Backbone.js

backbonejs.org/

BACKBONE.JS

Backbone.js gives structure to web applications by providing **models** with key-value binding and custom events, **collections** with a rich API of enumerable functions, **views** with declarative event handling, and connects it all to your existing API over a RESTful JSON interface.

The project is hosted on GitHub, and the annotated source code is available, as well as an online test suite, an example application, a list of tutorials and a long list of real-world projects that use Backbone. Backbone is available for use under the MIT software license.

You can report bugs and discuss features on the GitHub issues page, on Freenode IRC in the `#documentcloud` channel, post questions to the Google Group, add pages to the wiki or send tweets to @documentcloud.

Backbone is an open-source component of DocumentCloud.

Downloads & Dependencies (Right-click, and use "Save As")

Backbone's only hard dependency is Underscore.js (>= 1.8.3). For RESTful persistence and DOM manipulation with Backbone.View, include **jQuery** (>= 1.11.0), and **json2.js** for older Internet Explorer support. *(Mimics of the Underscore and jQuery APIs, such as Lodash and Zepto, will also tend to work, with varying degrees of compatibility.)*

Getting Started

When working on a web application that involves a lot of JavaScript, one of the first things you learn is to stop tying your data to the DOM. It's all too easy to create JavaScript applications that end up as tangled piles of jQuery selectors and callbacks, all trying frantically to keep data in sync between the HTML UI, your JavaScript logic, and the database on your server. For rich client-side applications, a more structured approach is often helpful.

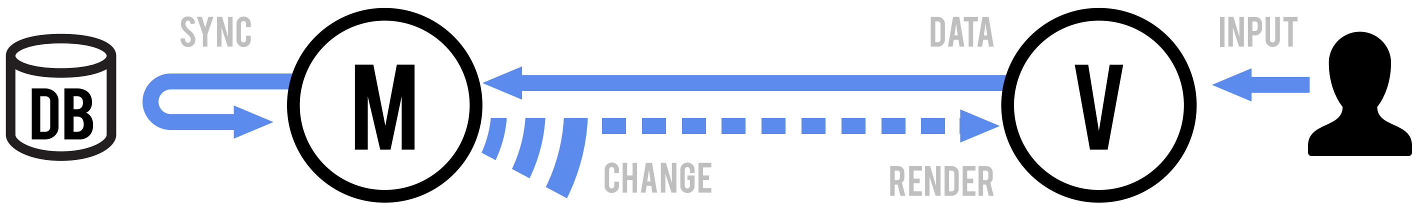
With Backbone, you represent your data as Models, which can be created, validated, destroyed, and saved to the server. Whenever a UI action causes an attribute of a model to change, the model triggers a *"change"* event; all the Views that display the model's state can be notified of the change, so that they are able to respond accordingly, re-rendering themselves with the new information. In a finished Backbone app, you don't have to write the glue code that looks into the DOM to find an element with a specific *id*, and update the HTML manually — when the model changes, the views simply update themselves.

Philosophically, Backbone is an attempt to discover the minimal set of data-structuring (models and collections) and user interface (views and URLs) primitives that are generally useful when building web applications with JavaScript. In an ecosystem where overarching, decides-everything-for-you frameworks are commonplace, and many libraries require your site to be reorganized to suit their look, feel, and default behavior — Backbone should continue to be a tool that gives you the *freedom* to design the full experience of your web application.

If you're new here, and aren't yet quite sure what Backbone is for, start by browsing the list of Backbone-based projects.

Many of the code examples in this documentation are runnable, because Backbone is included on this page. Click the *play* button to execute them.

Models and Views



The single most important thing that Backbone can help you with is keeping your business logic separate from your user interface. When the two are entangled, change is hard; when logic doesn't depend on UI, your interface becomes easier to work with.

Model

- Orchestrates data and business logic.
- Loads and saves from the server.
- Emits events when data changes.

View

- Listens for changes and renders UI.
- Handles user input and interactivity.
- Sends captured input to the model.

A **Model** manages an internal table of data attributes, and triggers `"change"` events when any of its data is modified. Models handle syncing data with a persistence layer — usually a REST API with a backing database. Design your models as the atomic reusable objects containing all of the helpful functions for manipulating their particular bit of data. Models should be able to be passed around throughout your app, and used anywhere that bit of data is needed.

A **View** is an atomic chunk of user interface. It often renders the data from a specific model, or number of models — but views can also be data-less chunks of UI that stand alone. Models should be generally unaware of views. Instead, views listen to the model `"change"` events, and react or re-render themselves appropriately.

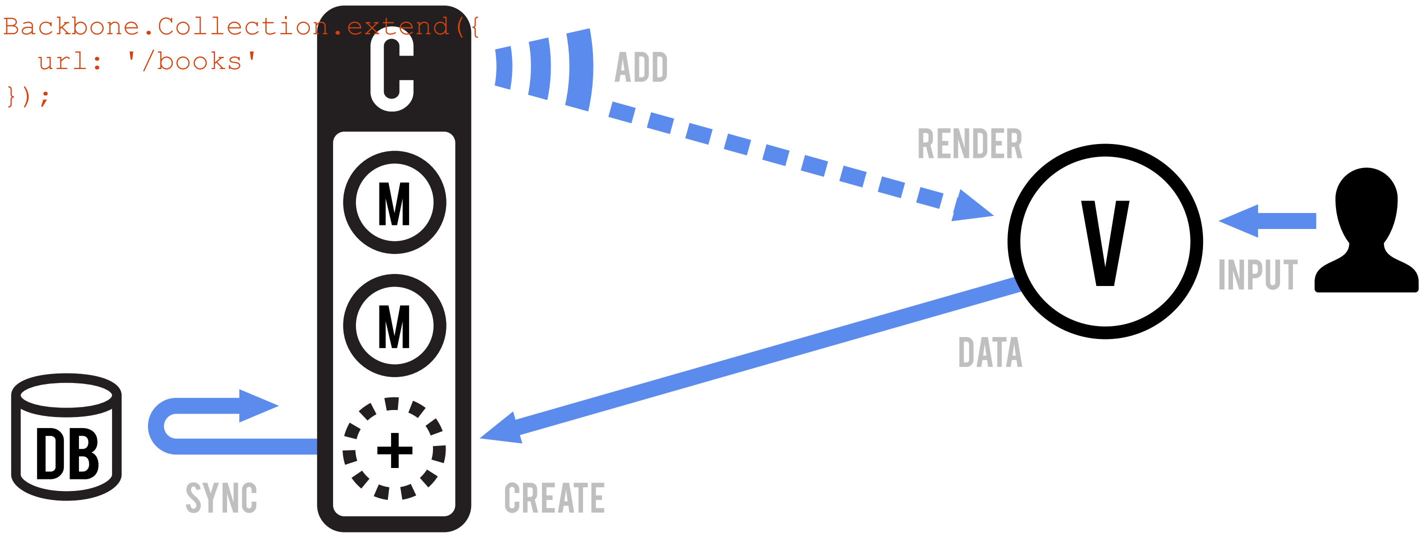
Collections

A **Collection** helps you deal with a group of related models, handling the loading and saving of new models to the server and providing helper functions for performing aggregations or computations against a list of models. Aside from their own events, collections also proxy through all of the events that occur to models within them, allowing you to listen in one place for any change that might happen to any model in the collection.

API Integration

Backbone is pre-configured to sync with a RESTful API. Simply create a new Collection with the `url` of your resource endpoint:

```
var Books =
Backbone.Collection.extend({
  url: '/books'
});
```



The **Collection** and **Model** components together form a direct mapping of REST resources using the following methods:

```
GET  /books/ .... collection.fetch();
POST /books/ ....
collection.create();
GET  /books/1 ... model.fetch();
PUT  /books/1 ... model.save();
DEL  /books/1 ... model.destroy();
```

When fetching raw JSON data from an API, a **Collection** will automatically populate itself with data formatted as an array, while a **Model** will automatically populate itself with data formatted as an object:

```
[{"id": 1}] ..... populates a Collection with one
model.
{"id": 1} ....... populates a Model with one attribute.
```

