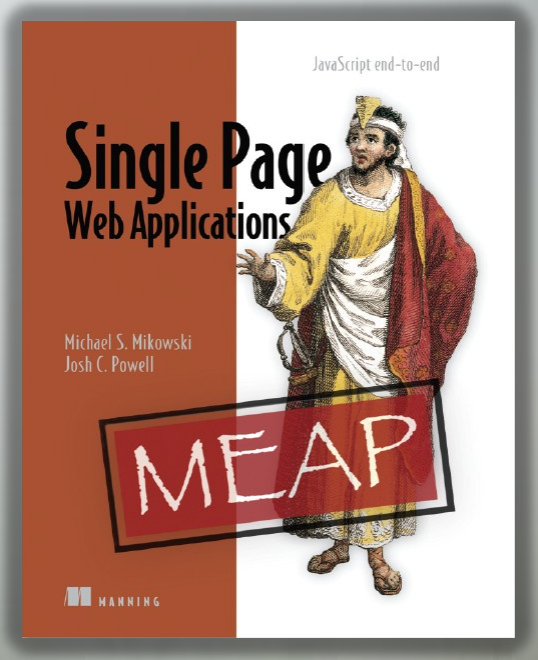


A bit more about SPAs

- Business logic: **Server** → **Browser**
- JS coding at a scale an order of magnitude greater than a traditional websites (100k lines)
- One SPA may require many developers
- **Conventions and discipline previously reserved for server-side development becomes a must for working at this scale**

A bit about me

- **Single Page Web Applications** – JavaScript end-to-end
- **UI Architect** at SnapLogic, team of 5
- Developer on **5 production SPAs** since 2006, Architect on all but one
- Previous back-end development manager on **HP+HA mod_perl clusters** (~2B web transactions per week)
- First SPA: European and US AMD "**wheretobuy.amd.com**," rel. 2007



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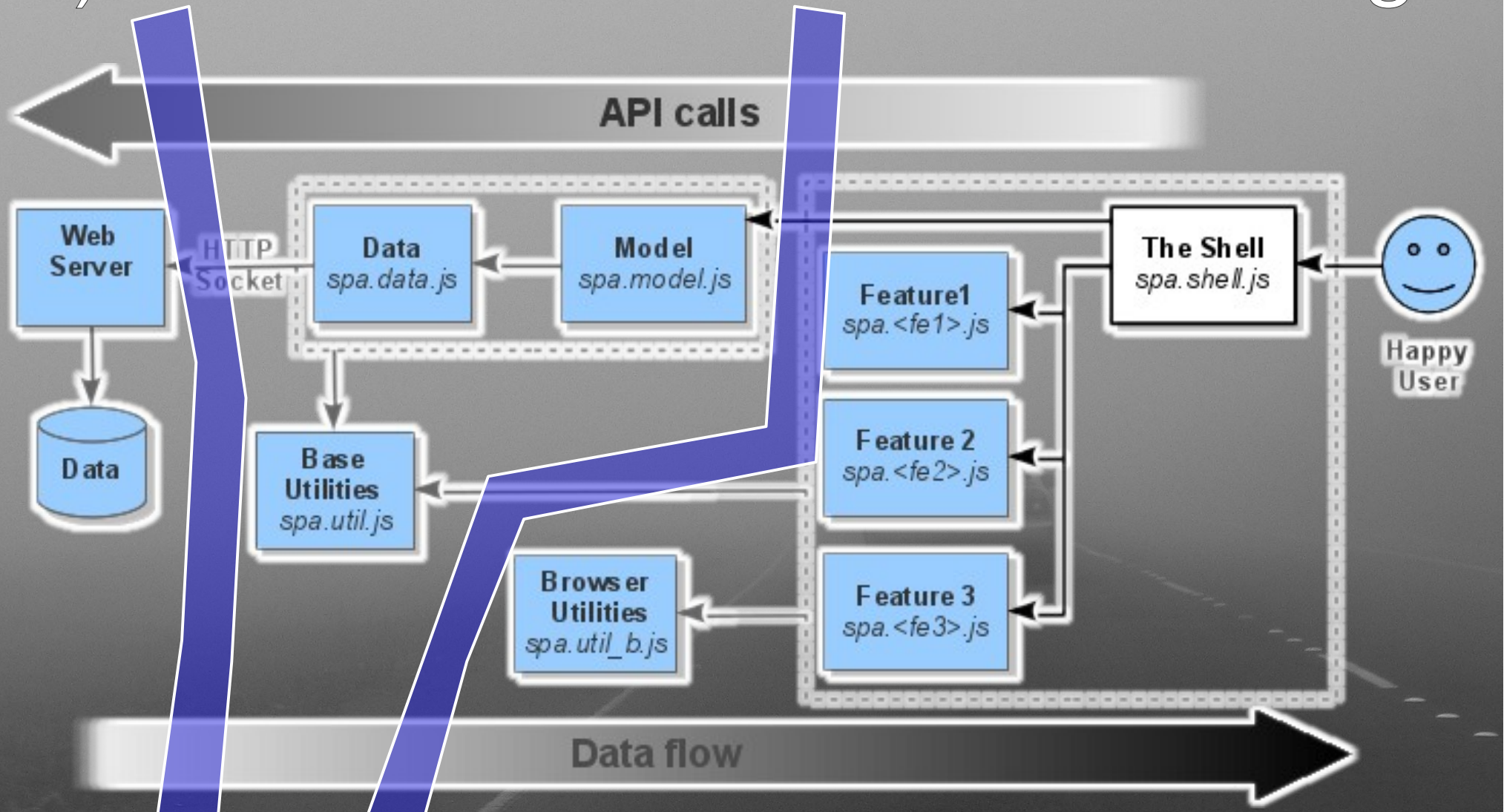
Also see LinkedIn

