FIFA Ultimate Team at REST

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Overview

* FIFA Ultimate Team
* What is REST?
* REST Benefits and Features
* Migrating FUT to REST
* Benefits of a RESTful FUT
* REST beyond FUT
* Advice for becoming RESTful

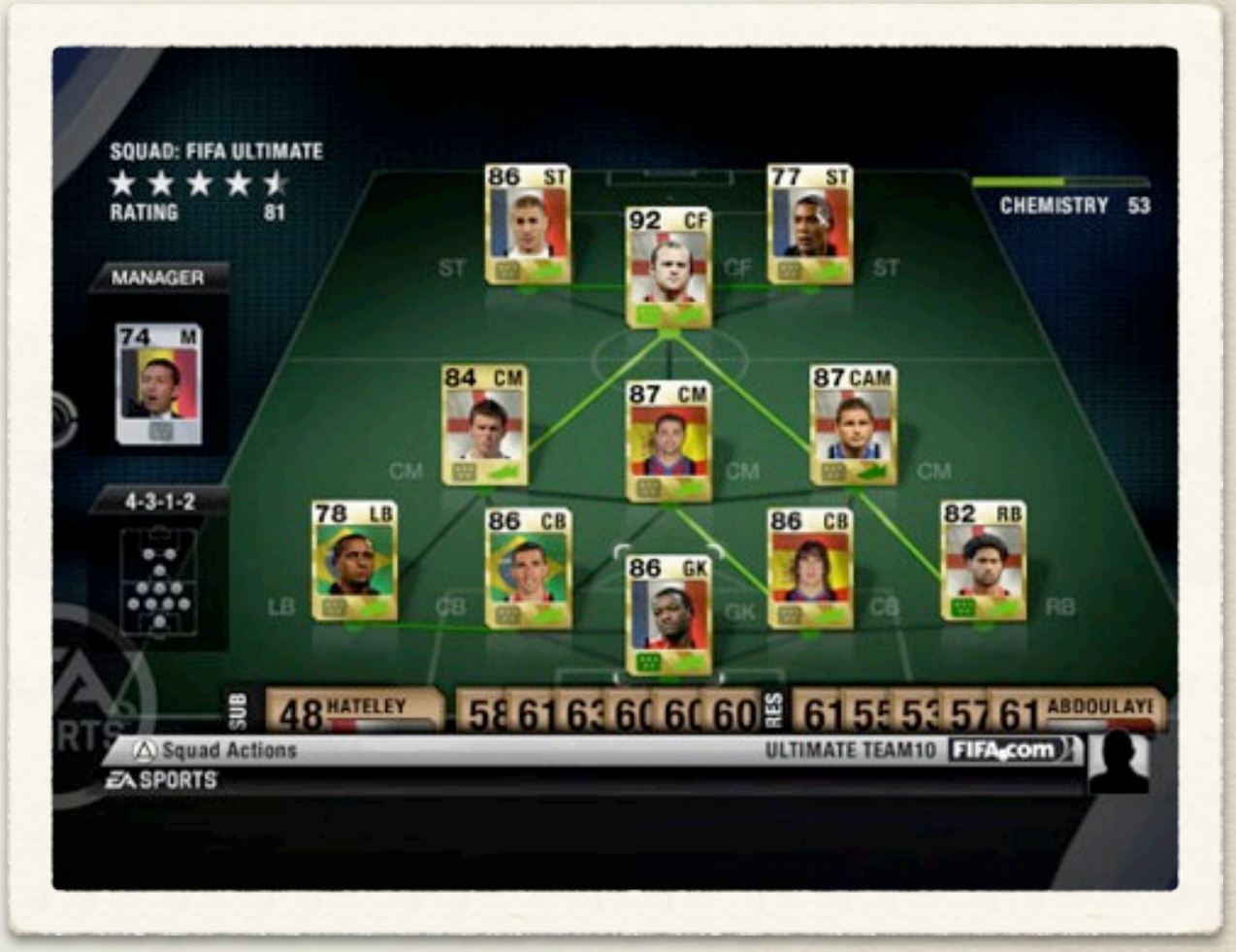
FIFA Ultimate Team

An Unexpected Game

- Break some new ground, alternative to a licensed title
- Card trading game mode in Champions League 07
- Expand the feature set, put it online, sell as add-on
- New product idea: prepared to break even