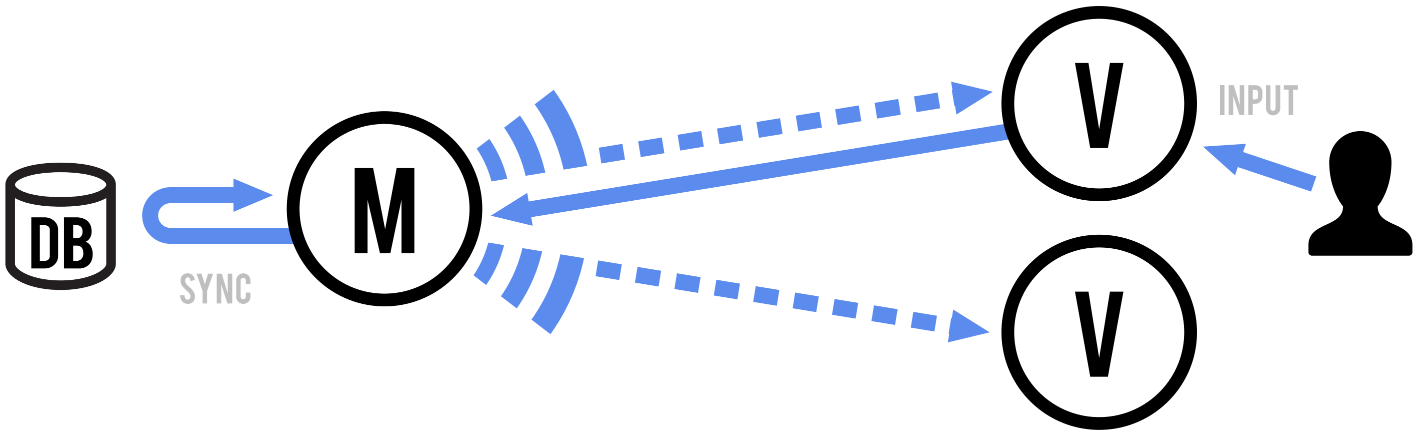
However, it's fairly common to encounter APIs that return data in a different format than what Backbone expects. For example, consider fetching a **Collection** from an API that returns the real data array wrapped in metadata:

```
{
  "page": 1,
  "limit": 10,
  "total": 2,
  "books": [
    {"id": 1, "title": "Pride and
Prejudice"},
    {"id": 4, "title": "The Great Gatsby"}
  ]
}
```

In the above example data, a **Collection** should populate using the `"books"` array rather than the root object structure. This difference is easily reconciled using a `parse` method that returns (or transforms) the desired portion of API data:

```
var Books =
Backbone.Collection.extend({
  url: '/books',
  parse: function(data) {
    return data.books;
  }
});
```

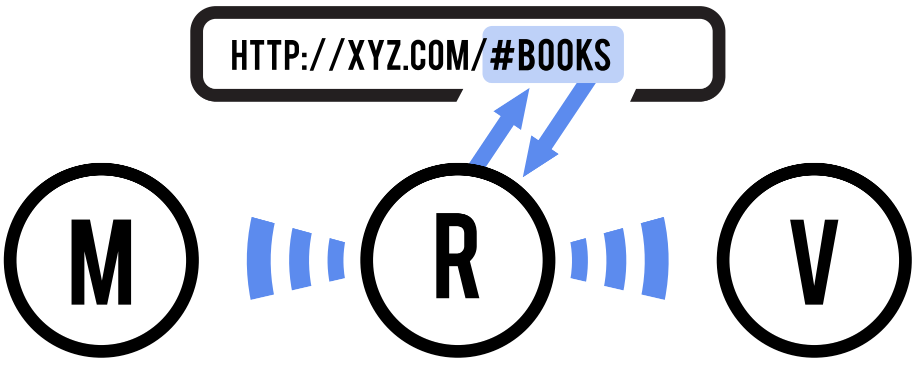
View Rendering



Each **View** manages the rendering and user interaction within its own DOM element. If you're strict about not allowing views to reach outside of themselves, it helps keep your interface flexible — allowing views to be rendered in isolation in any place where they might be needed.

Backbone remains unopinionated about the process used to render **View** objects and their subviews into UI: you define how your models get translated into HTML (or SVG, or Canvas, or something even more exotic). It could be as prosaic as a simple Underscore template, or as fancy as the React virtual DOM. Some basic approaches to rendering views can be found in the Backbone primer.

Routing with URLs



In rich web applications, we still want to provide linkable, bookmarkable, and shareable URLs to meaningful locations within an app. Use the **Router** to update the browser URL whenever the user reaches a new "place" in your app that they might want to bookmark or share. Conversely, the **Router** detects changes to the URL — say, pressing the "Back" button — and can tell your application exactly where you are now.

Backbone.Events

Events is a module that can be mixed in to any object, giving the object the ability to bind and trigger custom named events. Events do not have to be declared before they are bound, and may take passed arguments. For example:

```
var object = {};

_.extend(object, Backbone.Events);

object.on("alert", function(msg) {
  alert("Triggered " + msg);
});

object.trigger("alert", "an
event");
```

For example, to make a handy event dispatcher that can coordinate events among different areas of your application: `var dispatcher = _.clone(Backbone.Events)`

on `object.on(event, callback, [context])` Alias: bind
Bind a **callback** function to an object. The callback will be invoked whenever the **event** is fired. If you have a large number of different events on a page, the convention is to use colons to namespace them: `"poll:start"`, or `"change:selection"`. The event string may also be a space-delimited list of several events...

```
book.on("change:title change:author",
...);
```

Callbacks bound to the special `"all"` event will be triggered when any event occurs, and are passed the name of the event as the first argument. For example, to proxy all events from one object to another:

```
proxy.on("all", function(eventName)
{
  object.trigger(eventName);
});
```

All Backbone event methods also support an event map syntax, as an alternative to positional arguments:

```
book.on({
  "change:author": authorPane.update,
  "change:title change:subtitle":
titleView.update,
  "destroy": bookView.remove
});
```

To supply a **context** value for `this` when the callback is invoked, pass the optional last argument: `model.on('change', this.render, this)` or `model.on({change: this.render}, this)`.

off `object.off([event], [callback], [context])` Alias: unbind
Remove a previously-bound **callback** function from an object. If no **context** is specified, all of the versions of the callback with different contexts will be removed. If no callback is specified, all callbacks for the **event** will be removed. If no event is specified, callbacks for *all* events will be removed.

```
// Removes just the `onChange` callback.
object.off("change", onChange);

// Removes all "change" callbacks.
object.off("change");

// Removes the `onChange` callback for all events.
object.off(null, onChange);

// Removes all callbacks for `context` for all
events.
object.off(null, null, context);

// Removes all callbacks on `object`.
object.off();
```

Note that calling `model.off()`, for example, will indeed remove *all* events on the model — including events that Backbone uses for internal bookkeeping.

trigger `object.trigger(event, [*args])`
Trigger callbacks for the given **event**, or space-delimited list of events. Subsequent arguments to **trigger** will be passed along to the event callbacks.

once `object.once(event, callback, [context])`
Just like on, but causes the bound callback to fire only once before being removed. Handy for saying "the next time that X happens, do this". When multiple events are passed in using the space separated syntax, the event will fire once for every event you passed in, not once for a combination of all events

listenTo `object.listenTo(other, event, callback)`
Tell an **object** to listen to a particular event on an **other** object. The advantage of using this form, instead of `other.on(event, callback, object)`, is that **listenTo** allows the **object** to keep track of the events, and they can be removed all at once later on. The **callback** will always be called with **object** as context.

```
view.listenTo(model, 'change', view.render);
```

stopListening `object.stopListening([other], [event], [callback])`
Tell an **object** to stop listening to events. Either call **stopListening** with no arguments to have the **object** remove all of its registered callbacks ... or be more precise by telling it to remove just the events it's listening to on a specific object, or a specific event, or just a specific callback.

```
view.stopListening();

view.stopListening(model);
```

listenToOnce `object.listenToOnce(other, event, callback)`
Just like listenTo, but causes the bound callback to fire only once before being removed.

Catalog of Events
Here's the complete list of built-in Backbone events, with arguments. You're also free to trigger your own events on Models, Collections and Views as you see fit. The `Backbone` object itself mixes in `Events`, and can be used

to emit any global events that your application needs.

- **"add"** (model, collection, options) — when a model is added to a collection.
- **"remove"** (model, collection, options) — when a model is removed from a collection.
- **"update"** (collection, options) — single event triggered after any number of models have been added or removed from a collection.
- **"reset"** (collection, options) — when the collection's entire contents have been reset.
- **"sort"** (collection, options) — when the collection has been re-sorted.
- **"change"** (model, options) — when a model's attributes have changed.
- **"change:[attribute]"** (model, value, options) — when a specific attribute has been updated.
- **"destroy"** (model, collection, options) — when a model is destroyed.
- **"request"** (model_or_collection, xhr, options) — when a model or collection has started a request to the server.
- **"sync"** (model_or_collection, response, options) — when a model or collection has been successfully synced with the server.
- **"error"** (model_or_collection, response, options) — when a model's or collection's request to the server has failed.
- **"invalid"** (model, error, options) — when a model's validation fails on the client.
- **"route:[name]"** (params) — Fired by the router when a specific route is matched.
- **"route"** (route, params) — Fired by the router when *any* route has been matched.
- **"route"** (router, route, params) — Fired by history when *any* route has been matched.
- **"all"** — this special event fires for *any* triggered event, passing the event name as the first argument followed by all trigger arguments.

Generally speaking, when calling a function that emits an event (`model.set`, `collection.add`, and so on...), if you'd like to prevent the event from being triggered, you may pass `{silent: true}` as an option. Note that this is *rarely*, perhaps even never, a good idea. Passing through a specific flag in the options for your event callback to look at, and choose to ignore, will usually work out better.