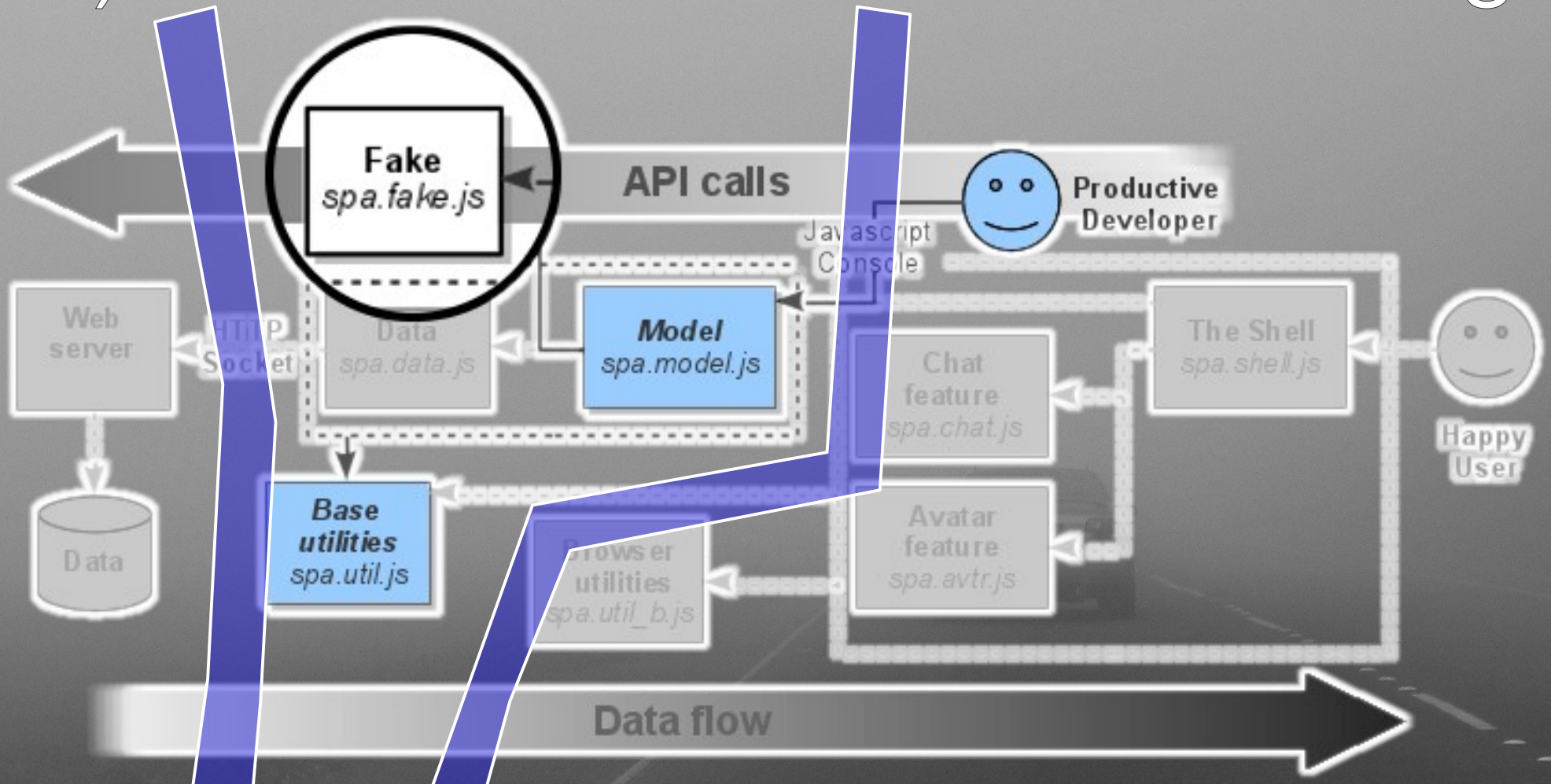
Seven lessons of SPA dev

1) Architect for workflow and testing
2) Design third-party style modules
3) Start at the front
4) Plan for many SPAs
5) Use a common language
6) Test the client back-end
7) Avoid shiny objects

1) Architect for workflow + testing



1) Architect for workflow + testing



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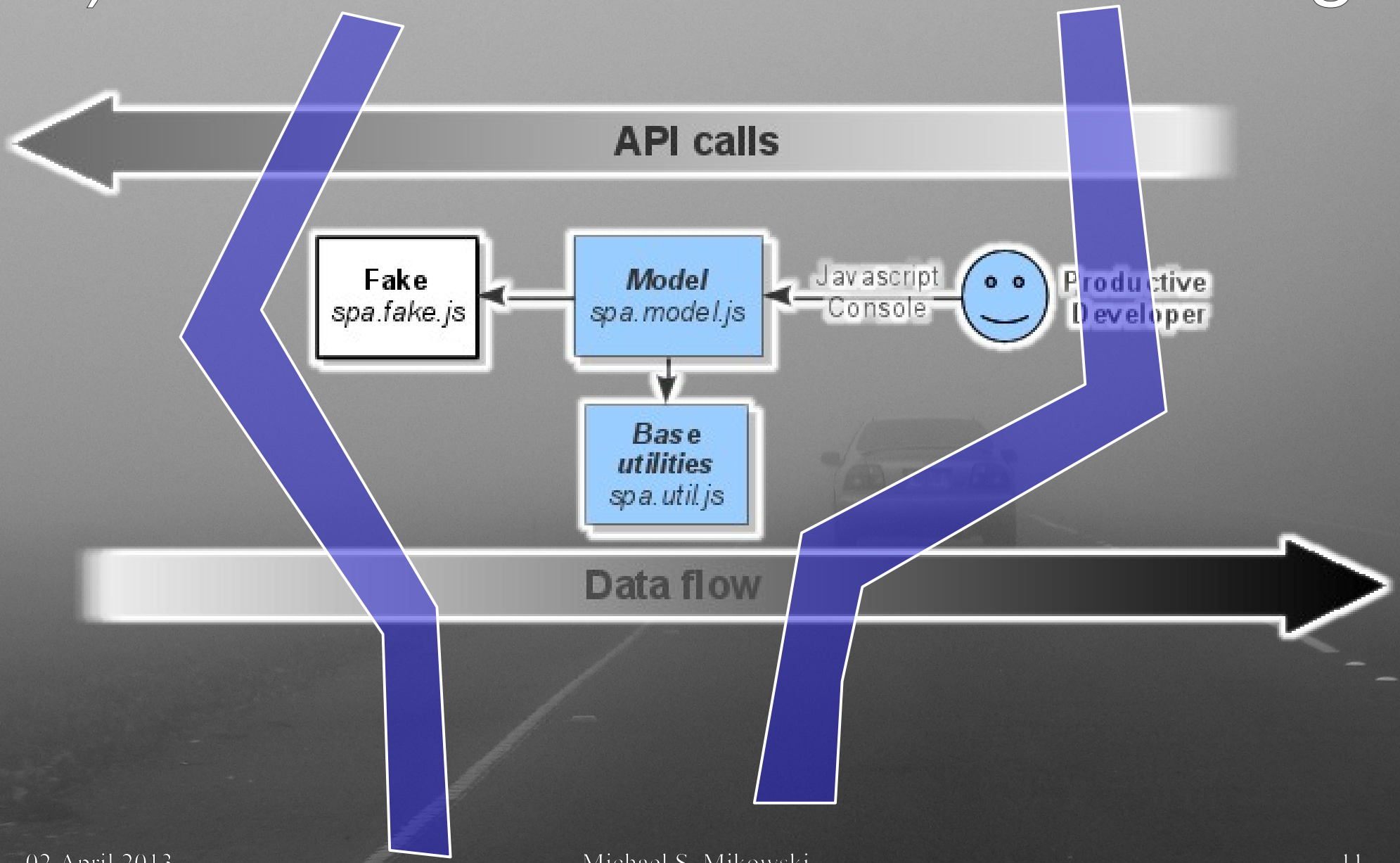


2) Design third-party style modules

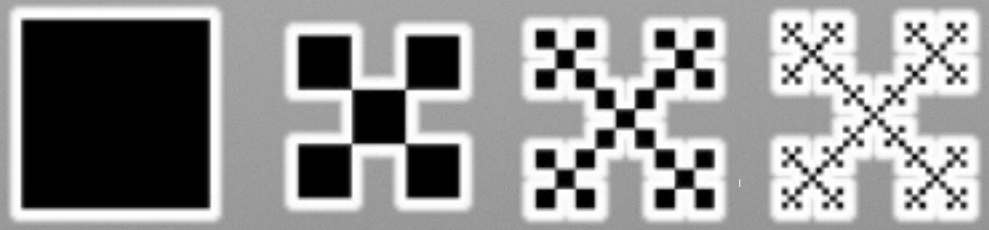
- **Add high-quality features at low cost**
- Examples:
  - **comments** (Disquss or Livefyre)
  - **advertising** (DoubleClick or ValueClick)
  - **analytics** (Google or Overture)
  - **sharing** (AddThis or ShareThis)
  - **social services** (Facebook “Like” or Google “+1”)