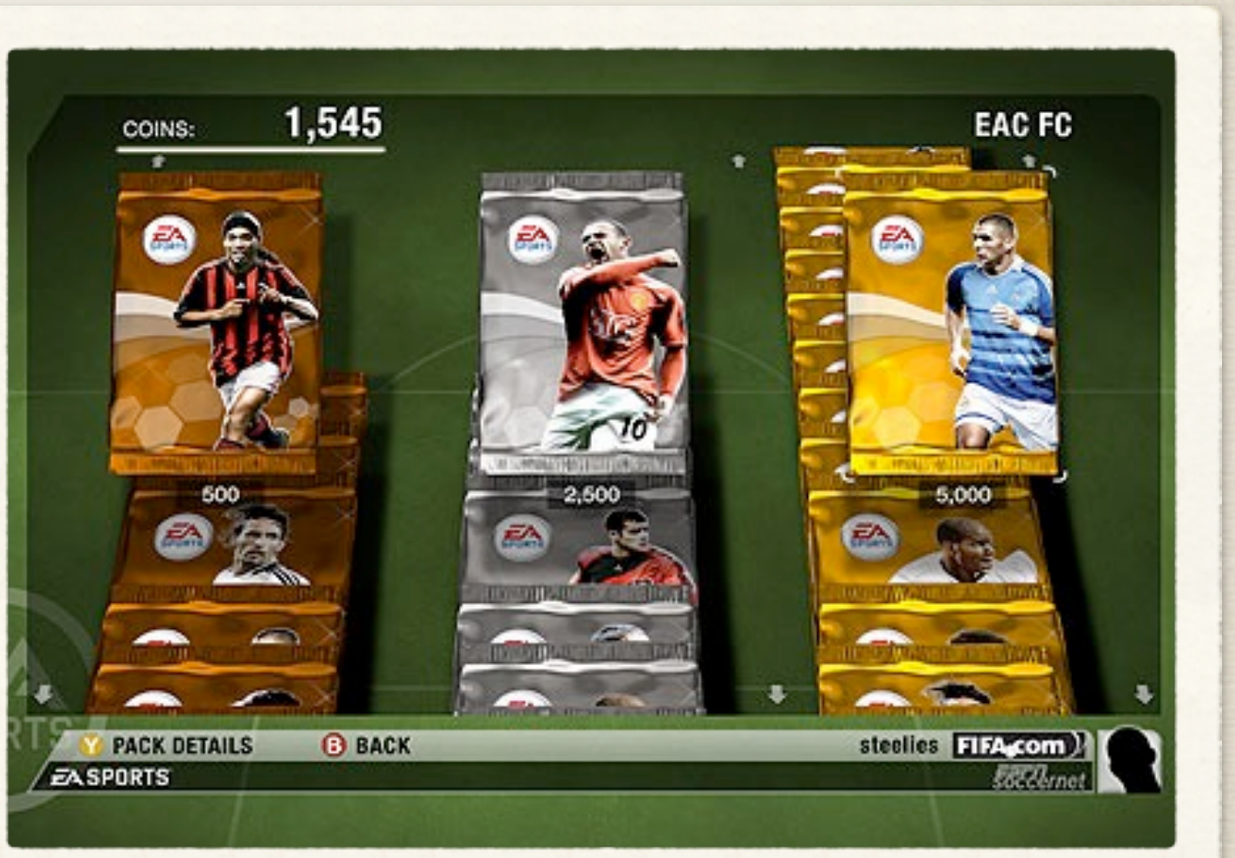
Collect, Trade and Play

- Purchase packs of players, contracts, power-ups
- Trade with other players
- Build your team
  - Team chemistry
- Play your team against another player's team
- Win coins



An Unexpected Success

- Turned a very good profit
  - More than the licensed product would have
- Made more money w/ MTX than selling the mode
- Followed up w/ FUT2 and continued success



Unexpected Problems

- FUT11 servers were shaky at launch
  - Server bottlenecks, connected to FIFA servers
- Game logic on client
  - Hard to update post-launch
- UI info on the server ("glow")
- Followed console model of server per title
  - No year-over-year support

A New Client

* FUT Web introduced in April 2010
* FUT servers used proprietary format, not HTTP
* Took advantage of an opportunity to start over
* ...with REST

What is REST?

The dirty details

What is REST?