Backbone.Model

Models are the heart of any JavaScript application, containing the interactive data as well as a large part of the logic surrounding it: conversions, validations, computed properties, and access control. You extend **Backbone.Model** with your domain-specific methods, and **Model** provides a basic set of functionality for managing changes.

The following is a contrived example, but it demonstrates defining a model with a custom method, setting an attribute, and firing an event keyed to changes in that specific attribute. After running this code once, `sidebar` will be available in your browser's console, so you can play around with it.

```
var Sidebar = Backbone.Model.extend({
  promptColor: function() {
    var cssColor = prompt("Please enter a CSS
color:");
    this.set({color: cssColor});
  }
});

window.sidebar = new Sidebar;

sidebar.on('change:color', function(model, color) {
  $('#sidebar').css({background: color});
});

sidebar.set({color: 'white'});

sidebar.promptColor();
```

extend`Backbone.Model.extend(properties, [classProperties])`
To create a **Model** class of your own, you extend **Backbone.Model** and provide instance **properties**, as well as optional **classProperties** to be attached directly to the constructor function.

extend correctly sets up the prototype chain, so subclasses created with **extend** can be further extended and subclassed as far as you like.

```
var Note = Backbone.Model.extend({

  initialize: function() { ... },

  author: function() { ... },

  coordinates: function() { ... },

  allowedToEdit: function(account)
{
    return true;
  }

});

var PrivateNote = Note.extend({

  allowedToEdit: function(account)
{
    return account.owns(this);
  }

});
```

Brief aside on `super`: JavaScript does not provide a simple way to call super — the function of the same name defined higher on the prototype chain. If you override a core function like `set`, or `save`, and you want to invoke the parent object's implementation, you'll have to explicitly call it, along these lines:

```
var Note = Backbone.Model.extend({
  set: function(attributes, options) {
    Backbone.Model.prototype.set.apply(this,
arguments);
    ...
  }
});
```

constructor / initialize `new Model([attributes], [options])`
When creating an instance of a model, you can pass in the initial values of the **attributes**, which will be set on the model. If you define an **initialize** function, it will be invoked when the model is created.

```
new Book({
  title: "One Thousand and One
Nights",
  author: "Scheherazade"
});
```

In rare cases, if you're looking to get fancy, you may want to override **constructor**, which allows you to replace the actual constructor function for your model.

```
var Library = Backbone.Model.extend({
  constructor: function() {
    this.books = new Books();
    Backbone.Model.apply(this,
arguments);
  },
  parse: function(data, options) {
    this.books.reset(data.books);
    return data.library;
  }
});
```

If you pass a `{collection: ...}` as the **options**, the model gains a `collection` property that will be used to indicate which collection the model belongs to, and is used to help compute the model's url. The `model.collection` property is normally created automatically when you first add a model to a collection. Note that the reverse is not true, as passing this option to the constructor will not automatically add the model to the collection. Useful, sometimes.

If `{parse: true}` is passed as an **option**, the **attributes** will first be converted by parse before being set on the model.

get`model.get(attribute)`
Get the current value of an attribute from the model. For example: `note.get("title")`

set `model.set(attributes, [options])`
Set a hash of attributes (one or many) on the model. If any of the attributes change the model's state, a `"change"` event will be triggered on the model. Change events for specific attributes are also triggered, and you can bind to those as well, for example: `change:title`, and `change:content`. You may also pass individual keys and values.

```
note.set({title: "March 20", content: "In his eyes she
eclipses..."});

book.set("title", "A Scandal in Bohemia");
```

escape`model.escape(attribute)`
Similar to get, but returns the HTML-escaped version of a model's attribute. If you're interpolating data from the model into HTML, using **escape** to retrieve attributes will prevent XSS attacks.

```
var hacker = new Backbone.Model({
  name: "<script>alert('xss')
</script>"
});

alert(hacker.escape('name'));
```

has`model.has(attribute)`
Returns `true` if the attribute is set to a non-null or non-undefined value.

```
if (note.has("title"))
{
  ...
}
```

unset`model.unset(attribute, [options])`
Remove an attribute by deleting it from the internal attributes hash. Fires a `"change"` event unless `silent` is passed as an option.

clear`model.clear([options])`
Removes all attributes from the model, including the `id` attribute. Fires a `"change"` event unless `silent` is passed as an option.

id`model.id`
A special property of models, the **id** is an arbitrary string (integer id or UUID). If you set the **id** in the attributes hash, it will be copied onto the model as a direct property. Models can be retrieved by id from collections, and the id is used to generate model URLs by default.

idAttribute`model.idAttribute`
A model's unique identifier is stored under the `id` attribute. If you're directly communicating with a backend (CouchDB, MongoDB) that uses a different unique key, you may set a Model's `idAttribute` to transparently map from that key to `id`.

```
var Meal = Backbone.Model.extend({
  idAttribute: "_id"
});

var cake = new Meal({ _id: 1, name: "Cake"
});
alert("Cake id: " + cake.id);
```

cid`model.cid`
A special property of models, the **cid** or client id is a unique identifier automatically assigned to all models when

they're first created. Client ids are handy when the model has not yet been saved to the server, and does not yet have its eventual true **id**, but already needs to be visible in the UI.

attributes`model.attributes`
The **attributes** property is the internal hash containing the model's state — usually (but not necessarily) a form of the JSON object representing the model data on the server. It's often a straightforward serialization of a row from the database, but it could also be client-side computed state.

Please use set to update the **attributes** instead of modifying them directly. If you'd like to retrieve and munge a copy of the model's attributes, use `_.clone(model.attributes)` instead.

Due to the fact that Events accepts space separated lists of events, attribute names should not include spaces.

changed`model.changed`
The **changed** property is the internal hash containing all the attributes that have changed since its last set. Please do not update **changed** directly since its state is internally maintained by set. A copy of **changed** can be acquired from changedAttributes.

defaults`model.defaults or model.defaults()`
The **defaults** hash (or function) can be used to specify the default attributes for your model. When creating an instance of the model, any unspecified attributes will be set to their default value.

```
var Meal = Backbone.Model.extend({
  defaults: {
    "appetizer":  "caesar salad",
    "entree":     "ravioli",
    "dessert":    "cheesecake"
  }
});

alert("Dessert will be " + (new
Meal).get('dessert'));
```

Remember that in JavaScript, objects are passed by reference, so if you include an object as a default value, it will be shared among all instances. Instead, define **defaults** as a function.

toJSON`model.toJSON([options])`
Return a shallow copy of the model's attributes for JSON stringification. This can be used for persistence, serialization, or for augmentation before being sent to the server. The name of this method is a bit confusing, as it doesn't actually return a JSON string — but I'm afraid that it's the way that the JavaScript API for **JSON.stringify** works.

```
var artist = new Backbone.Model({
  firstName: "Wassily",
  lastName: "Kandinsky"
});

artist.set({birthday: "December 16,
1866"});

alert(JSON.stringify(artist));
```

sync`model.sync(method, model, [options])`
Uses Backbone.sync to persist the state of a model to the server. Can be overridden for custom behavior.

fetch`model.fetch([options])`
Merges the model's state with attributes fetched from the server by delegating to Backbone.sync. Returns a jqXHR. Useful if the model has never been populated with data, or if you'd like to ensure that you have the latest server state. Triggers a `"change"` event if the server's state differs from the current attributes. `fetch` accepts `success` and `error` callbacks in the options hash, which are both passed `(model, response, options)` as arguments.

```
// Poll every 10 seconds to keep the channel model up-to-
date.
setInterval(function() {
  channel.fetch();
}, 10000);
```

save`model.save([attributes], [options])`
Save a model to your database (or alternative persistence layer), by delegating to Backbone.sync. Returns a jqXHR if validation is successful and `false` otherwise. The **attributes** hash (as in set) should contain the attributes you'd like to change — keys that aren't mentioned won't be altered — but, a *complete representation* of the resource will be sent to the server. As with `set`, you may pass individual keys and values instead of a hash. If the model has a validate method, and validation fails, the model will not be saved. If the model isNew, the save will be a `"create"` (HTTP `POST`), if the model already exists on the server, the save will be an `"update"` (HTTP `PUT`).

If instead, you'd only like the *changed* attributes to be sent to the server, call `model.save(attrs, {patch: true})`. You'll get an HTTP `PATCH` request to the server with just the passed-in attributes.

Calling `save` with new attributes will cause a `"change"` event immediately, a `"request"` event as the Ajax request begins to go to the server, and a `"sync"` event after the server has acknowledged the successful change. Pass `{wait: true}` if you'd like to wait for the server before setting the new attributes on the model.