2) Design third-party style modules

- How popular are third-party modules?
- Techcrunch – a snapshot
  - **At least 16** web services
  - **5** analytic services alone
  - A whopping **53** script tags

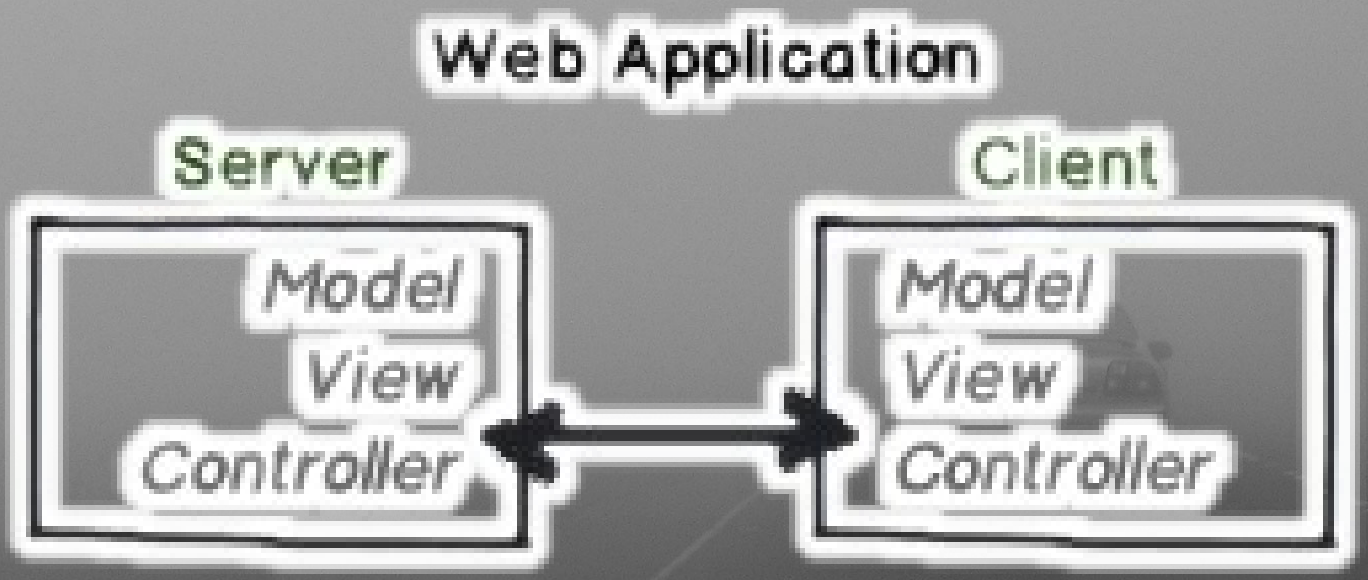
2) Design third-party style modules

Fractal MVC



2) Design third-party style modules

Fractal MVC



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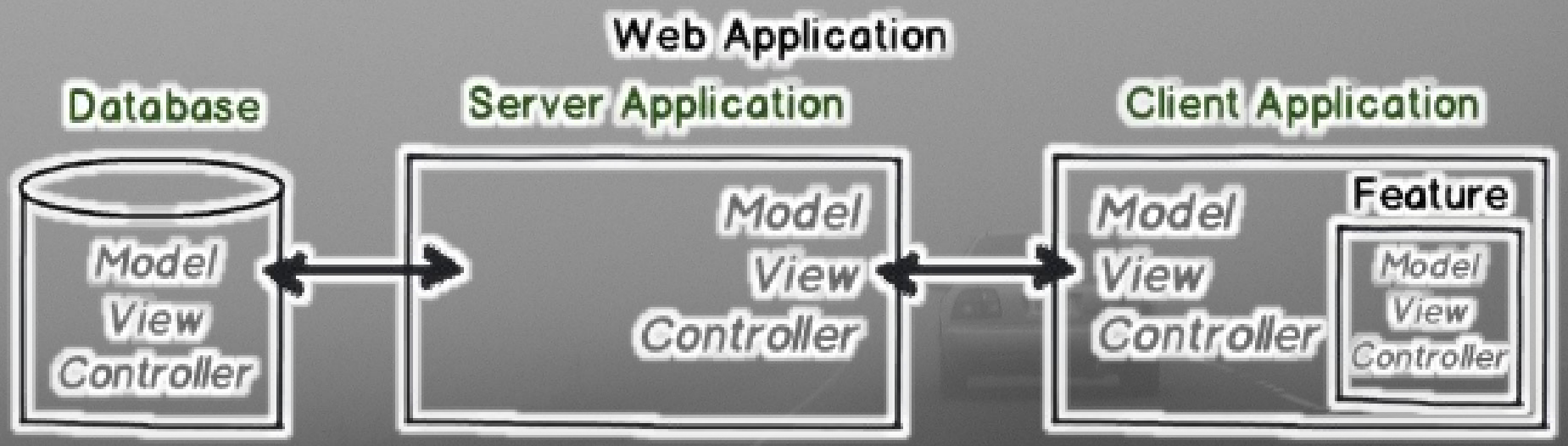

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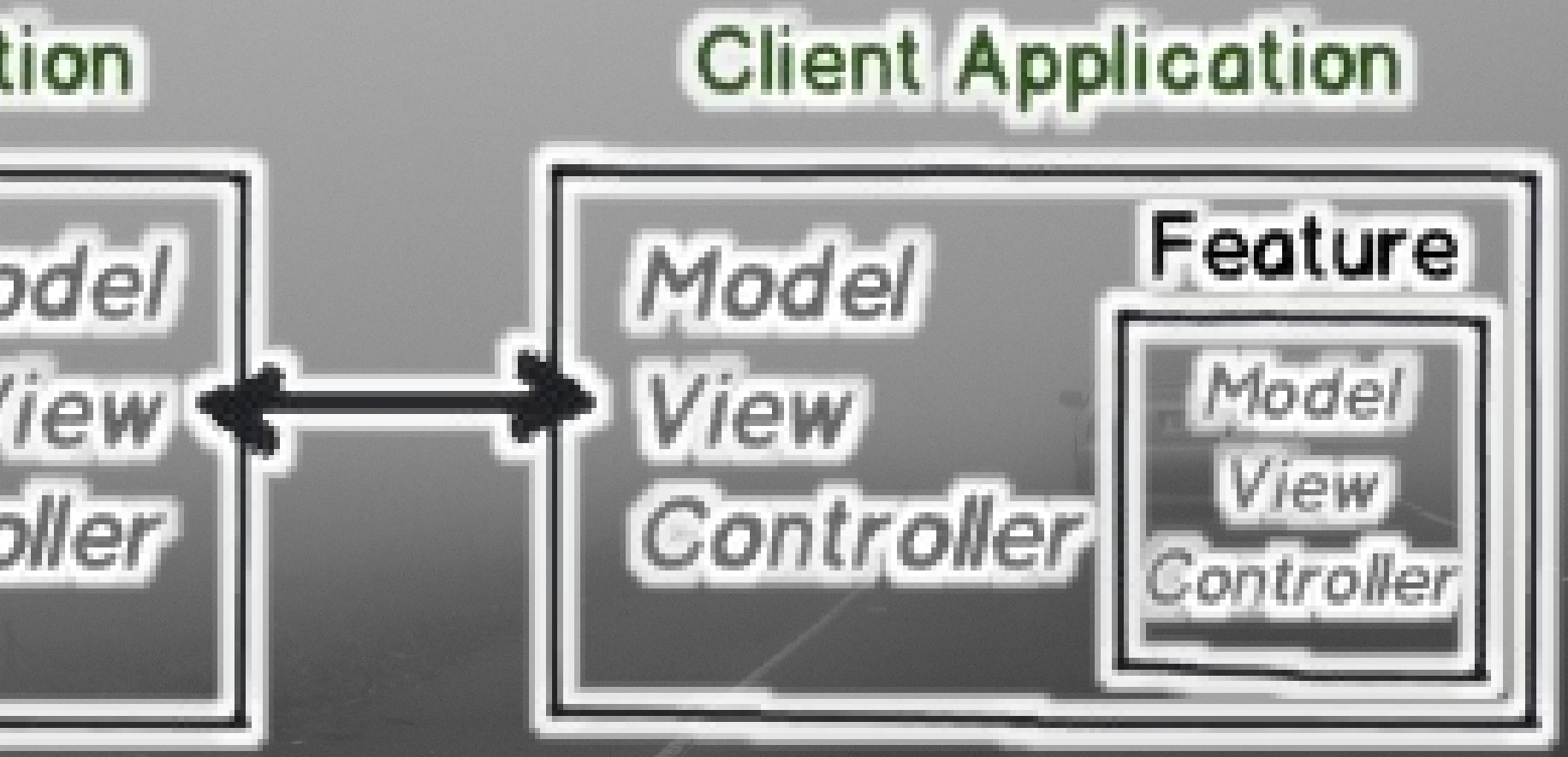
Fractal MVC