- REST stands for “REpresentation State Transfer”
  - REST is style of software architecture
  - REST is intended for online services

- REST first defined by Roy Fielding
  - “Architectural Styles and the Design of Network-based Software Architectures” (2000)
  - Fielding is the principle author of HTTP 1.0 and 1.1
  - Created for “distributed hypermedia” systems
  - Applications and benefits extend beyond WWW

REST is a Style, like OOP

- OOP is a *style* of software architecture
  - REST is a convention, not a syntax
- OOP can be done in many languages
  - Many protocols can be RESTful
- OOP has several variants and flavors
  - REST is also underdetermined
- OOP is open to interpretation
  - There are many ways to be RESTful
- OOP won't solve all your problems, introduces new ones
  - REST is not a complete solution
- Follow OOP, and gain benefits
  - ...and so it is with REST

REST Constraints

- Client/Server (separation of concerns)
- Uniform Interface w/ Hyperlinks
- Stateless
- Cacheable
- Layered
- *Code on Demand (optional)*

Client and Server

Client

User Interface
Rendering
Current Page
Device Security

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Server

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Database
File Access
Load Balancing
Fraud Detection

Session State

Application State

Separation of Concerns

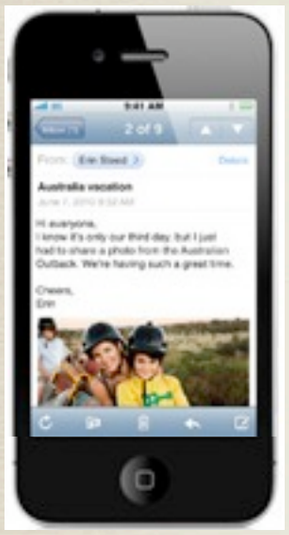
Services and Resources

Client

Resources

Services

Server



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Session State

Message

Folder

Mail

Contact

Mailing List

Address Book

Appointment

Meeting Room

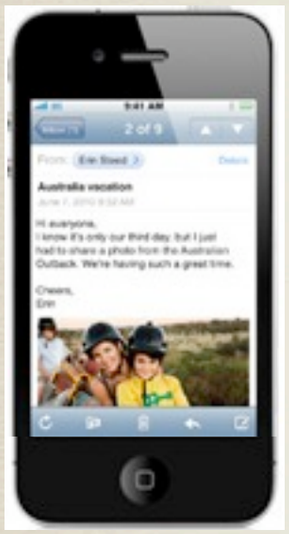
Calendar

Application State

Resource Representation

Changing Application State

Client



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Application State

Representational State Transfer

Statelessness

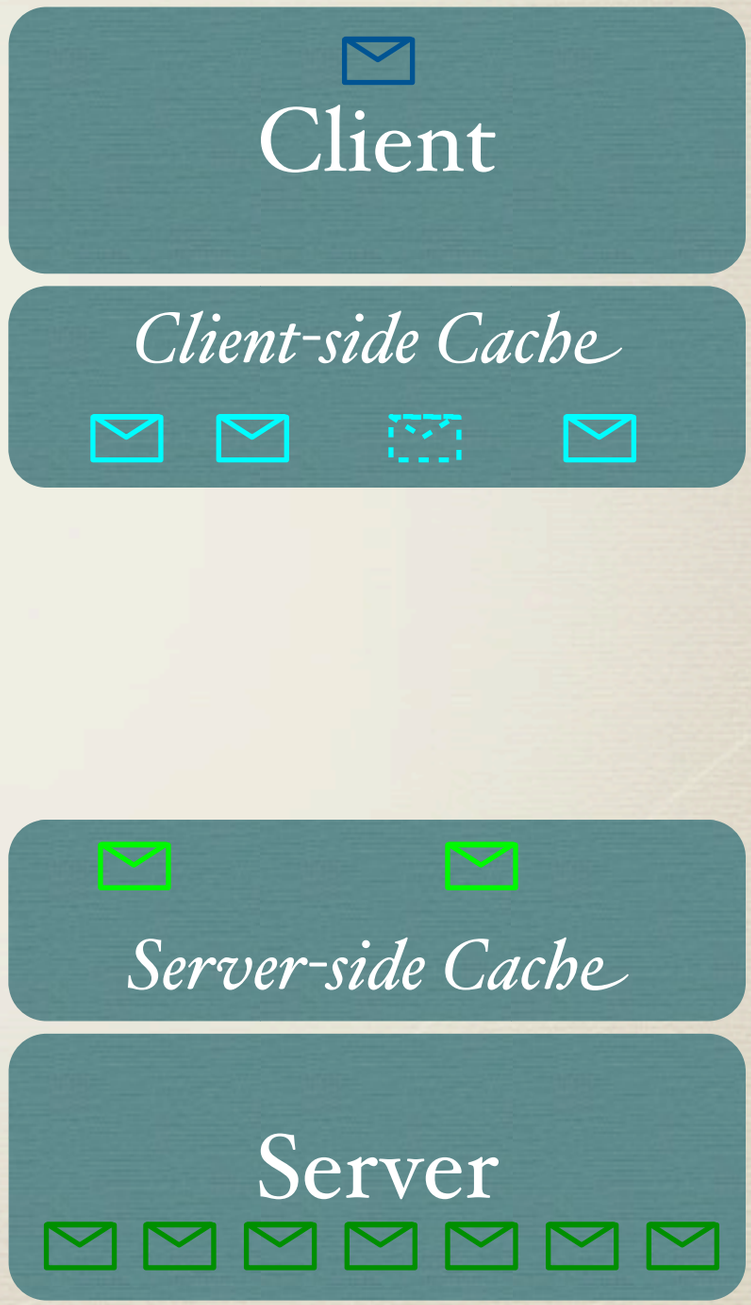
Stateful	Stateless
`move(direction, speed)`	`set_position(x, y)`
`find_user("Bob")` `send_msg("Hello!")`	`send_msg("Bob", "Hello!")`

