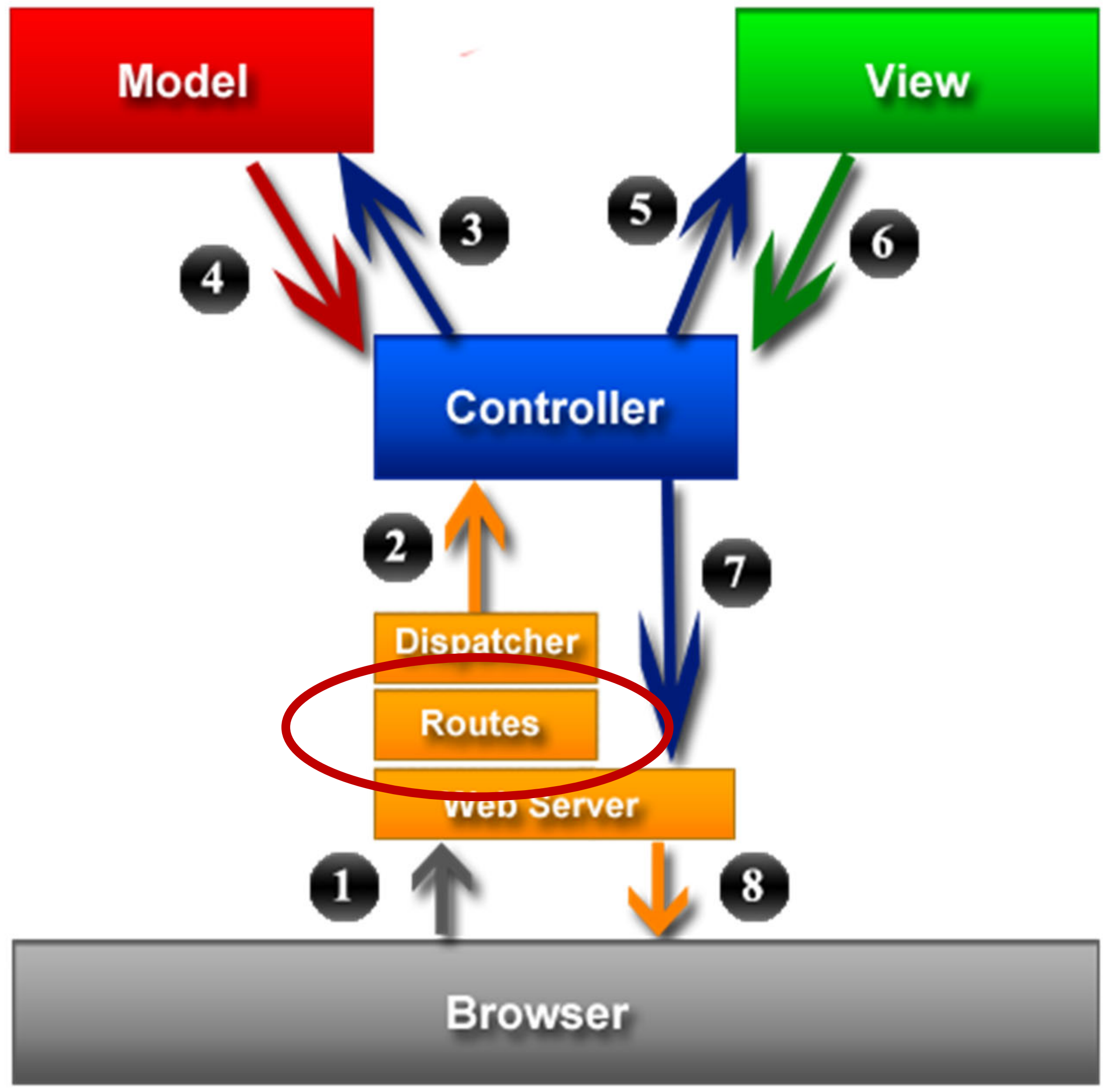
Rails: Routes

Lecture 30

Recall: Rails Architecture



Recall: Passing Args with HTTP

- GET

```
GET /passwords/?num=5&len=8&format=plain
HTTP/1.1
Host: www.random.org
```

- POST

```
POST /passwords/ HTTP/1.1
Host: www.random.org
Content-Type: application/x-www-form-
urlencoded
Content-Length: 24

num=5&len=8&format=plain
```

Configuration

- Need to map an HTTP request (verb, URL, parameters) to an application action (a method in a Ruby class)
  - Framework invokes the method, passing in parameters from HTTP request as arguments
  - Results in an HTTP response, typically with an HTML payload, sent back to client's browser
- These mappings are called *routes*
- Defined in **`config/routes.rb`**
  - Ruby code, but highly stylized (another DSL)
  - Checked top to bottom for first match