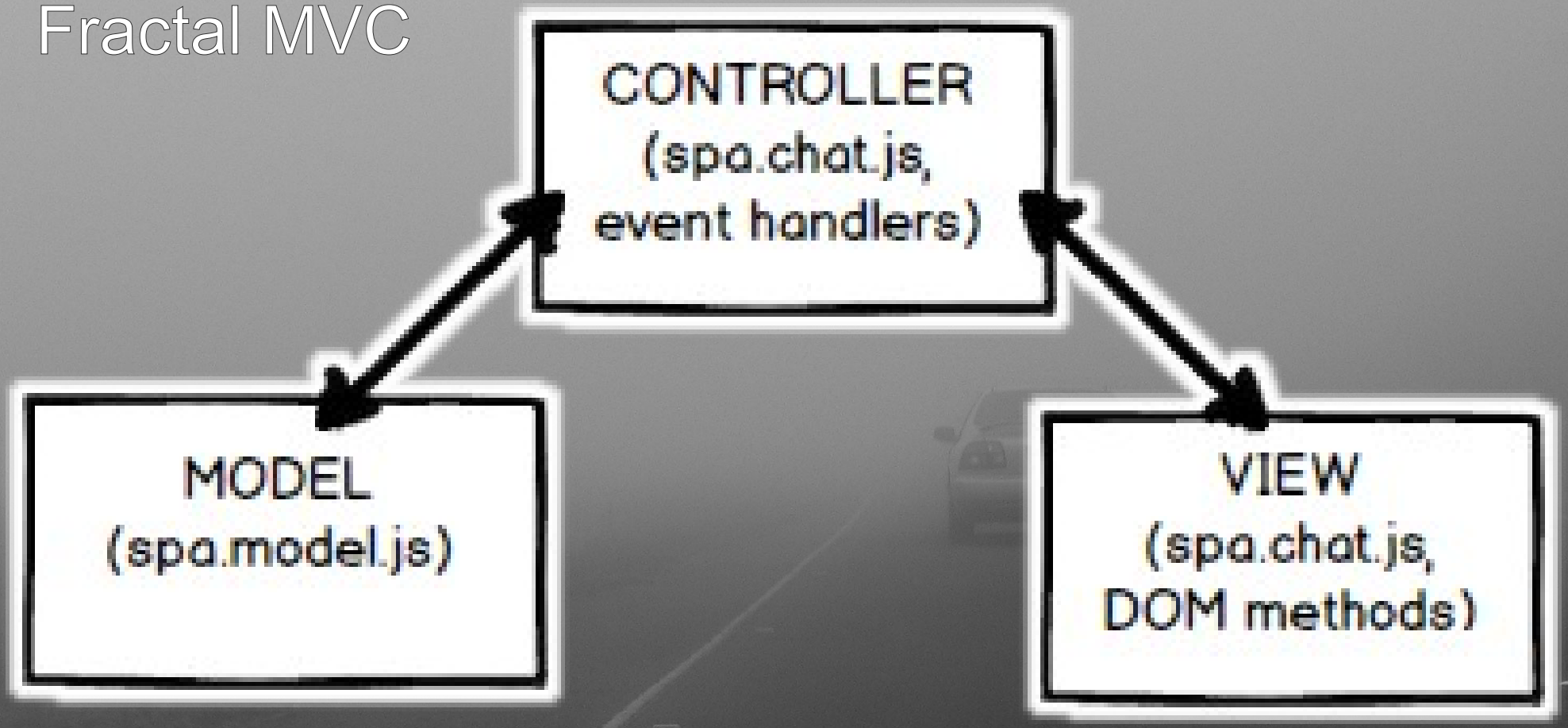


2) Design third-party style modules

- A feature module provides a **well-defined and scoped** capability to the applications
- No cross talk between modules
- **Benefit**: Third-party and your modules are interchangable
- **Benefit:** Reusable across projects
- **Benefit:** Focus on core and use third-party modules, replace as resources allow
- **Benefit:** A great way to divide work