`u1=owner(i1)`
`u2=owner(i2)`
`assign(i1, u2)`
`assign(i2, u1)`
	`u1=owner(i1)`
	`u2=owner(i2)`
	`assign(i1, u1, u2)`
	`assign(i2, u2, u1)`

All required state information is in the request.

Cacheability

- Representations are cacheable
  - Counters extra traffic caused by statelessness
- Representations include expiration info
- Representations can contain references to resources



Uniform Interface

* Resources must be uniformly identified
  * The same ID results in the same resource

* API consists of:
  * Resource representations
  * Resource identifiers
  * Requests and responses

Layered

Filter

Authentication

Cache

Router

Service A | Env 1 | Service B

Service C | Env 2 | Service D

REST Constraints

* Client/Server (separation of concerns)
* Uniform Interface w/ Hyperlinks
* Stateless
* Cacheable
* Layered

* If it has all these properties, it is RESTful.

Why REST?

What's in it for me?

REST Benefits

- Simplicity
  - Issues stay where they belong
  - Information is localized
  - Developers know what to build, can work in parallel
- Performance
  - Caching decreases response time, reduces DB hits
  - Can distribute across multiple servers
- Scalability
  - Services interact through references only
  - Can easily introduce new hardware as required
- Visibility
  - Clients know what resources are available
  - Clients are informed of the new state

REST Benefits

- Portability
  - All clients use the uniform interface
  - New clients can be added post hoc
  - Prepare us for a multi-platform online world
- Reliability
  - Transactions continued on new hardware if overloaded or crashed
  - Layered routers can direct traffic as needed

REST Best Practices

* HTTP
  * Conceptually compatible
  * Use four verbs: GET, PUT, POST, DELETE
* XML / JSON
  * Structured, easy to construct & parse, allows refs
* Java / C# / Ruby / Python
  * Can be deployed on arbitrary hardware
  * Built for reliability (not speed)
* REST vs. SOAP
  * SOAP *can be* RESTful (and C can be OO)
  * SOAP is more than you need for REST

RESTful Examples

- Twitter
- Facebook
- Picasa
- YouTube
- Flickr
- Google
- OpenSocial
- JIRA
- Gowalla
- Amazon
- Spore
- ...hundreds more