In the following example, notice how our overridden version of `Backbone.sync` receives a `"create"` request the first time the model is saved and an `"update"` request the second time.

```
Backbone.sync = function(method, model) {
  alert(method + ": " +
JSON.stringify(model));
  model.set('id', 1);
};

var book = new Backbone.Model({
  title: "The Rough Riders",
  author: "Theodore Roosevelt"
});

book.save();

book.save({author: "Teddy"});
```

save accepts `success` and `error` callbacks in the options hash, which will be passed the arguments `(model, response, options)`. If a server-side validation fails, return a non-`200` HTTP response code, along with an error response in text or JSON.

```
book.save("author", "F.D.R.", {error: function(){ ...
}});
```

destroy`model.destroy([options])`
Destroys the model on the server by delegating an HTTP `DELETE` request to Backbone.sync. Returns a jqXHR object, or `false` if the model isNew. Accepts `success` and `error` callbacks in the options hash, which will be passed `(model, response, options)`. Triggers a `"destroy"` event on the model, which will bubble up through any collections that contain it, a `"request"` event as it begins the Ajax request to the server, and a `"sync"` event, after the server has successfully acknowledged the model's deletion. Pass `{wait: true}` if you'd like to wait for the server to respond before removing the model from the collection.

```
book.destroy({success: function(model, response)
{
  ...
}});
```

Underscore Methods (9)
Backbone proxies to **Underscore.js** to provide 9 object functions on **Backbone.Model**. They aren't all documented here, but you can take a look at the Underscore documentation for the full details…

```
user.pick('first_name', 'last_name', 'email');

chapters.keys().join(', ');
```

validate`model.validate(attributes, options)`
This method is left undefined and you're encouraged to override it with any custom validation logic you have that can be performed in JavaScript. By default `save` checks **validate** before setting any attributes but you may also tell `set` to validate the new attributes by passing `{validate: true}` as an option.
The **validate** method receives the model attributes as well as any options passed to `set` or `save`. If the attributes are valid, don't return anything from **validate**; if they are invalid return an error of your choosing. It can be as simple as a string error message to be displayed, or a complete error object that describes the error programmatically. If **validate** returns an error, `save` will not continue, and the model attributes will not be modified on the server. Failed validations trigger an `"invalid"` event, and set the `validationError` property on the model with the value returned by this method.

```
var Chapter = Backbone.Model.extend({
  validate: function(attrs, options) {
    if (attrs.end < attrs.start) {
      return "can't end before it
starts";
    }
  }
});

var one = new Chapter({
  title : "Chapter One: The Beginning"
});

one.on("invalid", function(model, error)
{
  alert(model.get("title") + " " +
error);
});

one.save({
  start: 15,
  end:   10
});
```

`"invalid"` events are useful for providing coarse-grained error messages at the model or collection level.

validationError`model.validationError`
The value returned by validate during the last failed validation.

isValid`model.isValid()`
Run validate to check the model state.

```
var Chapter = Backbone.Model.extend({
  validate: function(attrs, options) {
    if (attrs.end < attrs.start) {
      return "can't end before it starts";
    }
  }
});

var one = new Chapter({
  title : "Chapter One: The Beginning"
});

one.set({
  start: 15,
  end:   10
});

if (!one.isValid()) {
  alert(one.get("title") + " " +
one.validationError);
}
```

url`model.url()`
Returns the relative URL where the model's resource would be located on the server. If your models are located

somewhere else, override this method with the correct logic. Generates URLs of the form: "[collection.url]/[id]" by default, but you may override by specifying an explicit urlRoot if the model's collection shouldn't be taken into account.

Delegates to Collection#url to generate the URL, so make sure that you have it defined, or a urlRoot property, if all models of this class share a common root URL. A model with an id of 101, stored in a Backbone.Collection with a url of "/documents/7/notes", would have this URL: "/documents/7/notes/101"

urlRoot`model.urlRoot or model.urlRoot()`
Specify a urlRoot if you're using a model *outside* of a collection, to enable the default url function to generate URLs based on the model id. "[urlRoot]/id"
Normally, you won't need to define this. Note that urlRoot may also be a function.

```
var Book = Backbone.Model.extend({urlRoot :
'/books'});

var solaris = new Book({id: "1083-lem-solaris"});

alert(solaris.url());
```

parse`model.parse(response, options)`
parse is called whenever a model's data is returned by the server, in fetch, and save. The function is passed the raw response object, and should return the attributes hash to be set on the model. The default implementation is a no-op, simply passing through the JSON response. Override this if you need to work with a preexisting API, or better namespace your responses.

If you're working with a Rails backend that has a version prior to 3.1, you'll notice that its default to_json implementation includes a model's attributes under a namespace. To disable this behavior for seamless Backbone integration, set:

```
ActiveRecord::Base.include_root_in_json =
false
```

clone`model.clone()`
Returns a new instance of the model with identical attributes.

isNew`model.isNew()`
Has this model been saved to the server yet? If the model does not yet have an id, it is considered to be new.

hasChanged`model.hasChanged([attribute])`
Has the model changed since its last set? If an **attribute** is passed, returns true if that specific attribute has changed.

Note that this method, and the following change-related ones, are only useful during the course of a "change" event.

```
book.on("change", function() {
  if (book.hasChanged("title"))
{
    ...
  }
});
```

changedAttributes`model.changedAttributes([attributes])`
Retrieve a hash of only the model's attributes that have changed since the last set, or `false` if there are none. Optionally, an external **attributes** hash can be passed in, returning the attributes in that hash which differ from the model. This can be used to figure out which portions of a view should be updated, or what calls need to be made to sync the changes to the server.

previous`model.previous(attribute)`
During a `"change"` event, this method can be used to get the previous value of a changed attribute.

```
var bill = new Backbone.Model({
  name: "Bill Smith"
});

bill.on("change:name", function(model, name) {
  alert("Changed name from " + bill.previous("name") + " to " +
name);
});

bill.set({name : "Bill Jones"});
```

previousAttributes`model.previousAttributes()`
Return a copy of the model's previous attributes. Useful for getting a diff between versions of a model, or getting back to a valid state after an error occurs.

Backbone.Collection

Collections are ordered sets of models. You can bind `"change"` events to be notified when any model in the collection has been modified, listen for `"add"` and `"remove"` events, `fetch` the collection from the server, and use a full suite of Underscore.js methods.

Any event that is triggered on a model in a collection will also be triggered on the collection directly, for convenience. This allows you to listen for changes to specific attributes in any model in a collection, for example: `documents.on("change:selected", ...)`

extend`Backbone.Collection.extend(properties, [classProperties])`
To create a **Collection** class of your own, extend **Backbone.Collection**, providing instance **properties**, as well as optional **classProperties** to be attached directly to the collection's constructor function.

model`collection.model([attrs], [options])`
Override this property to specify the model class that the collection contains. If defined, you can pass raw attributes objects (and arrays) to add, create, and reset, and the attributes will be converted into a model of the proper type.

```
var Library =
Backbone.Collection.extend({
  model: Book
});
```

A collection can also contain polymorphic models by overriding this property with a constructor that returns a model.

```
var Library = Backbone.Collection.extend({

  model: function(attrs, options) {
    if (condition) {
      return new PublicDocument(attrs, options);
    } else {
      return new PrivateDocument(attrs,
options);
    }
  }

});
```

modelId`collection.modelId(attrs)`
Override this method to return the value the collection will use to identify a model given its attributes. Useful for combining models from multiple tables with different `idAttribute` values into a single collection.

By default returns the value of the attributes' `idAttribute` from the collection's model class or failing that, `id`. If your collection uses a model factory and those models have an `idAttribute` other than `id` you must override this method.

```
var Library = Backbone.Collection.extend({
  modelId: function(attrs) {
    return attrs.type + attrs.id;
  }
});

var library = new Library([
  {type: 'dvd', id: 1},
  {type: 'vhs', id: 1}
]);

var dvdId = library.get('dvd1').id;
var vhsId = library.get('vhs1').id;
alert('dvd: ' + dvdId + ', vhs: ' +
vhsId);
```

constructor / initialize `new Backbone.Collection([models], [options])`
When creating a Collection, you may choose to pass in the initial array of **models**. The collection's comparator may be included as an option. Passing `false` as the comparator option will prevent sorting. If you define an **initialize** function, it will be invoked when the collection is created. There are a couple of options that, if provided, are attached to the collection directly: `model` and `comparator`.
Pass `null` for `models` to create an empty Collection with `options`.

```
var tabs = new TabSet([tab1, tab2, tab3]);
var spaces = new Backbone.Collection(null,
{
  model: Space
});
```

models`collection.models`
Raw access to the JavaScript array of models inside of the collection. Usually you'll want to use `get`, `at`, or the **Underscore methods** to access model objects, but occasionally a direct reference to the array is desired.

toJSON`collection.toJSON([options])`
Return an array containing the attributes hash of each model (via toJSON) in the collection. This can be used to serialize and persist the collection as a whole. The name of this method is a bit confusing, because it conforms to JavaScript's JSON API.

```
var collection = new
Backbone.Collection([
  {name: "Tim", age: 5},
  {name: "Ida", age: 26},
  {name: "Rob", age: 55}
]);

alert(JSON.stringify(collection));
```

sync`collection.sync(method, collection, [options])`
Uses Backbone.sync to persist the state of a collection to the server. Can be overridden for custom behavior.