2) Design third-party style modules

Fractal MVC



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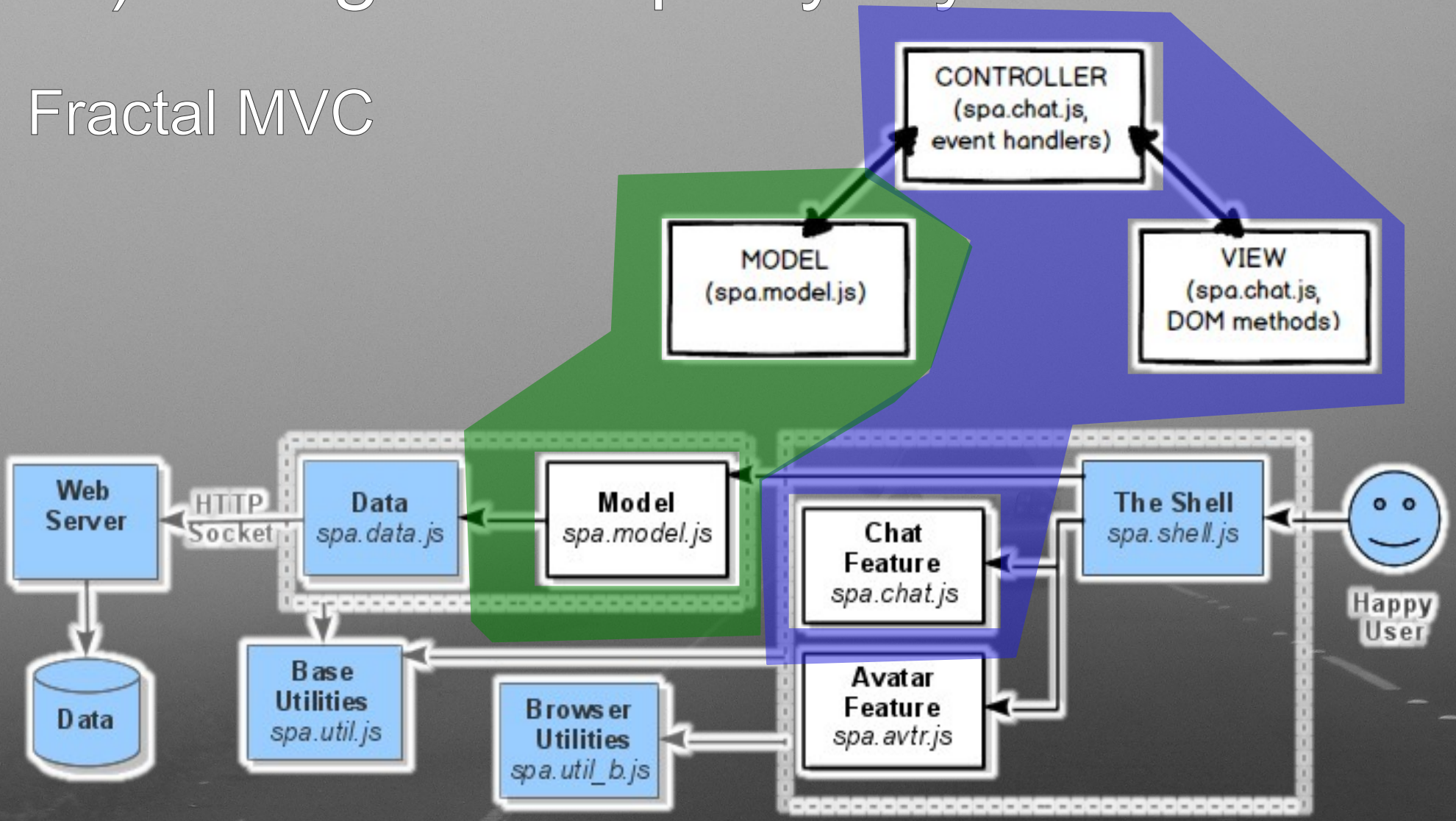
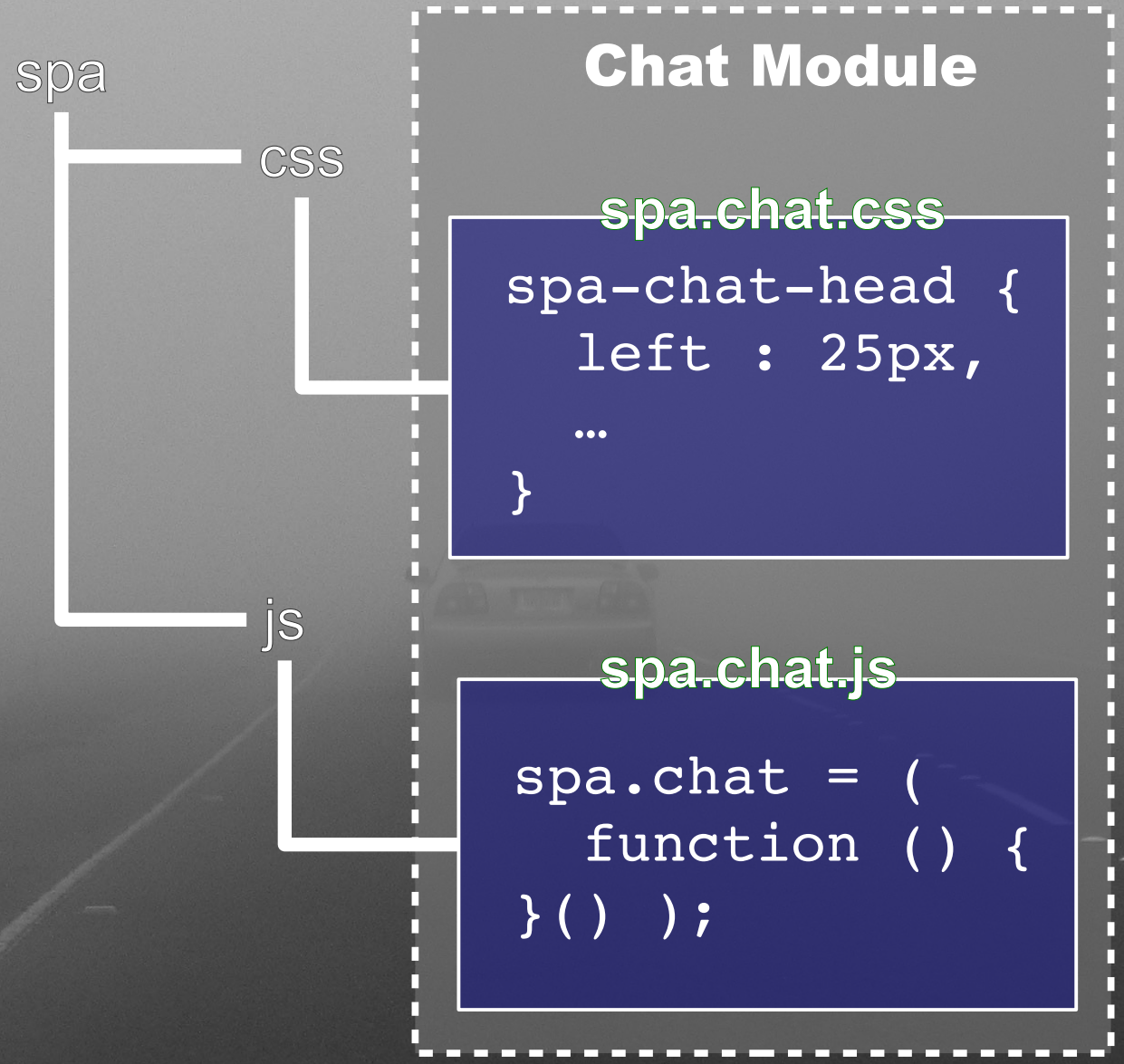
Fractal MVC