Migrating FUT to REST

Getting from here to there

Step 1: A RESTful API

FUT Console Servers

FUT REST API

Step 2: RESTful Proxy

FUT Console Servers

FUT REST API

FUT Application Server

Step 3: Componentization

FUT Console Servers

Warehouse	Store
Trading	Tournaments

FUT REST API

FUT Application Server

Step 4: Application Servers

FUT Console Servers

FUT REST API

FUT Application Server

Warehouse

Store

Trading

Tournaments

Step 5: All Clients on REST

FUT REST API

FUT Application Server

Warehouse

Store

Trading

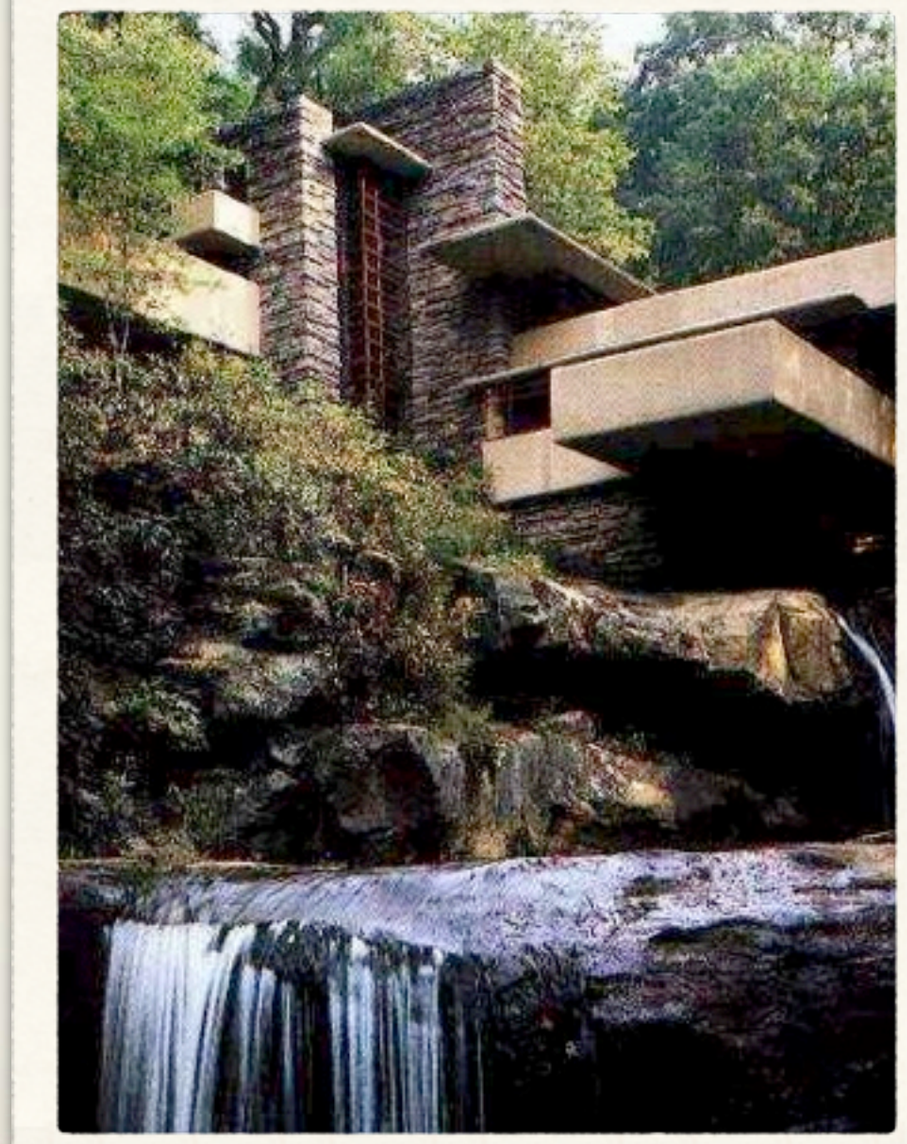
Tournaments

How REST Benefits FUT

The Big Wins

REST for Good Design

* REST can guide good design decisions
* Example: transactions as resources
* Enforces stateless transactions
* Removed serious transaction problems and increased robustness



Modular Services

- FUT built from components
- Scaling components independently based on use
- Updating implementation one step at a time

Services are Shared

- FUT components used by other products
- FUT uses other shared components
- Components managed independently

Enforces Organization

- Each service has a well-defined function
- Dramatically fewer server bugs
- Problems are isolated and easy to find
- Clients better understand how to implement (web client took four months)

Promotes Live Updating

- Client gets state from server
- Easy to update functionality
  - Even for data we didn't expect to update: item types

Support New Clients

- No client assumptions in the server
- New clients can be supported quickly
- No need for server team support

REST beyond FUT

What else can we do?