Underscore Methods (46)
Backbone proxies to **Underscore.js** to provide 46 iteration functions on **Backbone.Collection**. They aren't all documented here, but you can take a look at the Underscore documentation for the full details…

Most methods can take an object or string to support model-attribute-style predicates or a function that receives the model instance as an argument.

```
books.each(function(book) {
  book.publish();
});

var titles = books.map("title");

var publishedBooks = books.filter({published:
true});

var alphabetical = books.sortBy(function(book) {
  return book.author.get("name").toLowerCase();
});

var randomThree = books.sample(3);
```

add`collection.add(models, [options])`
Add a model (or an array of models) to the collection, firing an `"add"` event for each model, and an `"update"` event afterwards. If a model property is defined, you may also pass raw attributes objects, and have them be vivified as instances of the model. Returns the added (or preexisting, if duplicate) models. Pass `{at: index}` to splice the model into the collection at the specified `index`. If you're adding models to the collection that are *already* in the collection, they'll be ignored, unless you pass `{merge: true}`, in which case their attributes will be merged into the corresponding models, firing any appropriate `"change"` events.

```
var ships = new Backbone.Collection;

ships.on("add", function(ship) {
  alert("Ahoy " + ship.get("name") +
"!");
});

ships.add([
  {name: "Flying Dutchman"},
  {name: "Black Pearl"}
]);
```

Note that adding the same model (a model with the same `id`) to a collection more than once
is a no-op.

remove`collection.remove(models, [options])`
Remove a model (or an array of models) from the collection, and return them. Each model can be a Model instance, an `id` string or a JS object, any value acceptable as the `id` argument of `collection.get`. Fires a `"remove"` event for each model, and a single `"update"` event afterwards, unless `{silent: true}` is passed. The model's index before removal is available to listeners as `options.index`.

reset`collection.reset([models], [options])`
Adding and removing models one at a time is all well and good, but sometimes you have so many models to change that you'd rather just update the collection in bulk. Use **reset** to replace a collection with a new list of models (or attribute hashes), triggering a single `"reset"` event on completion, and *without* triggering any add or remove events on any models. Returns the newly-set models. For convenience, within a `"reset"` event, the list of any previous models is available as `options.previousModels`.
Pass `null` for `models` to empty your Collection with `options`.

Here's an example using **reset** to bootstrap a collection during initial page load, in a Rails application:

```
<script>
  var accounts = new Backbone.Collection;
  accounts.reset(<%= @accounts.to_json
%>);
</script>
```

Calling `collection.reset()` without passing any models as arguments will empty the entire collection.

set`collection.set(models, [options])`
The **set** method performs a "smart" update of the collection with the passed list of models. If a model in the list isn't yet in the collection it will be added; if the model is already in the collection its attributes will be merged; and if the collection contains any models that *aren't* present in the list, they'll be removed. All of the appropriate `"add"`, `"remove"`, and `"change"` events are fired as this happens. Returns the touched models in the collection. If you'd like to customize the behavior, you can disable it with options: `{add: false}`, `{remove: false}`, or `{merge: false}`.

```
var vanHalen = new Backbone.Collection([eddie, alex, stone,
roth]);

vanHalen.set([eddie, alex, stone, hagar]);

// Fires a "remove" event for roth, and an "add" event for
"hagar".
// Updates any of stone, alex, and eddie's attributes that may
have
// changed over the years.
```

get`collection.get(id)`
Get a model from a collection, specified by an id, a cid, or by passing in a **model**.

```
var book =
library.get(110);
```

at`collection.at(index)`
Get a model from a collection, specified by index. Useful if your collection is sorted, and if your collection isn't sorted, **at** will still retrieve models in insertion order. When passed a negative index, it will retrieve the model from the back of the collection.

push`collection.push(model, [options])`
Add a model at the end of a collection. Takes the same options as add.

pop`collection.pop([options])`
Remove and return the last model from a collection. Takes the same options as remove.

unshift`collection.unshift(model, [options])`
Add a model at the beginning of a collection. Takes the same options as add.

shift`collection.shift([options])`
Remove and return the first model from a collection. Takes the same options as remove.

slice`collection.slice(begin, end)`
Return a shallow copy of this collection's models, using the same options as native Array#slice.

length`collection.length`
Like an array, a Collection maintains a `length` property, counting the number of models it contains.

comparator`collection.comparator`
By default there is no **comparator** for a collection. If you define a comparator, it will be used to maintain the collection in sorted order. This means that as models are added, they are inserted at the correct index in `collection.models`. A comparator can be defined as a sortBy (pass a function that takes a single argument), as a sort (pass a comparator function that expects two arguments), or as a string indicating the attribute to sort by.

"sortBy" comparator functions take a model and return a numeric or string value by which the model should be ordered relative to others. "sort" comparator functions take two models, and return `-1` if the first model should come before the second, `0` if they are of the same rank and `1` if the first model should come after. *Note that Backbone depends on the arity of your comparator function to determine between the two styles, so be careful if your comparator function is bound.*

Note how even though all of the chapters in this example are added backwards, they come out in the proper order:

```
var Chapter  = Backbone.Model;
var chapters = new Backbone.Collection;

chapters.comparator = 'page';

chapters.add(new Chapter({page: 9, title: "The End"}));
chapters.add(new Chapter({page: 5, title: "The Middle"}));
chapters.add(new Chapter({page: 1, title: "The
Beginning"}));

alert(chapters.pluck('title'));
```

Collections with a comparator will not automatically re-sort if you later change model attributes, so you may wish to call `sort` after changing model attributes that would affect the order.

sort`collection.sort([options])`
Force a collection to re-sort itself. You don't need to call this under normal circumstances, as a collection with a comparator will sort itself whenever a model is added. To disable sorting when adding a model, pass `{sort: false}` to `add`. Calling **sort** triggers a `"sort"` event on the collection.

pluck`collection.pluck(attribute)`
Pluck an attribute from each model in the collection. Equivalent to calling `map` and returning a single attribute from the iterator.

```
var stooges = new
Backbone.Collection([
  {name: "Curly"},
  {name: "Larry"},
  {name: "Moe"}
]);

var names = stooges.pluck("name");

alert(JSON.stringify(names));
```

where`collection.where(attributes)`
Return an array of all the models in a collection that match the passed **attributes**. Useful for simple cases of `filter`.

```
var friends = new Backbone.Collection([
  {name: "Athos",      job: "Musketeer"},
  {name: "Porthos",    job: "Musketeer"},
  {name: "Aramis",     job: "Musketeer"},
  {name: "d'Artagnan", job: "Guard"},
]);

var musketeers = friends.where({job:
"Musketeer"});

alert(musketeers.length);
```

findWhere`collection.findWhere(attributes)`
Just like where, but directly returns only the first model in the collection that matches the passed **attributes**.

url`collection.url or collection.url()`
Set the **url** property (or function) on a collection to reference its location on the server. Models within the collection will use **url** to construct URLs of their own.

```
var Notes = Backbone.Collection.extend({
  url: '/notes'
});

// Or, something more sophisticated:

var Notes = Backbone.Collection.extend({
  url: function() {
    return this.document.url() +
'/notes';
  }
});
```

parse`collection.parse(response, options)`
parse is called by Backbone whenever a collection's models are returned by the server, in fetch. The function is passed the raw `response` object, and should return the array of model attributes to be added to the collection. The default implementation is a no-op, simply passing through the JSON response. Override this if you need to work with a preexisting API, or better namespace your responses.

```
var Tweets = Backbone.Collection.extend({
  // The Twitter Search API returns tweets under
"results".
  parse: function(response) {
    return response.results;
  }
});
```

clone`collection.clone()`
Returns a new instance of the collection with an identical list of models.

fetch`collection.fetch([options])`
Fetch the default set of models for this collection from the server, setting them on the collection when they arrive. The **options** hash takes `success` and `error` callbacks which will both be passed `(collection, response, options)` as arguments. When the model data returns from the server, it uses set to (intelligently) merge the fetched models, unless you pass `{reset: true}`, in which case the collection will be (efficiently) reset. Delegates to Backbone.sync under the covers for custom persistence strategies and returns a jqXHR. The server handler for **fetch** requests should return a JSON array of models.

```
Backbone.sync = function(method, model)
{
  alert(method + ": " + model.url);
};

var accounts = new Backbone.Collection;
accounts.url = '/accounts';

accounts.fetch();
```

The behavior of **fetch** can be customized by using the available set options. For example, to fetch a collection, getting an `"add"` event for every new model, and a `"change"` event for every changed existing model, without removing anything: `collection.fetch({remove: false})`

jQuery.ajax options can also be passed directly as **fetch** options, so to fetch a specific page of a paginated collection: `Documents.fetch({data: {page: 3}})`

Note that **fetch** should not be used to populate collections on page load — all models needed at load time should already be bootstrapped in to place. **fetch** is intended for lazily-loading models for interfaces that are not needed immediately: for example, documents with collections of notes that may be toggled open and closed.

create `collection.create(attributes, [options])`
Convenience to create a new instance of a model within a collection. Equivalent to instantiating a model with a hash of attributes, saving the model to the server, and adding the model to the set after being successfully created. Returns the new model. If client-side validation failed, the model will be unsaved, with validation errors. In order for this to work, you should set the model property of the collection. The **create** method can accept either an attributes hash or an existing, unsaved model object.