Basic Route

- Pattern string and application action
  - In config/routes.rb
  - Pattern string usually contains *segments*
- Example route

```
get 'status/go/:system/memory/:seg',
    to: 'reporter#show'
```

- Matches any HTTP request like

```
GET /status/go/lander/memory/0?page=3
```

- Result:
  - Instantiates `ReporterController`
  - Invokes `show` method on that new instance
  - Provides a hash-like object called `params`

```
params == { system: "lander",
            seg: "0",
            page: "3" }
```

Default Values

- Special segments
  - `:controller` - the controller class to use
  - `:action` - the method to invoke in that controller
- Example route

```
get ':controller/go/:action/:system'
```

- Matches *any* HTTP request like

```
GET /reporter/go/show/lander?page=3
```

- Result:
  - Instantiates `ReporterController`
  - Invokes `show` method on that new instance
  - Provides an object called `params`

```
params == { system: "lander",
            page: "3",
            # also :controller and :action }
```

- Note: Not recommended
  - Opens app up too much to scary internet

Customizing Routes

- Recognize different HTTP verb(s)
  - `get, put, post, delete`
  - Alternative: `match via: [:get, :post]`
- Optional segments with `( )`

```
get ':controller(/:action(/:id))'
```

- Default values for params

```
get 'photos/:id', to: 'photos#show',
    defaults: { format: 'jpg' }
```

REST

- REpresentational State Transfer
  - An architectural style for web applications
  - Maps database operations to HTTP requests
- Small set of database operations (CRUD)
  - Create, Read, Update, Delete
- Small set of HTTP verbs, with fixed semantics (*e.g.*, idempotence)
  - GET, POST, PUT, DELETE
- The protocol is stateless
- *Resource*: bundle of (server-side) state
  - Each resource is identified by a URL

Resources

- A resource could be an individual *member*
  - Example: a single student
  - Corresponds to a row in a table
- A resource could be a *collection* of items
  - Example: a set of students
  - Corresponds to a table
- In REST, resources have URLs
  - Each member element has its own URL
    `http://quickrosters.com/students/42`
  - Each collection has its own URL
    `http://quickrosters.com/students`

Read Collection: GET

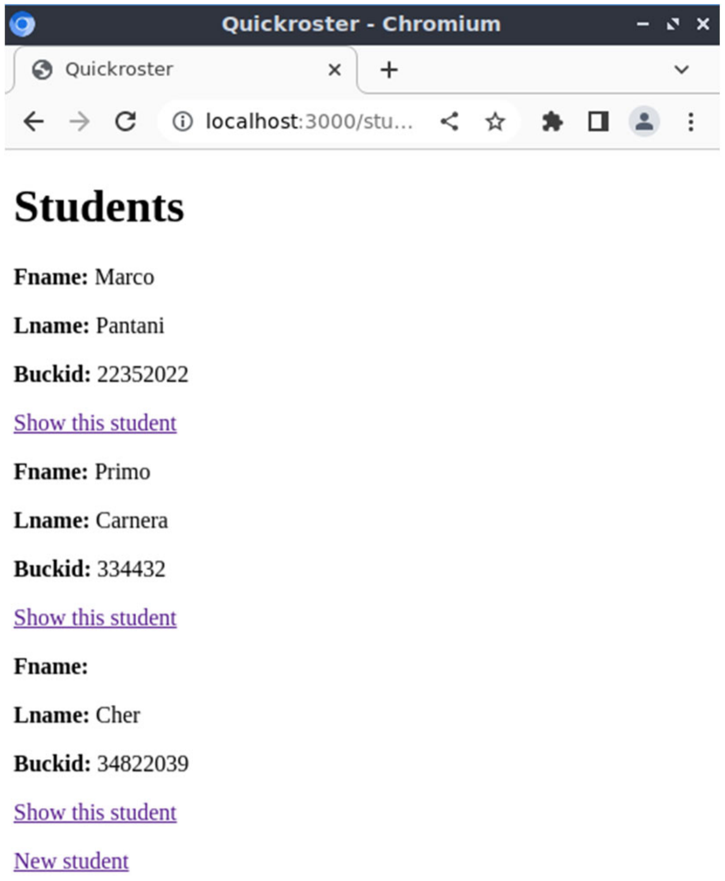
```
GET /students HTTP/1.1
Host: quickrosters.com
```

Request

Read Collection: GET

```
GET /students HTTP/1.1
Host: quickrosters.com
```

Request



Students

Fname: Marco

Lname: Pantani

Buckid: 22352022

Show this student

Fname: Primo

Lname: Carnera

Buckid: 334432

Show this student

Fname:

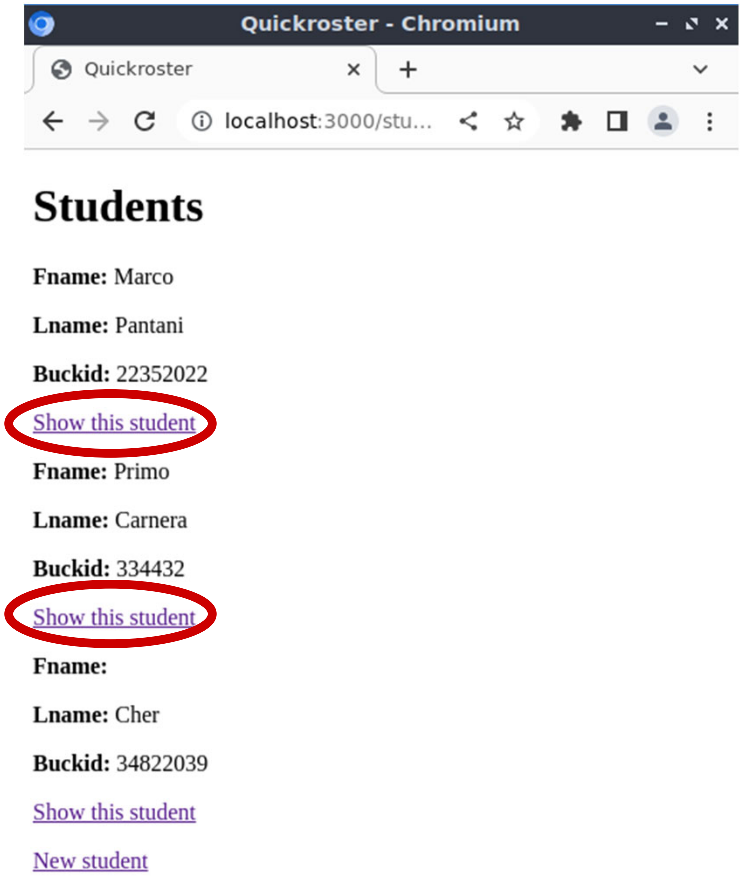
Lname: Cher

Buckid: 34822039

Show this student

New student

Read Collection: GET



Students

Fname: Marco

Lname: Pantani

Buckid: 22352022

Show this student

Fname: Primo

Lname: Carnera

Buckid: 334432

Show this student

Fname:

Lname: Cher

Buckid: 34822039

Show this student

New student

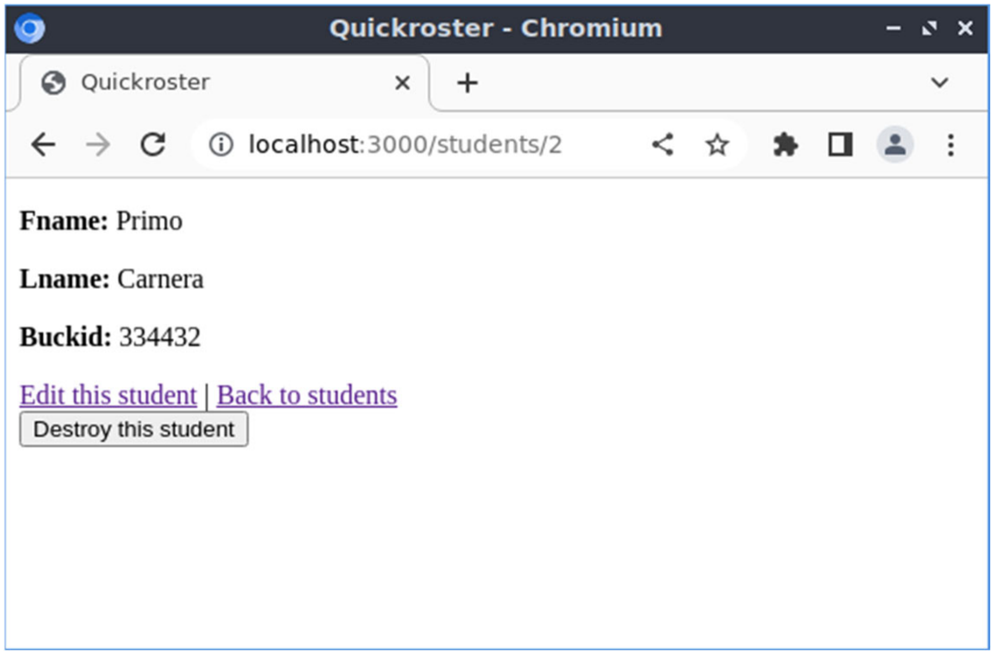
HTML Source (GET Collection)

```
…
<h1>Students</h1>

<div id="students">
    <div id="student_1">
        <p> <strong>Fname:</strong> Marco </p>
        <p> <strong>Lname:</strong> Pantani </p>
        <p> <strong>Buckid:</strong> 22352022 </p>
    </div>
    <p> <a href="/students/1">Show this student</a> </p>
    <div id="student_2">
        <p> <strong>Fname:</strong> Primo </p>
        <p> <strong>Lname:</strong> Carnera </p>
        <p> <strong>Buckid:</strong> 334432 </p>
    </div>
    <p> <a href="/students/2">Show this student</a> </p>
    …
    <a href="/students/new">New student</a>
</div>
…
```