Games as Products

Games as Services

Games as Services

Advice for Getting Rest

Lessons Learned

Think Resources

- Define your services in terms of resources
- Determine how they will be identified, represented, manipulated
- Organize them hierarchically
- Opposite of OOP
  - Not data hiding, data exposing

API Before Code

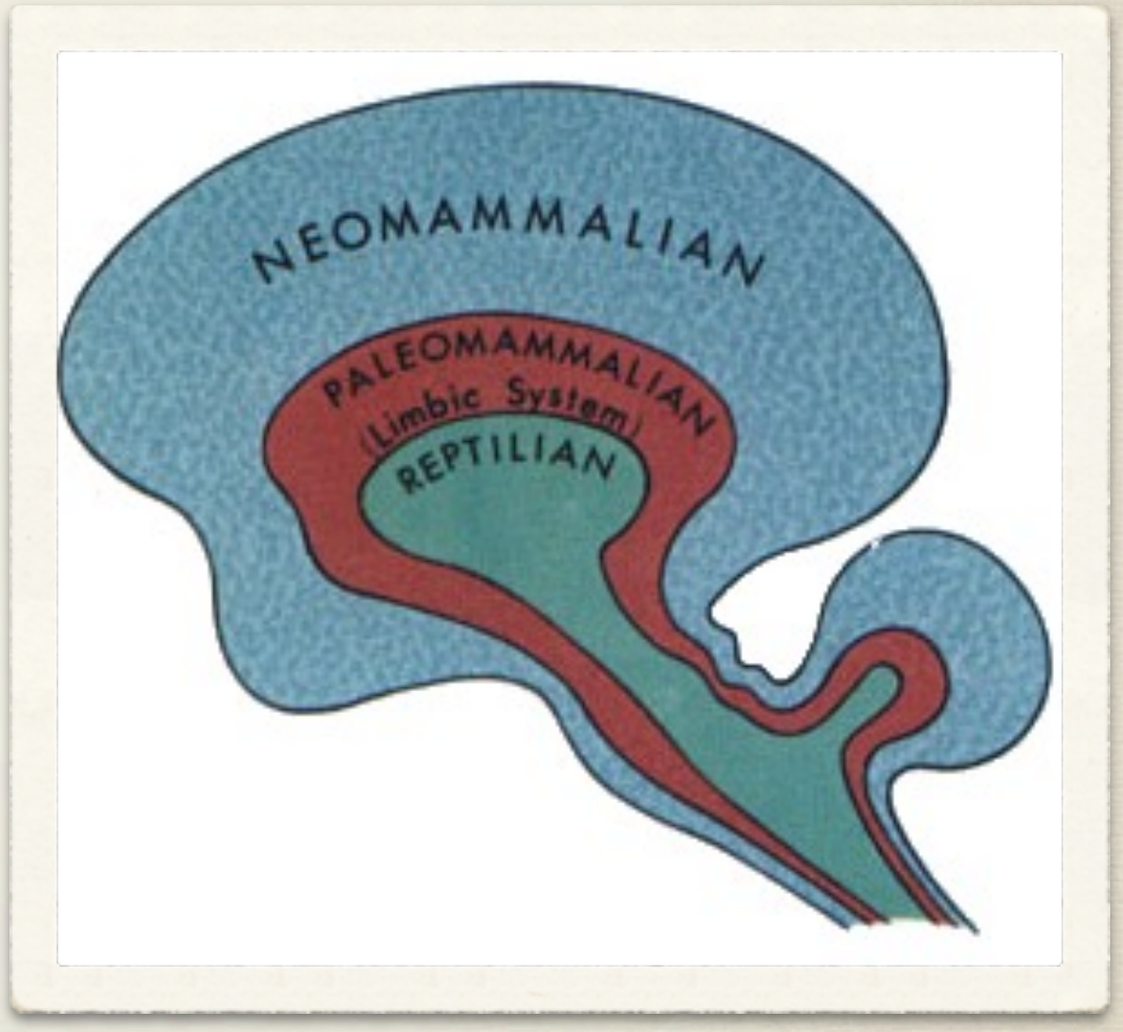
- Document your API *before* you write your server
- Get API vetted by client teams
- Development can start on client & server together
- Can test out API with working client & dummy data