Creating a model will cause an immediate `"add"` event to be triggered on the collection, a `"request"` event as the new model is sent to the server, as well as a `"sync"` event, once the server has responded with the successful creation of the model. Pass `{wait: true}` if you'd like to wait for the server before adding the new model to the collection.

```
var Library =
Backbone.Collection.extend({
  model: Book
});

var nypl = new Library;

var othello = nypl.create({
  title: "Othello",
  author: "William Shakespeare"
});
```

Backbone.Router

Web applications often provide linkable, bookmarkable, shareable URLs for important locations in the app. Until recently, hash fragments (`#page`) were used to provide these permalinks, but with the arrival of the History API, it's now possible to use standard URLs (`/page`). **Backbone.Router** provides methods for routing client-side pages, and connecting them to actions and events. For browsers which don't yet support the History API, the Router handles graceful fallback and transparent translation to the fragment version of the URL.

During page load, after your application has finished creating all of its routers, be sure to call `Backbone.history.start()` or `Backbone.history.start({pushState: true})` to route the initial URL.

extend `Backbone.Router.extend(properties, [classProperties])`
Get started by creating a custom router class. Define actions that are triggered when certain URL fragments are matched, and provide a routes hash that pairs routes to actions. Note that you'll want to avoid using a leading slash in your route definitions:

```
var Workspace = Backbone.Router.extend({

  routes: {
    "help":                 "help",    // #help
    "search/:query":        "search",  // #search/kiwis
    "search/:query/p:page": "search"   //
#search/kiwis/p7
  },

  help: function() {
    ...
  },

  search: function(query, page) {
    ...
  }

});
```

routes router.routes
The routes hash maps URLs with parameters to functions on your router (or just direct function definitions, if you prefer), similar to the View's events hash. Routes can contain parameter parts, :param, which match a single URL component between slashes; and splat parts *splat, which can match any number of URL components. Part of a route can be made optional by surrounding it in parentheses (/:optional).

For example, a route of "search/:query/p:page" will match a fragment of #search/obama/p2, passing "obama" and "2" to the action.

A route of "file/*path" will match #file/folder/file.txt, passing "folder/file.txt" to the action.

A route of "docs/:section(/:subsection)" will match #docs/faq and #docs/faq/installing, passing "faq" to the action in the first case, and passing "faq" and "installing" to the action in the second.

A nested optional route of "docs(/:section)(/:subsection)" will match #docs, #docs/faq, and #docs/faq/installing, passing "faq" to the action in the second case, and passing "faq" and "installing" to the action in the third.

Trailing slashes are treated as part of the URL, and (correctly) treated as a unique route when accessed. docs and docs/ will fire different callbacks. If you can't avoid generating both types of URLs, you can define a "docs(/)" matcher to capture both cases.

When the visitor presses the back button, or enters a URL, and a particular route is matched, the name of the action will be fired as an event, so that other objects can listen to the router, and be notified. In the following example, visiting #help/uploading will fire a route:help event from the router.

```
routes: {
  "help/:page":         "help",
  "download/*path":     "download",
  "folder/:name":
"openFolder",
  "folder/:name-:mode": "openFolder"
}
```

```
router.on("route:help", function(page) {
  ...
});
```

constructor / initialize `new Router([options])`
When creating a new router, you may pass its routes hash directly as an option, if you choose. All `options` will also be passed to your `initialize` function, if defined.

route `router.route(route, name, [callback])`
Manually create a route for the router, The `route` argument may be a routing string or regular expression. Each matching capture from the route or regular expression will be passed as an argument to the callback. The `name` argument will be triggered as a `"route:name"` event whenever the route is matched. If the `callback` argument is omitted `router[name]` will be used instead. Routes added later may override previously declared routes.

```
initialize: function(options) {

  // Matches #page/10, passing "10"
  this.route("page/:number", "page", function(number){ ...
});

  // Matches /117-a/b/c/open, passing "117-a/b/c" to
this.open
  this.route(/^(.*?)\/open$/, "open");

},

open: function(id) { ... }
```

navigate `router.navigate(fragment, [options])`
Whenever you reach a point in your application that you'd like to save as a URL, call **navigate** in order to update the URL. If you also wish to call the route function, set the **trigger** option to `true`. To update the URL without creating an entry in the browser's history, set the **replace** option to `true`.

```
openPage: function(pageNumber) {
  this.document.pages.at(pageNumber).open();
  this.navigate("page/" + pageNumber);
}

# Or ...

app.navigate("help/troubleshooting", {trigger: true});

# Or ...

app.navigate("help/troubleshooting", {trigger: true, replace:
true});
```

execute `router.execute(callback, args, name)`
This method is called internally within the router, whenever a route matches and its corresponding **callback** is about to be executed. Return **false** from execute to cancel the current transition. Override it to perform custom parsing or wrapping of your routes, for example, to parse query strings before handing them to your route callback, like so:

```
var Router = Backbone.Router.extend({
  execute: function(callback, args, name) {
    if (!loggedIn) {
      goToLogin();
      return false;
    }
    args.push(parseQueryString(args.pop()));
    if (callback) callback.apply(this,
args);
  }
});
```

Backbone.history

History serves as a global router (per frame) to handle `hashchange` events or `pushState`, match the appropriate route, and trigger callbacks. You shouldn't ever have to create one of these yourself since `Backbone.history` already contains one.

pushState support exists on a purely opt-in basis in Backbone. Older browsers that don't support `pushState` will continue to use hash-based URL fragments, and if a hash URL is visited by a `pushState`-capable browser, it will be transparently upgraded to the true URL. Note that using real URLs requires your web server to be able to correctly render those pages, so back-end changes are required as well. For example, if you have a route of `/documents/100`, your web server must be able to serve that page, if the browser visits that URL directly. For full search-engine crawlability, it's best to have the server generate the complete HTML for the page ... but if it's a web application, just rendering the same content you would have for the root URL, and filling in the rest with Backbone Views and JavaScript works fine.

start`Backbone.history.start([options])`
When all of your Routers have been created, and all of the routes are set up properly, call `Backbone.history.start()` to begin monitoring `hashchange` events, and dispatching routes. Subsequent calls to `Backbone.history.start()` will throw an error, and `Backbone.History.started` is a boolean value indicating whether it has already been called.

To indicate that you'd like to use HTML5 `pushState` support in your application, use `Backbone.history.start({pushState: true})`. If you'd like to use `pushState`, but have browsers that don't support it natively use full page refreshes instead, you can add `{hashChange: false}` to the options.

If your application is not being served from the root url `/` of your domain, be sure to tell History where the root really is, as an option: `Backbone.history.start({pushState: true, root: "/public/search/"})`

When called, if a route succeeds with a match for the current URL, `Backbone.history.start()` returns `true`. If no defined route matches the current URL, it returns `false`.

If the server has already rendered the entire page, and you don't want the initial route to trigger when starting History, pass `silent: true`.

Because hash-based history in Internet Explorer relies on an , be sure to call `start()` only after the DOM is ready.

```
$(function(){
  new WorkspaceRouter();
  new HelpPaneRouter();
  Backbone.history.start({pushState:
true});
});
```

Backbone.sync

Backbone.sync is the function that Backbone calls every time it attempts to read or save a model to the server. By default, it uses `jQuery.ajax` to make a RESTful JSON request and returns a jqXHR. You can override it in order to use a different persistence strategy, such as WebSockets, XML transport, or Local Storage.

The method signature of **Backbone.sync** is `sync(method, model, [options])`

- **method** – the CRUD method (`"create"`, `"read"`, `"update"`, or `"delete"`)
- **model** – the model to be saved (or collection to be read)
- **options** – success and error callbacks, and all other jQuery request options

With the default implementation, when **Backbone.sync** sends up a request to save a model, its attributes will be passed, serialized as JSON, and sent in the HTTP body with content-type `application/json`. When returning a JSON response, send down the attributes of the model that have been changed by the server, and need to be updated on the client. When responding to a `"read"` request from a collection (Collection#fetch), send down an array of model attribute objects.

Whenever a model or collection begins a **sync** with the server, a `"request"` event is emitted. If the request completes successfully you'll get a `"sync"` event, and an `"error"` event if not.

The **sync** function may be overridden globally as `Backbone.sync`, or at a finer-grained level, by adding a `sync` function to a Backbone collection or to an individual model.