Read Member: GET

```
GET /students/2
```



Fname: Primo

Lname: Carnera

Buckid: 334432

Edit this student | Back to students

Destroy this student

Minimal Set of Routes (R)

	Collection `/students`	**Member** `/students/42`
GET	List all members	Show info about a member
PUT		
POST		
DELETE		

Minimal Set of Routes (CR)

	Collection `/students`	**Member** `/students/42`
GET	List all members	Show info about a member
PUT		
POST		
DELETE		

- How to map "create member" action?
  - Member doesn't exist ➔ target is … ?
  - Creation *is not* idempotent ➔ verb is … ?

Minimal Set of Routes (CR)

	Collection `/students`	**Member** `/students/42`
GET	List all members	Show info about a member
PUT		
POST		
DELETE		

- How to map "create member" action?
  - Member doesn't exist ➔ target is collection
  - Creation *is not* idempotent ➔ verb is post

Minimal Set of Routes (CR)

	Collection `/students`	**Member** `/students/42`
GET	List all members	Show info about a member
PUT		
POST	Create a new member	
DELETE		

- How to map "create member" action?
  - Member doesn't exist ➔ target is collection
  - Creation is not idempotent ➔ verb is post

Minimal Set of Routes (CRU)

	Collection `/students`	**Member** `/students/42`
GET	List all members	Show info about a member
PUT		
POST	Create a new member	
DELETE		

- How to map "update member" action?
  - Target is… a member
  - Update overwrites, so it *is* idempotent…

Minimal Set of Routes (CRU)

	Collection `/students`	**Member** `/students/42`
GET	List all members	Show info about a member
PUT		Update member
POST	Create a new member	
DELETE		

- How to map "update member" action?
  - Target is a member
  - Update overwrites, so it is idempotent…

Minimal Set of Routes (CRUD)

	Collection `/students`	**Member** `/students/42`
GET	List all members	Show info about a member
PUT		Update member
POST	Create a new member	
DELETE		Delete this member

- Delete action destroys a member

Minimal Set of Routes

	Collection `/students`	**Member** `/students/42`
GET	List all members	Show info about a member
PUT		Update member
POST	Create a new member	
DELETE		Delete this member

- Implications
  - You can't delete a collection
  - No idempotent operations on collection

Typical Workflow: Delete

- How does one destroy a member?
  - Need to issue an HTTP request:

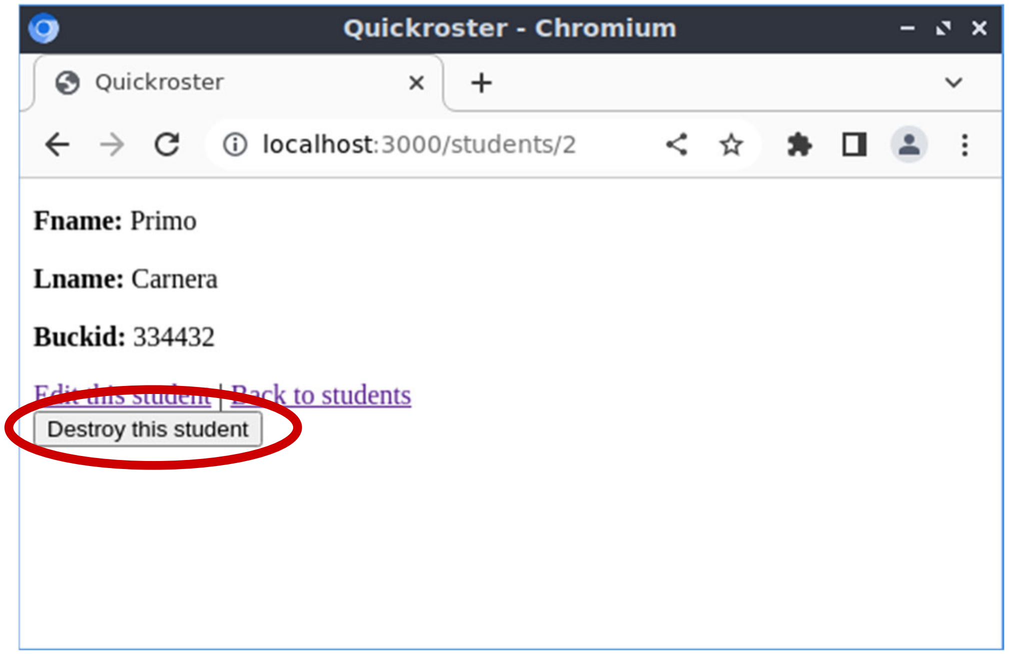
```
DELETE /students/4
```

- Protocol:
  - GET the member to see the details
  - Click a button on that page to issue a DELETE for that member