Plan to Hand Off

- Build your service to be handed off to your ops team
- Don't assume you have any control of the server
- Clients can go though unexpected layers
- May not talk to the same server instance twice

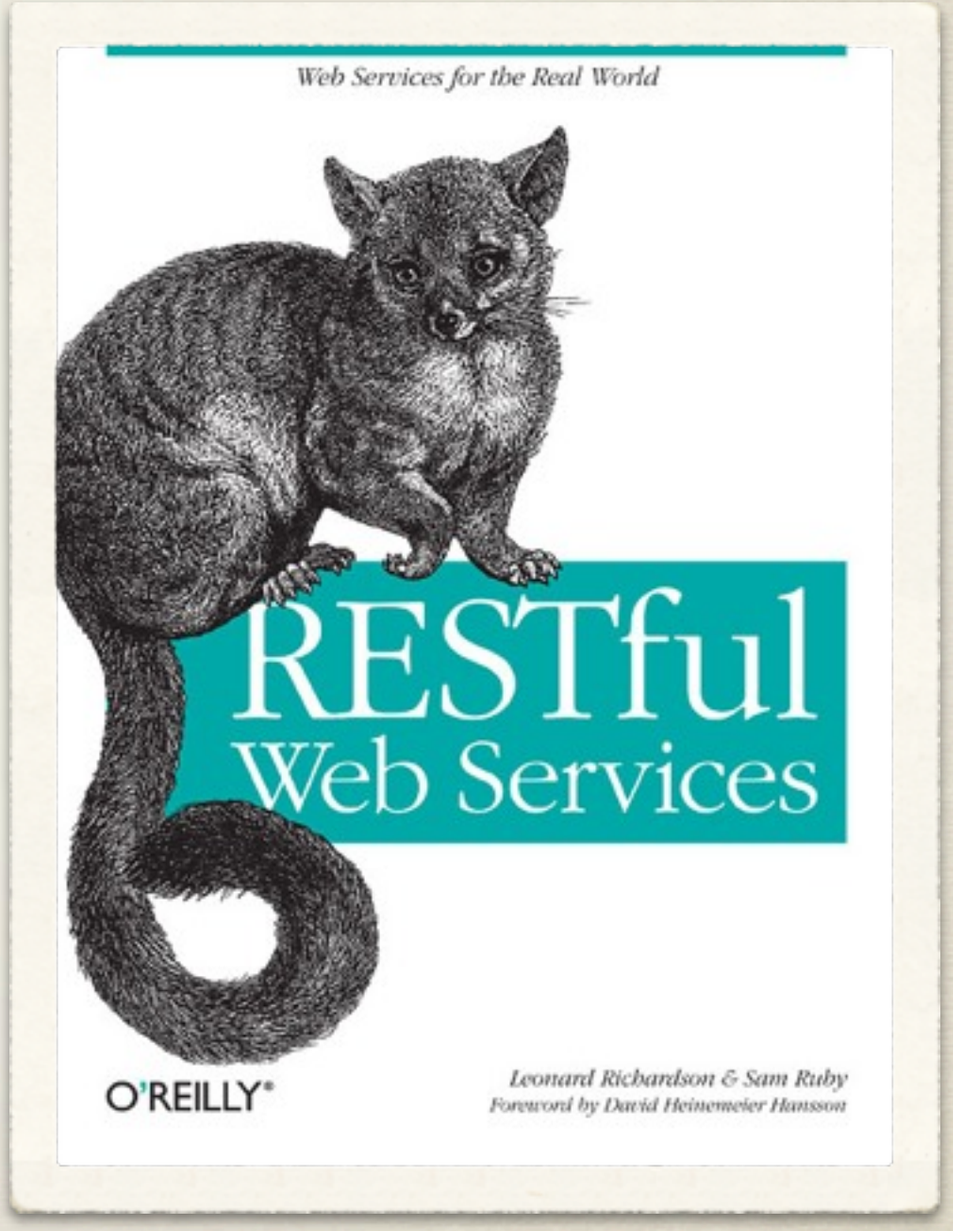
Version through API

* Expand existing APIs
  * Build clients to ignore extra information
* When API meaning changes, make new resource
* Sunset old resources when clients stop using them



Good Reference

* Richardson & Ruby
* Understandable explanations
* Several good examples
  * Transaction resource



The End

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