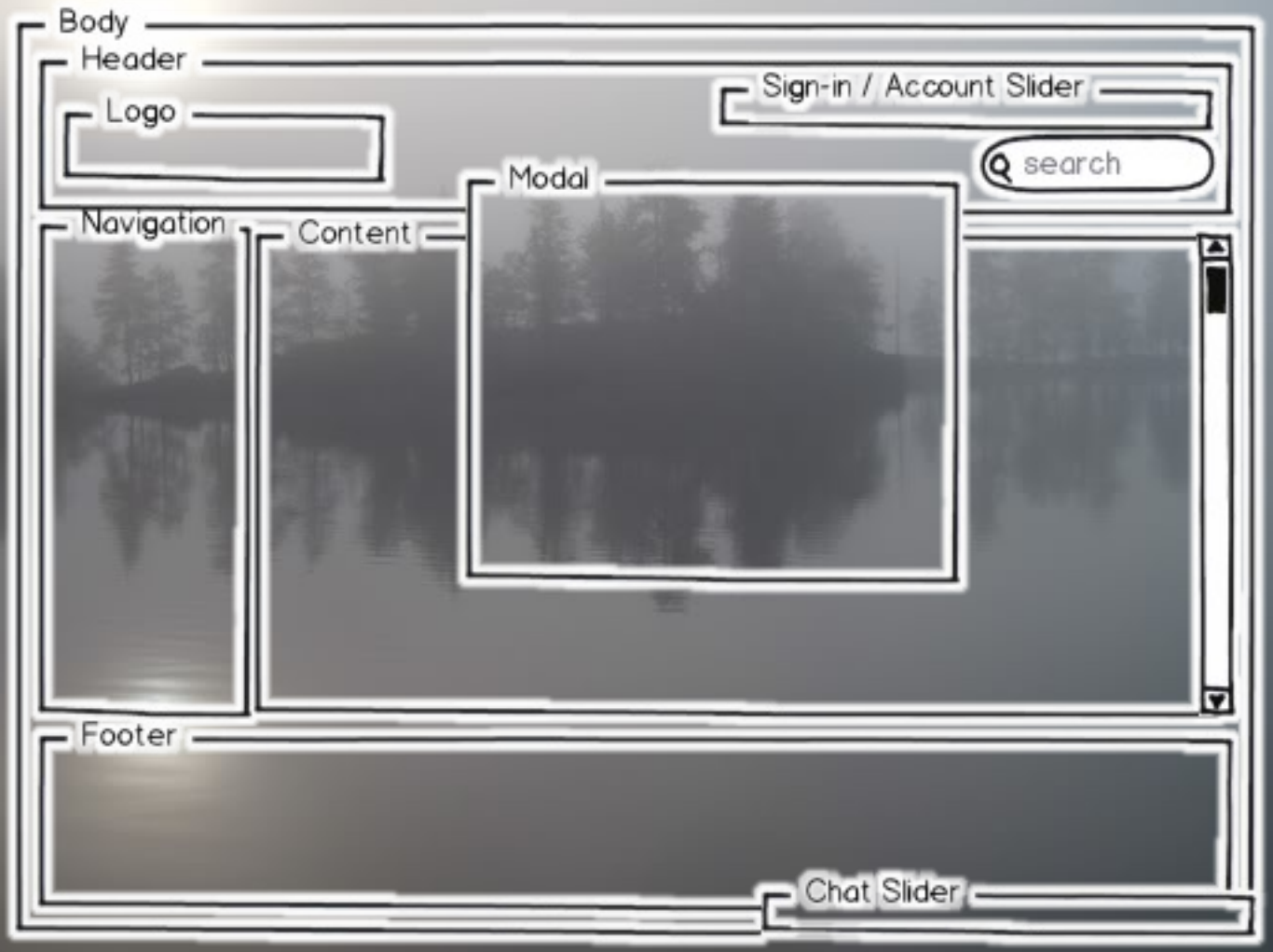
2) Design third-party style modules

- Namespace
  - JavaScript
  - CSS
  - Files
- Our spa should 'use' only two global variables 1) our root namespace, and 2) our common namespace



3) Start at the front

Design layout first



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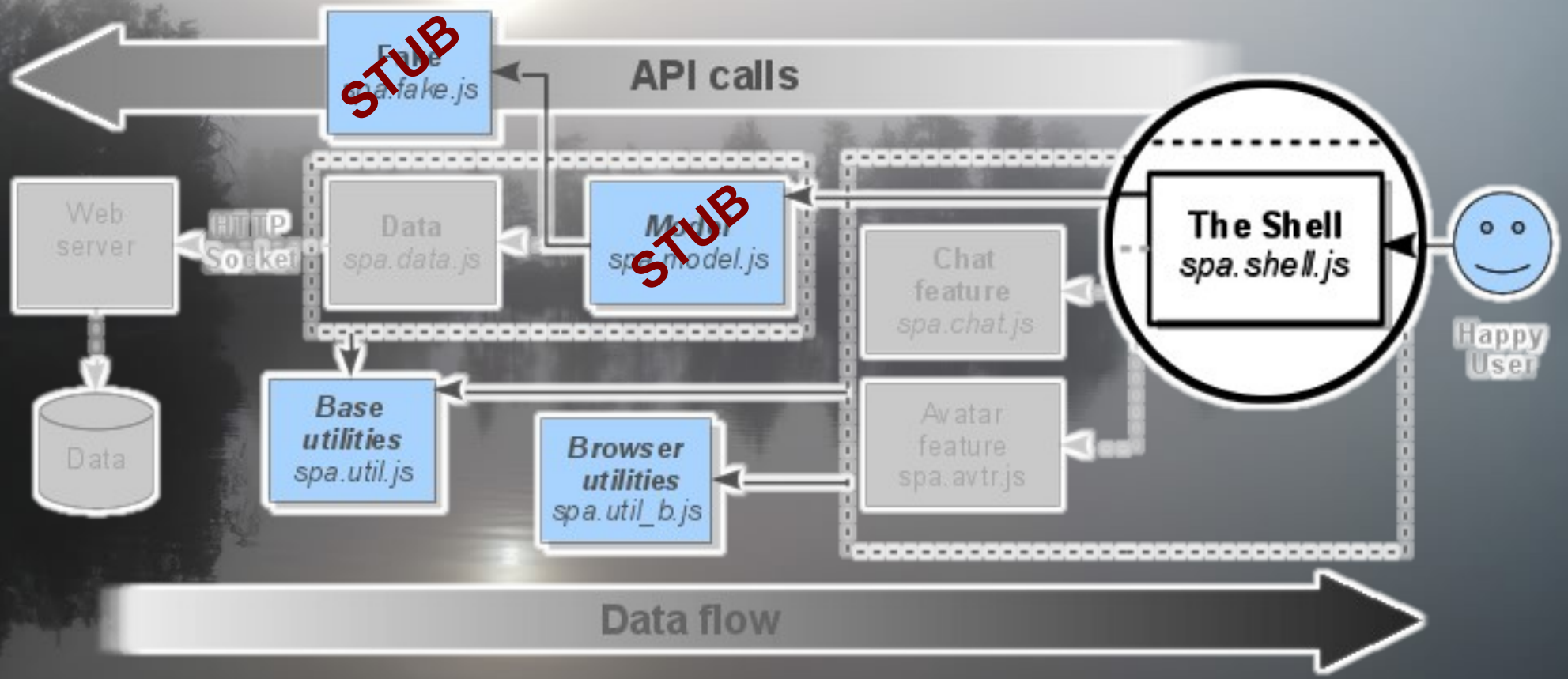
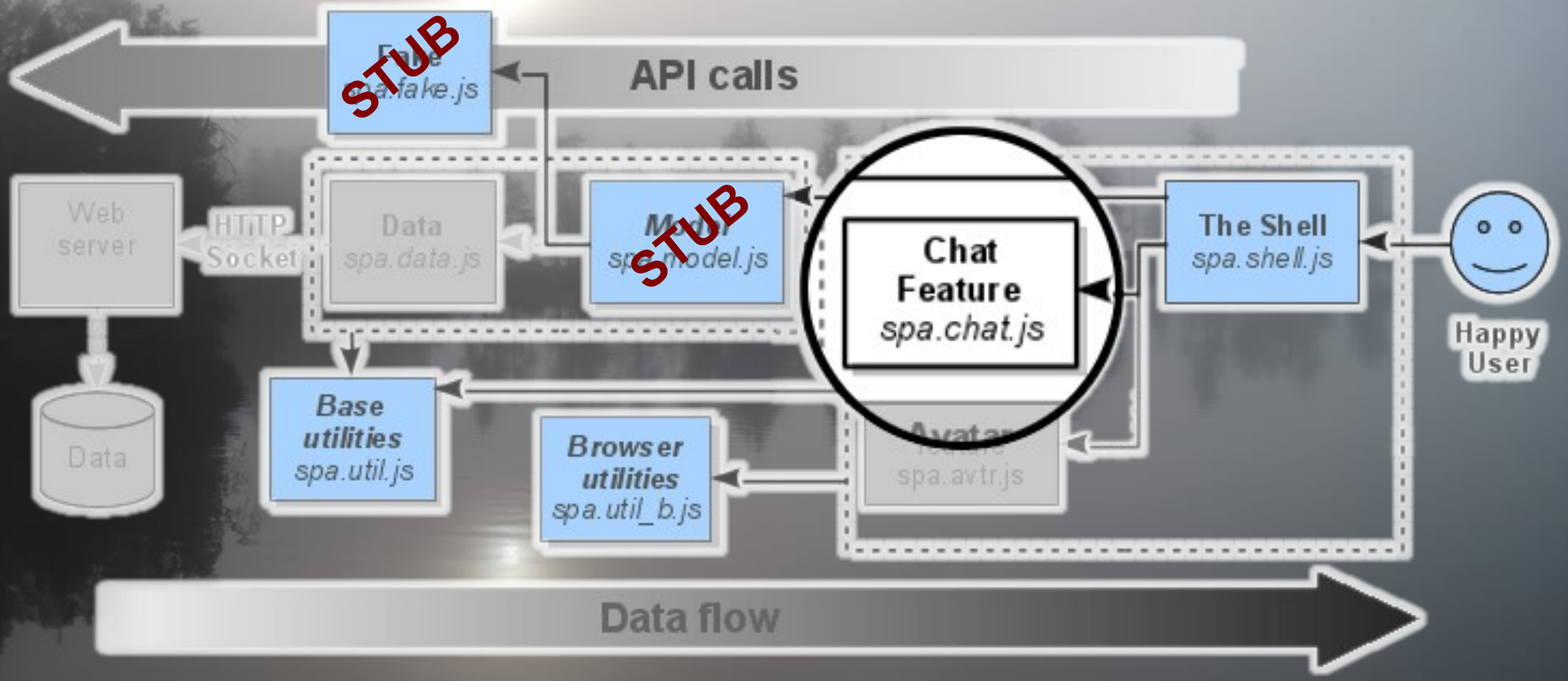