GET Member, Then DELETE

`GET /students/2`

Request



Fname: Primo

Lname: Carnera

Buckid: 334432

Edit this student | Back to students

`DELETE /students/2`

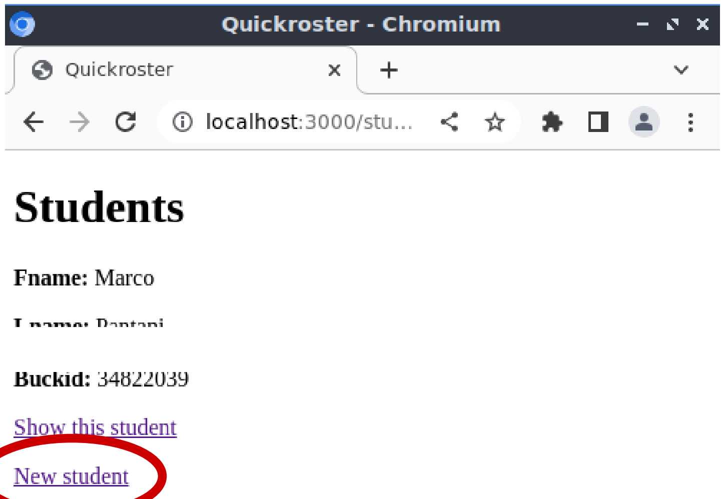
HTML of Member (for DELETE)

```
…
<div id="student_2">
  <p> <strong>Fname:</strong> Primo </p>
  <p> <strong>Lname:</strong> Carnera </p>
  <p> <strong>Buckid:</strong> 334432 </p>
</div>
<div>
  <a href="/students/2/edit">Edit this student</a> |
  <a href="/students">Back to students</a>
  <form class="button_to"
        method="post"
        action="/students/2">
    <input type="hidden" name="_method" value="delete" />
    <button type="submit">Destroy this student</button>
  </form>
</div>
```

Typical Workflow: Create

- How does one issue a POST on collection?
  - GET a (blank) form
  - Fill in fields of form
  - Click a button to submit, resulting in the POST
- That first GET is *a new route*
  - GET on the collection
  - But instead of a list of members, the result is a form to be filled in and submitted