The default **sync** handler maps CRUD to REST like so:

- **create → POST** `/collection`
- **read → GET** `/collection[/id]`
- **update → PUT** `/collection/id`
- **patch → PATCH** `/collection/id`
- **delete → DELETE** `/collection/id`

As an example, a Rails 4 handler responding to an `"update"` call from `Backbone` might look like this:

```
def update
  account = Account.find params[:id]
  permitted = params.require(:account).permit(:name,
:otherparam)
  account.update_attributes permitted
  render :json => account
end
```

One more tip for integrating Rails versions prior to 3.1 is to disable the default namespacing for `to_json` calls on models by setting `ActiveRecord::Base.include_root_in_json = false`

ajax`Backbone.ajax = function(request) { ... };`
If you want to use a custom AJAX function, or your endpoint doesn't support the jQuery.ajax API and you need to tweak things, you can do so by setting `Backbone.ajax`.

emulateHTTP`Backbone.emulateHTTP = true`
If you want to work with a legacy web server that doesn't support Backbone's default REST/HTTP approach, you may choose to turn on `Backbone.emulateHTTP`. Setting this option will fake `PUT`, `PATCH` and `DELETE` requests with a HTTP `POST`, setting the `X-HTTP-Method-Override` header with the true method. If `emulateJSON` is also on, the true method will be passed as an additional `_method` parameter.

```
Backbone.emulateHTTP = true;

model.save();  // POST to "/collection/id", with "_method=PUT" +
header.
```

emulateJSON`Backbone.emulateJSON = true`
If you're working with a legacy web server that can't handle requests encoded as `application/json`, setting `Backbone.emulateJSON = true;` will cause the JSON to be serialized under a `model` parameter, and the request to be made with a `application/x-www-form-urlencoded` MIME type, as if from an HTML form.

Backbone.View

Backbone views are almost more convention than they are code — they don't determine anything about your HTML or CSS for you, and can be used with any JavaScript templating library. The general idea is to organize your interface into logical views, backed by models, each of which can be updated independently when the model changes, without having to redraw the page. Instead of digging into a JSON object, looking up an element in the DOM, and updating the HTML by hand, you can bind your view's `render` function to the model's `"change"` event — and now everywhere that model data is displayed in the UI, it is always immediately up to date.

extend`Backbone.View.extend(properties, [classProperties])`
Get started with views by creating a custom view class. You'll want to override the render function, specify your declarative events, and perhaps the `tagName`, `className`, or `id` of the View's root element.

```
var DocumentRow = Backbone.View.extend({

  tagName: "li",

  className: "document-row",

  events: {
    "click .icon":          "open",
    "click .button.edit":   "openEditDialog",
    "click .button.delete": "destroy"
  },

  initialize: function() {
    this.listenTo(this.model, "change",
this.render);
  },

  render: function() {
    ...
  }

});
```

Properties like `tagName`, `id`, `className`, `el`, and `events` may also be defined as a function, if you want to wait to define them until runtime.

constructor / initialize `new View([options])`
There are several special options that, if passed, will be attached directly to the view: `model`, `collection`, `el`, `id`, `className`, `tagName`, `attributes` and `events`. If the view defines an **initialize** function, it will be called when the view is first created. If you'd like to create a view that references an element *already* in the DOM, pass in the element as an option: `new View({el: existingElement})`

```
var doc = documents.first();

new DocumentRow({
  model: doc,
  id: "document-row-" +
doc.id
});
```

el `view.el`
All views have a DOM element at all times (the **el** property), whether they've already been inserted into the page or not. In this fashion, views can be rendered at any time, and inserted into the DOM all at once, in order to get high-performance UI rendering with as few reflows and repaints as possible.

`this.el` can be resolved from a DOM selector string or an Element; otherwise it will be created from the view's `tagName`, `className`, `id` and `attributes` properties. If none are set, `this.el` is an empty `div`, which is often just fine. An **el** reference may also be passed in to the view's constructor.

```
var ItemView =
Backbone.View.extend({
  tagName: 'li'
});

var BodyView =
Backbone.View.extend({
  el: 'body'
});

var item = new ItemView();
var body = new BodyView();

alert(item.el + ' ' + body.el);
```

$el`view.$el`
A cached jQuery object for the view's element. A handy reference instead of re-wrapping the DOM element all the time.

```
view.$el.show();

listView.$el.append(itemView.el);
```

setElement`view.setElement(element)`
If you'd like to apply a Backbone view to a different DOM element, use **setElement**, which will also create the cached `$el` reference and move the view's delegated events from the old element to the new one.

attributes`view.attributes`
A hash of attributes that will be set as HTML DOM element attributes on the view's `el` (id, class, data-properties, etc.), or a function that returns such a hash.

$ (jQuery)`view.$(selector)`
If jQuery is included on the page, each view has a **$** function that runs queries scoped within the view's element. If you use this scoped jQuery function, you don't have to use model ids as part of your query to pull out specific elements in a list, and can rely much more on HTML class attributes. It's equivalent to running: `view.$el.find(selector)`

```
ui.Chapter = Backbone.View.extend({
  serialize : function() {
    return {
      title: this.$(".title").text(),
      start: this.$(".start-
page").text(),
      end:   this.$(".end-page").text()
    };
  }
});
```

template`view.template([data])`
While templating for a view isn't a function provided directly by Backbone, it's often a nice convention to define a **template** function on your views. In this way, when rendering your view, you have convenient access to instance data. For example, using Underscore templates:

```
var LibraryView =
Backbone.View.extend({
  template: _.template(...)
});
```

render`view.render()`
The default implementation of **render** is a no-op. Override this function with your code that renders the view template from model data, and updates `this.el` with the new HTML. A good convention is to `return this` at the end of **render** to enable chained calls.

```
var Bookmark = Backbone.View.extend({
  template: _.template(...),
  render: function() {

this.$el.html(this.template(this.model.attributes));
    return this;
  }
});
```

Backbone is agnostic with respect to your preferred method of HTML templating. Your **render** function could even munge together an HTML string, or use `document.createElement` to generate a DOM tree. However, we suggest choosing a nice JavaScript templating library. Mustache.js, Haml-js, and Eco are all fine alternatives. Because Underscore.js is already on the page, _.template is available, and is an excellent choice if you prefer simple interpolated-JavaScript style templates.

Whatever templating strategy you end up with, it's nice if you *never* have to put strings of HTML in your JavaScript. At DocumentCloud, we use Jammit in order to package up JavaScript templates stored in `/app/views` as part of our main `core.js` asset package.

remove`view.remove()`
Removes a view and its `el` from the DOM, and calls stopListening to remove any bound events that the view has listenTo'd.

`view.events or`
events`view.events()`
The **events** hash (or method) can be used to specify a set of DOM events that will be bound to methods on your View through delegateEvents.

Backbone will automatically attach the event listeners at instantiation time, right before invoking initialize.

```
var ENTER_KEY = 13;
var InputView = Backbone.View.extend({

  tagName: 'input',

  events: {
    "keydown" : "keyAction",
  },

  render: function() { ... },

  keyAction: function(e) {
    if (e.which === ENTER_KEY) {
      this.collection.add({text:
this.$el.val()});
    }
  }
});
```

delegateEvents`delegateEvents([events])`
Uses jQuery's `on` function to provide declarative callbacks for DOM events within a view. If an **events** hash is not passed directly, uses `this.events` as the source. Events are written in the format `{"event selector": "callback"}`. The callback may be either the name of a method on the view, or a direct function body. Omitting the `selector` causes the event to be bound to the view's root element (`this.el`). By default, `delegateEvents` is called within the View's constructor for you, so if you have a simple `events` hash, all of your DOM events will always already be connected, and you will never have to call this function yourself.

The `events` property may also be defined as a function that returns an **events** hash, to make it easier to programmatically define your events, as well as inherit them from parent views.

Using **delegateEvents** provides a number of advantages over manually using jQuery to bind events to child elements during render. All attached callbacks are bound to the view before being handed off to jQuery, so when the callbacks are invoked, `this` continues to refer to the view object. When **delegateEvents** is run again, perhaps with a different `events` hash, all callbacks are removed and delegated afresh — useful for views which need to behave differently when in different modes.

A single-event version of **delegateEvents** is available as `delegate`. In fact, **delegateEvents** is simply a multi-event wrapper around `delegate`. A counterpart to `undelegateEvents` is available as `undelegate`.

A view that displays a document in a search result might look something like this:

```
var DocumentView = Backbone.View.extend({

  events: {
    "dblclick"                : "open",
    "click .icon.doc"         : "select",
    "contextmenu .icon.doc"   : "showMenu",
    "click .show_notes"       : "toggleNotes",
    "click .title .lock"      : "editAccessLevel",
    "mouseover .title .date"  : "showTooltip"
  },

  render: function() {

this.$el.html(this.template(this.model.attributes));
    return this;
  },

  open: function() {
    window.open(this.model.get("viewer_url"));
  },

  select: function() {
    this.model.set({selected: true});
  },

  ...

});
```

undelegateEvents`undelegateEvents()`
Removes all of the view's delegated events. Useful if you want to disable or remove a view from the DOM temporarily.