3) Start at the front

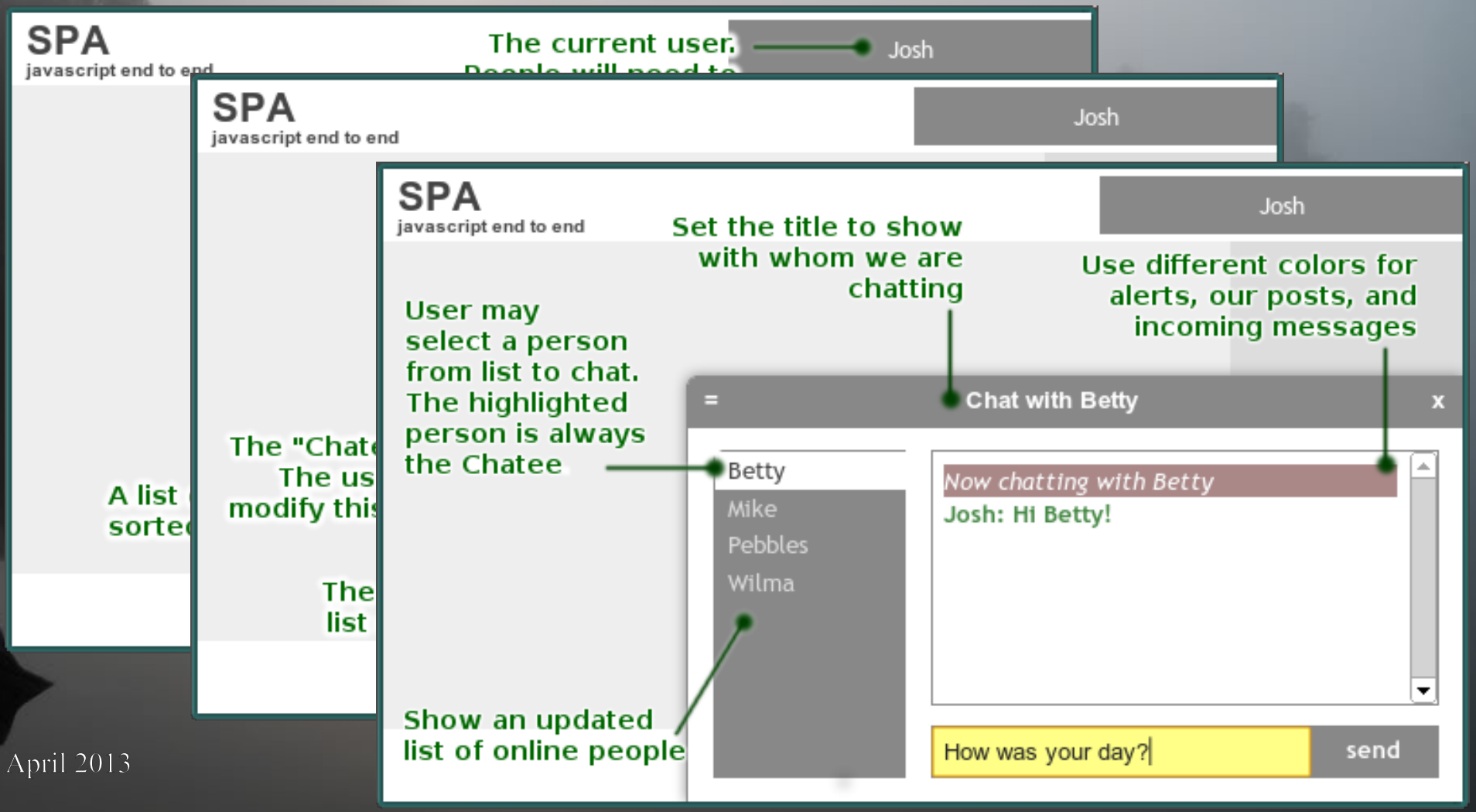
- Now start the Shell:
- “Master controller”
- Coordinates feature modules
- Handles browse-wide interfaces like...
  - URL anchor (“hash fragment”)
  - Feature containers
  - Cookies