GET Blank Form, POST the Form



Students

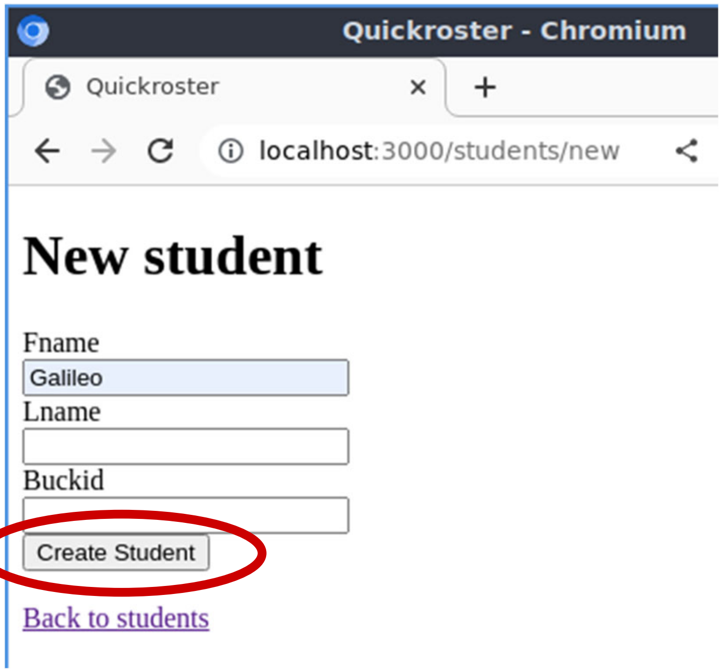
Fname: Marco

Lname: Pantani

Buckid: 34822039

Show this student

New student



New student

Fname

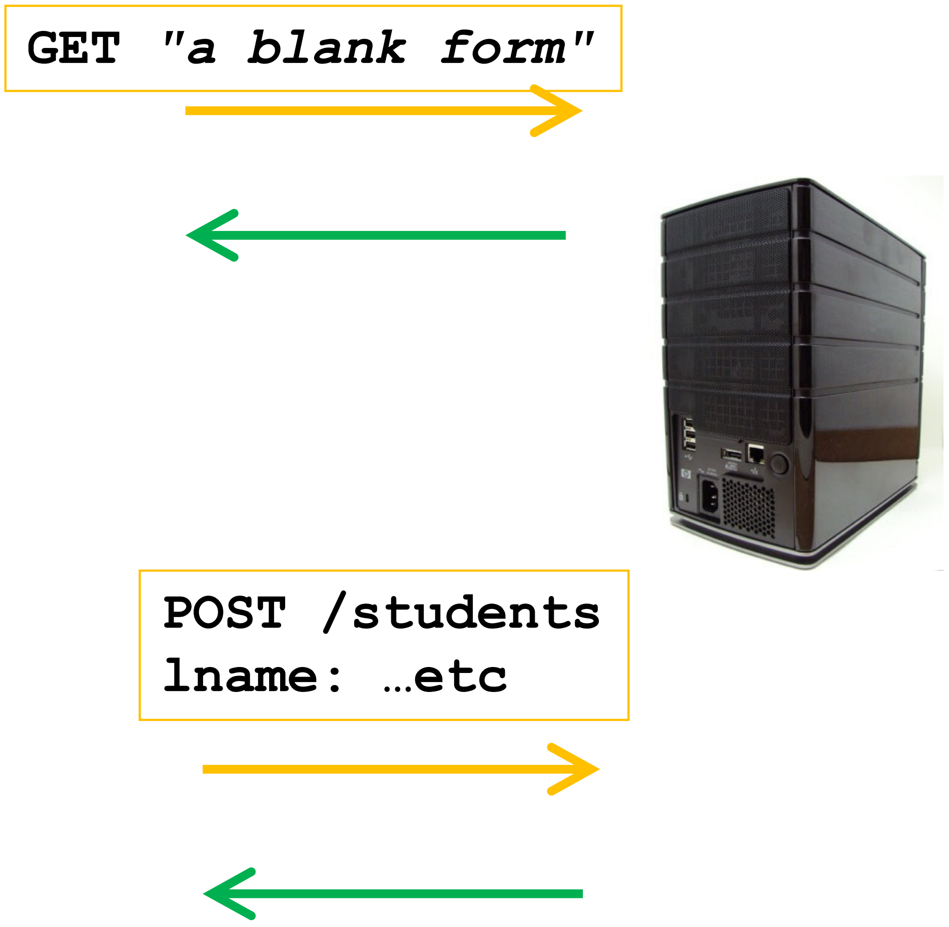
Galileo

Lname

Buckid

Create Student

Back to students



Standard Set of Routes

	Collection `/students`	**Member** `/students/42`
GET	1. List all members 2. Form for entering a new member's data	1. Show info about a member
PUT		Update member
POST	Create a new member	
DELETE		Delete this member

HTML of Collection

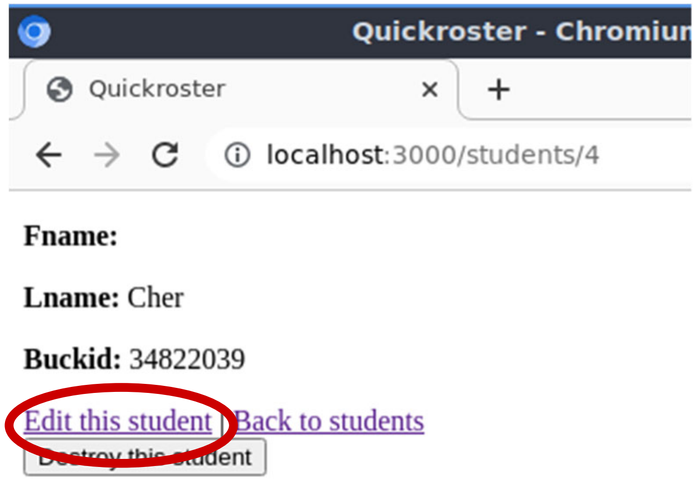
```
…
<h1>Students</h1>

<div id="students">
    <div id="student_1">
        <p> <strong>Fname:</strong> Marco </p>
        <p> <strong>Lname:</strong> Pantani </p>
        <p> <strong>Buckid:</strong> 22352022 </p>
    </div>
    <p> <a href="/students/1">Show this student</a> </p>
    <div id="student_2">
        <p> <strong>Fname:</strong> Primo </p>
        <p> <strong>Lname:</strong> Carnera </p>
        <p> <strong>Buckid:</strong> 334432 </p>
    </div>
    <p> <a href="/students/2">Show this student</a> </p>
    …
    <a href="/students/new">New student</a>
</div>
…
```

Typical Workflow: Update

- How does one issue a PUT on a member?
  - GET a (populated) form
  - Edit the fields of the form
  - Click a button to send, resulting in the PUT
- That first GET is *a new route*
  - GET on a member
  - But instead of a display of information about that member, the result is a populated form to modify and submit