Utility

Backbone.noConflict`var backbone = Backbone.noConflict();`
Returns the `Backbone` object back to its original value. You can use the return value of `Backbone.noConflict()` to keep a local reference to Backbone. Useful for embedding Backbone on third-party websites, where you don't want to clobber the existing Backbone.

```
var localBackbone = Backbone.noConflict();
var model =
localBackbone.Model.extend(...);
```

Backbone.$`Backbone.$ = $;`
If you have multiple copies of `jQuery` on the page, or simply want to tell Backbone to use a particular object as its DOM / Ajax library, this is the property for you.

```
Backbone.$ = require('jquery');
```

F.A.Q.

Why use Backbone, not [other framework X]?
If your eye hasn't already been caught by the adaptability and elan on display in the above list of examples, we can get more specific: Backbone.js aims to provide the common foundation that data-rich web applications with ambitious interfaces require — while very deliberately avoiding painting you into a corner by making any decisions that you're better equipped to make yourself.

- The focus is on supplying you with helpful methods to manipulate and query your data, not on HTML widgets or reinventing the JavaScript object model.
- Backbone does not force you to use a single template engine. Views can bind to HTML constructed in your favorite way.
- It's smaller. There are fewer kilobytes for your browser or phone to download, and less *conceptual* surface area. You can read and understand the source in an afternoon.
- It doesn't depend on stuffing application logic into your HTML. There's no embedded JavaScript, template logic, or binding hookup code in `data-` or `ng-` attributes, and no need to invent your own HTML tags.
- Synchronous events are used as the fundamental building block, not a difficult-to-reason-about run loop, or by constantly polling and traversing your data structures to hunt for changes. And if you want a specific event to be asynchronous and aggregated, no problem.
- Backbone scales well, from embedded widgets to massive apps.
- Backbone is a library, not a framework, and plays well with others. You can embed Backbone widgets in Dojo apps without trouble, or use Backbone models as the data backing for D3 visualizations (to pick two entirely random examples).
- "Two-way data-binding" is avoided. While it certainly makes for a nifty demo, and works for the most basic CRUD, it doesn't tend to be terribly useful in your real-world app. Sometimes you want to update on every keypress, sometimes on blur, sometimes when the panel is closed, and sometimes when the "save" button is clicked. In almost all cases, simply serializing the form to JSON is faster and easier. All that aside, if your heart is set, go for it.
- There's no built-in performance penalty for choosing to structure your code with Backbone. And if you do want to optimize further, thin models and templates with flexible granularity make it easy to squeeze every last drop of potential performance out of, say, IE8.

There's More Than One Way To Do It
It's common for folks just getting started to treat the examples listed on this page as some sort of gospel truth. In fact, Backbone.js is intended to be fairly agnostic about many common patterns in client-side code. For example...

References between Models and Views can be handled several ways. Some people like to have direct pointers, where views correspond 1:1 with models (`model.view` and `view.model`). Others prefer to have intermediate "controller" objects that orchestrate the creation and organization of views into a hierarchy. Others still prefer the evented approach, and always fire events instead of calling methods directly. All of these styles work well.

Batch operations on Models are common, but often best handled differently depending on your server-side setup. Some folks don't mind making individual Ajax requests. Others create explicit resources for RESTful batch operations: `/notes/batch/destroy?ids=1,2,3,4`. Others tunnel REST over JSON, with the creation of "changeset" requests:

```
  {
    "create":  [array of models to create]
    "update":  [array of models to update]
    "destroy": [array of model ids to
destroy]
  }
```

Feel free to define your own events. Backbone.Events is designed so that you can mix it in to any JavaScript object or prototype. Since you can use any string as an event, it's often handy to bind and trigger your own custom events: `model.on("selected:true")` or `model.on("editing")`

Render the UI as you see fit. Backbone is agnostic as to whether you use Underscore templates, Mustache.js, direct DOM manipulation, server-side rendered snippets of HTML, or jQuery UI in your `render` function. Sometimes you'll create a view for each model ... sometimes you'll have a view that renders thousands of models at once, in a tight loop. Both can be appropriate in the same app, depending on the quantity of data involved, and the complexity of the UI.

Nested Models & Collections
It's common to nest collections inside of models with Backbone. For example, consider a `Mailbox` model that contains many `Message` models. One nice pattern for handling this is have a `this.messages` collection for each mailbox, enabling the lazy-loading of messages, when the mailbox is first opened ... perhaps with `MessageList` views listening for `"add"` and `"remove"` events.

```
var Mailbox = Backbone.Model.extend({

  initialize: function() {
    this.messages = new Messages;
    this.messages.url = '/mailbox/' + this.id +
'/messages';
    this.messages.on("reset", this.updateCounts);
  },

  ...

});

var inbox = new Mailbox;

// And then, when the Inbox is opened:

inbox.messages.fetch({reset: true});
```

If you're looking for something more opinionated, there are a number of Backbone plugins that add sophisticated associations among models, available on the wiki.

Backbone doesn't include direct support for nested models and collections or "has many" associations because there are a number of good patterns for modeling structured data on the client side, and *Backbone should provide the foundation for implementing any of them.* You may want to…

- Mirror an SQL database's structure, or the structure of a NoSQL database.
- Use models with arrays of "foreign key" ids, and join to top level collections (a-la tables).
- For associations that are numerous, use a range of ids instead of an explicit list.
- Avoid ids, and use direct references, creating a partial object graph representing your data set.

- Lazily load joined models from the server, or lazily deserialize nested models from JSON documents.

Loading Bootstrapped Models
When your app first loads, it's common to have a set of initial models that you know you're going to need, in order to render the page. Instead of firing an extra AJAX request to fetch them, a nicer pattern is to have their data already bootstrapped into the page. You can then use reset to populate your collections with the initial data. At DocumentCloud, in the ERB template for the workspace, we do something along these lines:

```
<script>
  var accounts = new Backbone.Collection;
  accounts.reset(<%= @accounts.to_json %>);
  var projects = new Backbone.Collection;
  projects.reset(<%= @projects.to_json(:collaborators => true)
%>);
</script>
```

You have to escape `</` within the JSON string, to prevent javascript injection attacks.

Extending Backbone
Many JavaScript libraries are meant to be insular and self-enclosed, where you interact with them by calling their public API, but never peek inside at the guts. Backbone.js is *not* that kind of library.

Because it serves as a foundation for your application, you're meant to extend and enhance it in the ways you see fit — the entire source code is annotated to make this easier for you. You'll find that there's very little there apart from core functions, and most of those can be overridden or augmented should you find the need. If you catch yourself adding methods to `Backbone.Model.prototype`, or creating your own base subclass, don't worry — that's how things are supposed to work.

How does Backbone relate to "traditional" MVC?
Different implementations of the Model-View-Controller pattern tend to disagree about the definition of a controller. If it helps any, in Backbone, the View class can also be thought of as a kind of controller, dispatching events that originate from the UI, with the HTML template serving as the true view. We call it a View because it represents a logical chunk of UI, responsible for the contents of a single DOM element.

Comparing the overall structure of Backbone to a server-side MVC framework like **Rails**, the pieces line up like so:

- **Backbone.Model** – Like a Rails model minus the class methods. Wraps a row of data in business logic.
- **Backbone.Collection** – A group of models on the client-side, with sorting/filtering/aggregation logic.
- **Backbone.Router** – Rails `routes.rb` + Rails controller actions. Maps URLs to functions.
- **Backbone.View** – A logical, re-usable piece of UI. Often, but not always, associated with a model.
- **Client-side Templates** – Rails `.html.erb` views, rendering a chunk of HTML.

Binding "this"
Perhaps the single most common JavaScript "gotcha" is the fact that when you pass a function as a callback, its value for `this` is lost. When dealing with events and callbacks in Backbone, you'll often find it useful to rely on listenTo or the optional `context` argument that many of Underscore and Backbone's methods use to specify the `this` that will be used when the callback is later invoked. (See _.each, _.map, and object.on, to name a few). View events are automatically bound to the view's context for you. You may also find it helpful to use _.bind and _.bindAll from Underscore.js.

```
var MessageList = Backbone.View.extend({

  initialize: function() {
    var messages = this.collection;
    messages.on("reset", this.render, this);
    messages.on("add", this.addMessage, this);
    messages.on("remove", this.removeMessage,
this);

    messsages.each(this.addMessage, this);
  }

});

// Later, in the app...

Inbox.messages.add(newMessage);
```

Working with Rails
Backbone.js was originally extracted from a Rails application; getting your client-side (Backbone) Models to sync correctly with your server-side (Rails) Models is painless, but there are still a few things to be aware of.

By default, Rails versions prior to 3.1 add an extra layer of wrapping around the JSON representation of models. You can disable this wrapping by setting:

```
ActiveRecord::Base.include_root_in_json =
false
```

... in your configuration. Otherwise, override parse to pull model attributes out of the wrapper. Similarly, Backbone PUTs and POSTs direct JSON representations of models, where by default Rails expects namespaced attributes. You can have your controllers filter attributes directly from `params`, or you can override toJSON in Backbone to add the extra wrapping Rails expects.