3) Start at the front



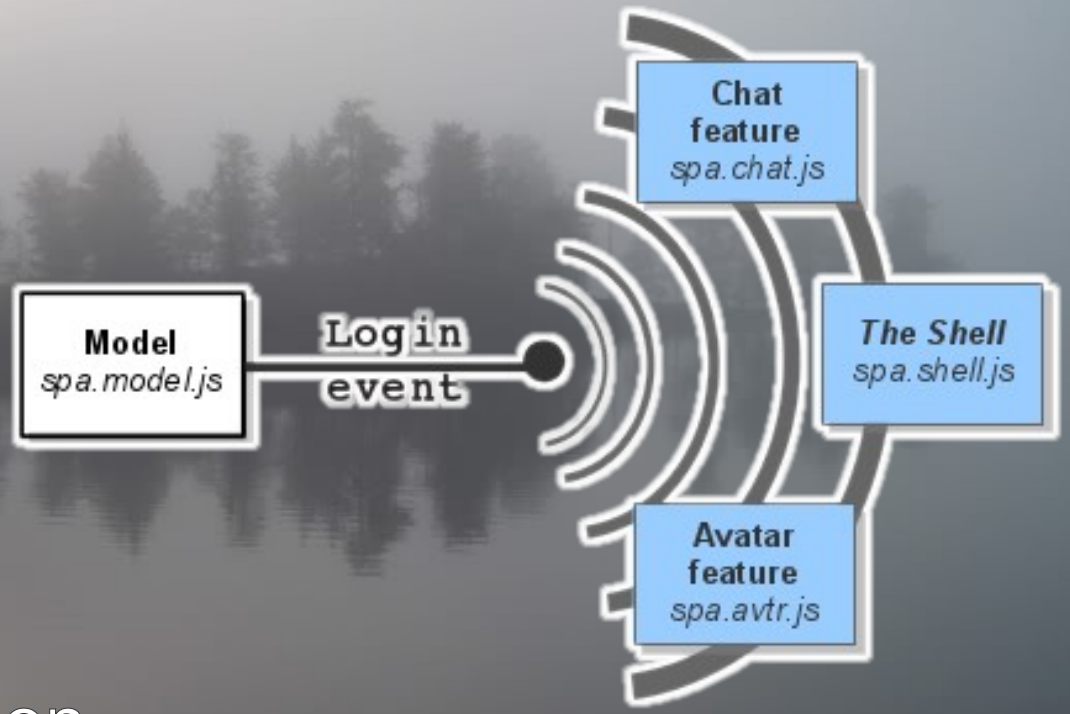
3) Start at the front

Now design your **feature module**



3) Start at the front

- Write the API first
- No cross-talk between modules
- Use events to minimize callbacks
- Use promises to minimize callbacks, dependencies
- Use argument checks on all major APIs, prefer named arguments



3) Start at the front

- API Doc Format
- Overview
- Methods
  - Synchronous calls
  - Minimize callbacks
- Events
  - Asynchronous data
  - Often results from external input
  - Include data with events

API

4) Plan for many SPAs

- Most “web application” sites are actually a collection of a 2 or more SPAs
- Example: AMD, one SPA per computer type
- Decide where to split the capabilities
- Plan on common capabilities and look and feel per site

4) Plan for many SPAs

- spa
  - css
    - common
    - admin
    - designer
    - commerce
  - js
    - common
    - admin
    - designer
    - commerce
  - img
    - common...

We have selected 'sp' as our “common” namespace

Include common libraries before the SPA specific libraries

- Standard utilities (sp.util)
- Browser utilities (sp.util_b)
- Argument checking (sp.arg)
- Templating (sp.dust)

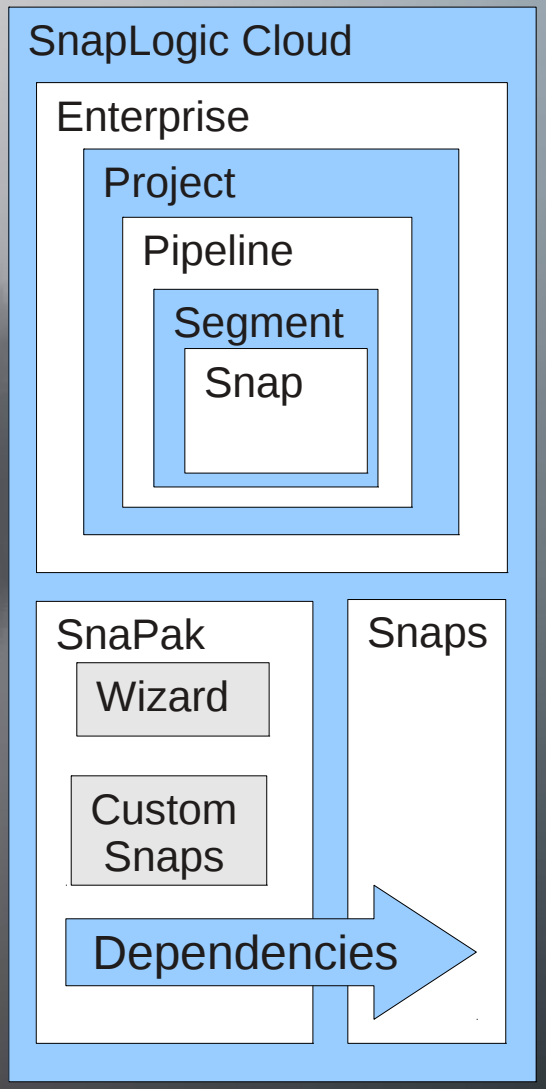
5) Use a common language

- Q. Why is Google developing Dart?
- A. The overhead of Java/JavaScript development is a serious drag on iterations

Multiple languages drain creativity and productivity

5) Use a common language

- Start with product design
- Define terms as early as possible
- It is best if marketing uses the same terms as product planners, developers, and sysops
- Write definitions for each
- Avoids miscommunication throughout the product
- As important as code standards



5) Use a common lanuguage

- Keep the languages **simple and few**
- Use **native** JavaScript and CSS
  - Use of a JS complier and CSS compiler are two additional steps that can go wrong
  - When you debug your application, you see CSS and JavaScript – so you need to know these really well
  - The best way to know CSS and JavaScript really well is to use them everyday
  - **We have found the tradeoffs aren't worth it**
- Do we want to test the application immediately or work through a 2-step compile each time?

5) Use a common language

- Name your variables **to indicate type**, or …
  - Use TypeScript?
  - Use Closure Compiler?
  - Use GWT?
  - Use Dart?
- **All of these** try to solve type discovery problems
- **Most variables never change type**; most are mistakes
- Polymorphic interfaces are almost always a bad idea
- If your function returns a string, always return a string. ***Throw an exception on error – don't return false!***

5) Use a common language

DataType	Indicator	Examples	Notes
Boolean	sw, is, has, do	is_used	***true*** or ***false***
String	name, text, title, type, key, string	user_name	Type and key indicate enum
Integer	int, count, i,j,k, index, length	list_length	Indicates intent; only Firefox uses type-inference
Number	num,n,ratio	scale_ratio	Always signed double fp
Regex	regex	regex_match	Technically an object
Array	list	user_list	Ordered list
Hash (Mapt)	map	user_map	Technically an object
Object	(no indicator)	house_boat	Traditional object with methods
JQuery Obj	$	$tabs	Technically an object
Function	<verb>noun	make_dog	First class artifact
unknown	data	http_data	Unknown or polymorphic

5) Use a common languange

- Compare meaning in conventions ...

```
var make_house
  = curry_build_item({
    item_type : 'house'
  });
```

5) Use a common languange

Versus no convention:

```
// 'creator' is an object constructor we get by
// calling 'maker'. The first positional argmuent
// of 'maker' must be a string, and it directs
// the type of object constructor to be returned.
// 'maker' uses a closure to remember the type
// of object the returned function is to
// meant to create.
//
var creator = maker( 'house' );
```

Updates are a nightmare!

5) Use a common language

- **Share a common IDE**
  - We have found an IDE that is great as a result of a 4-day study
  - Sharing it reduces language barriers
  - Allows us to **share settings** in our GIT repository
  - Hosts a nice test framwork
  - Spend time evaluating the best IDE for your use
- **Use a code review tool**
  - A great way to keep team members in sync
  - Prevent everyone from getting too far “out there”

6) Test the client backend

- Remember an SPA is a **client** not just the UI
- **JSLint** is invaluable in spotting common, stupid errors. Make it part of your commit hook
- **All public APIs** should use common argument checking and named arguments
- The Model and Fake data provide an excellent foundation for **TDD** using known data
- **Regression tests!**

7) Avoid shiny objects

- **Dangling beads** and accidents
- **Candidate example** (avoiding requirements)
- The moral: Minimize tool kits and languages
  - Add toolkits only after **careful consideration.** Can we do this with our existing tools?
  - Can we test without numerous build steps or multiple layers of abstraction?
  - **avoid** unmanagable complexity
- Backbone event example
- Simplify, simplify, simplify.

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