GET Filled Form, PUT the Form



Quickroster - Chromium

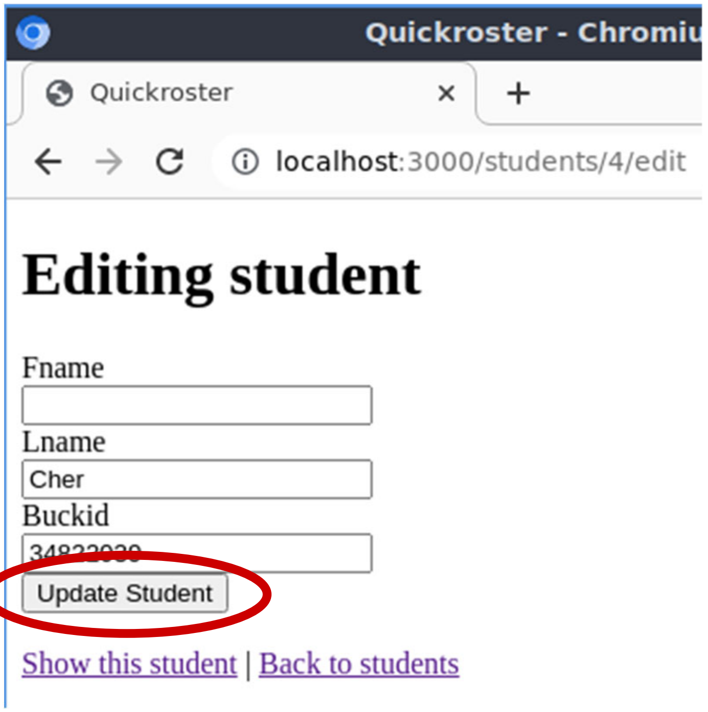
Quickroster

localhost:3000/students/4

Fname:

Lname: Cher

Buckid: 34822039



localhost:3000/students/4/edit

Editing student

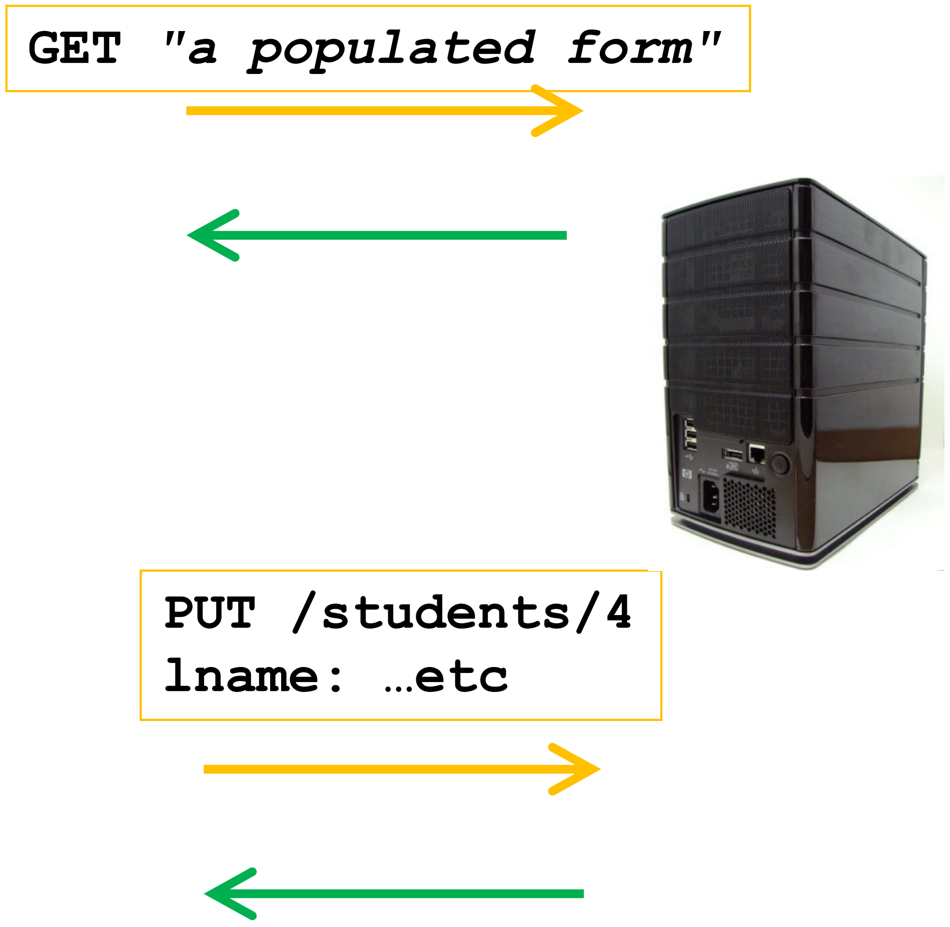
Fname

Lname

Cher

Buckid

34822039



Standard Set of Routes

	Collection `/students`	**Member** `/students/42`
GET	1. List all members 2. Form for entering a new member's data	1. Show info about a member 2. Form for editing an existing member's data
PUT		Update member
POST	Create a new member	
DELETE		Delete this member

HTML of Member

```
…
<div id="student_2">
  <p> <strong>Fname:</strong> Primo </p>
  <p> <strong>Lname:</strong> Carnera </p>
  <p> <strong>Buckid:</strong> 334432 </p>
</div>
<div>
  <a href="/students/2/edit">Edit this student</a> |
  <a href="/students">Back to students</a>
  <form class="button_to"
        method="post"
        action="/students/2">
    <input type="hidden" name="_method" value="delete" />
    <button type="submit">Destroy this student</button>
  </form>
</div>
```

Rails Resource-Based Routes

- For a resource like :students, the action pack includes
  - 1 controller (StudentsController)
  - 7 routes (each with a method in controller)
  - 4 Views (list of students, show 1 student, new, edit)

HTTP Verb	URL	Resource	Method	Response (View)
`GET`	`/students`	Collection	`index`	list all
`POST`	`/students`	Collection	`create`	show one
`GET`	`/students/new`	Collection	`new`	blank form
`GET`	`/students/3`	Member	`show`	show one
`GET`	`/students/3/edit`	Member	`edit`	filled form
`PUT`	`/students/3`	Member	`update`	show one
`DELETE`	`/students/3`	Member	`destroy`	list all

Defining Resource-Based Routes

- In RosterTool app's `config/routes.rb`

```
Rails.application.routes.draw do
  resources :students
  resources :faculty
end
```

Customizing Routes

- To change which 7 routes are created

```
resources :students, except:
                         [:update, :destroy]
resources :grades, only: [:index, :show]
```

- To specify a particular controller

```
resources :students, controller: 'ugrads'
```

- To rename certain actions

```
resources :students, path_names:
                       { create: 'enroll' }
```

- To add more routes to standard set
  - Add `GET /students/:id/avatar` (*i.e.* on member)
  - Add `GET /students/search` (*i.e.* on collection)

```
resources :students do
  get 'avatar', on: :member
  get 'search', on: :collection
end
```

Segment Keys

- URL request has *arguments* for controller
  - Example: products/42
  - Pattern string: 'products/:id'
- Segment key gets value when route matches
- Controller gets a hash (called **`params`**) of segment keys and their values
  - Example: **`params[:id]`** is **`'42'`**
- Common case: Look up an item by id

```
def set_product
  @product = Product.find(params[:id])
end
```

Recognition vs Generation

- Dual problems
  - Recognize a URL (request for an action)
  - Generate a URL (a hyperlink or redirect)
- Routes used for both!
- For generation, route must be *named*

```
get 'status/:seg', to: 'reporter#show',
    as: :info
```

- Results in two helpers (_path, _url)

```
info_path(4)#=> "/status/4"
info_url(4) #=> "http://faces.com/status/4"
```

- Used with `link_to` to generate hyperlinks

```
link_to 'S', info_path(4), class: 'btn'
#=> "<a class='btn' href='/status/4'>S</a>"
```

Helper Methods for Resources

- Resource-based routes have names

```
photos_path          #=> /photos
photos_url           #=> http://faces.com/photos
new_photo_path       #=> /photos/new
photo_path(:id)      #=> /photos/4
edit_photo_path(:id) #=> /photos/4/edit
```

Name	HTTP	URL	Resource	Method
`photos`	`GET`	`/photos`	Collection	`index`
	`POST`	`/photos`	Collection	`create`
`new_photo`	`GET`	`/photos/new`	Collection	`new`
`photo`	`GET`	`/photos/3`	Member	`show`
`edit_photo`	`GET`	`/photos/3/edit`	Member	`edit`
	`PUT`	`/photos/3`	Member	`update`
	`DELETE`	`/photos/3`	Member	`destroy`

Debugging Routes and Helpers

- To see the full list of routes

```
$ rails routes
    Prefix Verb URI Pattern          Contr#Action
      info GET  /status/:seg         reporter#show
    photos GET  /photos              photos#index
           POST /photos              photos#create
     photo GET  /photo/:id           photos#show
edit_photo GET  /photos/:id/edit …
…etc…
```

- To see/use helpers in the console

```
$ rails console
> app.edit_photo_path(42)
=> "/photos/42/edit"
> helper.link_to 'Click here',
    app.edit_photo_path(42)
=> "<a href=\"/photos/42/edit\">Click here</a>"
```

Root Route

- With no matching route, **`GET`** for **`http://example.com`** gets index.html from application's public directory
- To customize landing page, 2 choices:
  - Create public/index.html
  - Add **`root`** route to config/routes.rb, pointing to a controller#action (better)

```
root to: "welcome#index"
```

Summary

- REST and CRUD
  - Create, read, update, destroy
  - Map data to resources
  - Map actions to HTTP requests (verb + URL)
- Routes
  - Connect HTTP request to specific method in a controller class
  - Defined in config/routes.rb
  - Resource based, or match-based
  - Dual problem: recognition and generation