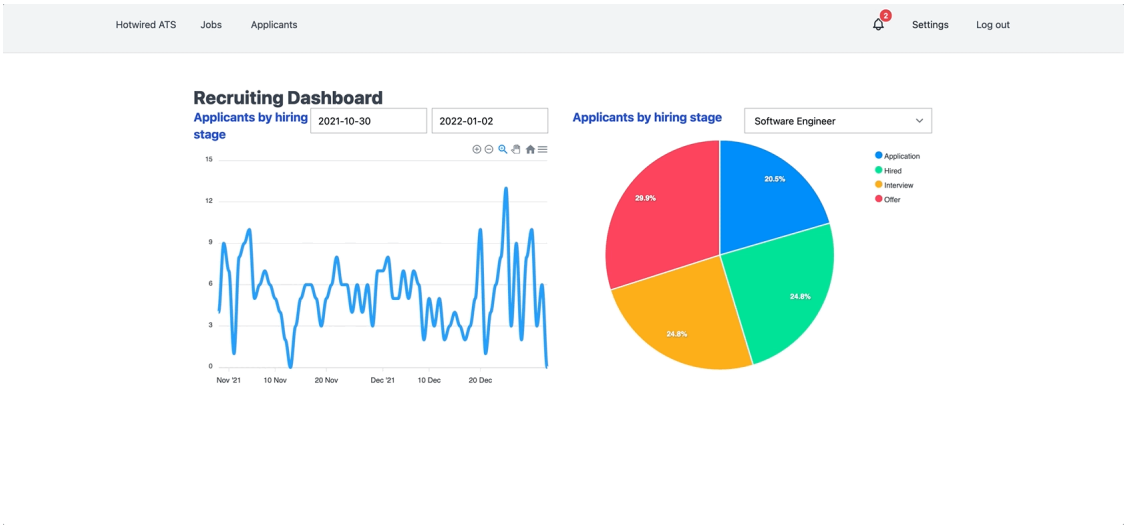
Interactive charts with StimulusReflex

When you are building spreadsheet replacement applications for business users, you will inevitably need to build charts and graphs to help users learn about trends in their account, share updates with executives, and use data to make decisions. Also, a certain segment of users just love looking at pretty charts.

In this chapter, we are going to use ApexCharts and StimulusReflex to add two sample charts to the account dashboard, tracking inbound applicant volume over time and presenting a snapshot of the account's current hiring pipeline.

Users will be able to filter the charts in a variety of ways, with StimulusReflex handling updating the charts as the user changes their filters.

The finished version of the dashboard will look like this:



Applicants over time chart

The first chart we will build is a line chart displaying new applications received by day, with the day as the x-axis and the number of applications received that day as the y-axis.

Both charts will be created using **ApexCharts**. Install it from your terminal:

```
yarn add apexcharts
```

We will use StimulusReflex to handle initializing charts and re-rendering the chart when the user changes the chart filters.

First, create a new reflex from your terminal:

```
rails g stimulus_reflex applicants_chart
rails stimulus:manifest:update
```

Remember that generating a reflex creates both a server-side reflex (`**app/reflexes/applicants_chart_reflex.rb**`) and a client-side Stimulus controller (`**app/javascript/controllers/applicants_chart_controller.js**`). Update the Stimulus controller first:

app/javascript/controllers/applicants_chart_controller.js

```
import ApplicationController from
'./application_controller'
import ApexCharts from "apexcharts"

export default class extends ApplicationController {
  static targets = ["chart"]

  static values = {
    categories: Array,
    series: Array
  }

  initialize() {
    this.chart = new ApexCharts(this.chartTarget,
```

```
this.chartOptions);
    this.chart.render();
  }

  get chartOptions() {
    return {
      chart: {
        height: "400px",
        type: 'line',
      },
      series: [{
        name: 'Applicants',
        data: this.seriesValue
      }],
      xaxis: {
        categories: this.categoriesValue,
        type: 'datetime'
      },
      stroke: {
        curve: "smooth"
      }
    }
  }
}
```

This controller imports the `ApexChart` package and initializes a new chart, using `this.chartTarget` to attach the chart to a DOM element.

The data for the chart is read from the DOM using the `categories` and `series` values.

`chartOptions` tells ApexCharts what type of chart we want to create. The options here are all well documented in the ApexCharts **documentation**.

We need to connect the Stimulus controller to the DOM. Update the dashboard show page:

app/views/dashboard/show.html.erb

```
<div>
  <h2 class="mt-6 text-3xl font-extrabold text-gray-
700">
    Recruiting Dashboard
  </h2>
</div>
<div class="flex w-full space-x-8 sm:flex-col md:flex-
row flex-1">
  <div id="applicants-chart" class="sm:w-full md:w-
1/2">
    <%= render "applicants_chart", categories:
@categories, series: @series %>
  </div>
  <div id="hiring-stages-chart" class="sm:w-full md:w-
1/2">
    <!-- Build me next -->
  </div>
</div>
```

Here we have the basic structure of the new dashboard page layout, rendering an **`applicants_chart`** partial that will display the chart we are building now and with a placeholder for the hiring pipeline chart we will build next.

Notice that we are passing **`@categories`** and **`@series`** to the applicants chart partial. We will set these values in the **`dashboard`** controller for our first pass at this feature.

The **`applicants_chart`** partial does not exist yet. Create it now from your terminal:

```
touch app/views/dashboard/_applicants_chart.html.erb
```

And fill the new partial in with:

app/views/dashboard/_applicants_chart.html.erb

```
<div
  data-controller="applicants-chart"
  data-applicants-chart-categories-value="<%=
categories %>"
  data-applicants-chart-series-value="<%= series %>"
>
  <div class="flex justify-between">
    <h3 class="text-xl font-bold text-blue-
700">Applicants over time</h3>
  </div>
  <div data-applicants-chart-target="chart"></div>
</div>
```

This partial connects the `applicants-chart` controller to the DOM and adds an empty div with a `chart` target. This div will be populated with the chart from ApexCharts — recall the `initialize` function in `applicants_chart_controller.js`:

app/javascript/controllers/applicants_chart_controller.js

```
this.chart = new ApexCharts(this.chartTarget,
this.chartOptions);
```

This is a common pattern when working with third party JavaScript libraries that attach behavior to the browser. Stimulus initializes the library, sets the needed options, and then uses `initialize` or `connect` lifecycle methods along with `target` elements to add the desired behavior on the front end.

Earlier in this book we used a very similar pattern to enable drag and drop with Sortablejs.

With the partial ready to go, next we need to update the `DashboardController` to populate the `series` and `categories` values for the chart.

Head to the `DashboardController` and update it:

app/controllers/dashboard_controller.rb

```
class DashboardController < ApplicationController
  before_action :authenticate_user!

  def show
    report_data =
Charts::ApplicantsChart.new(current_user.account_id).gene

    @categories = report_data.keys.to_json
    @series = report_data.values.to_json
  end
end
```

Here, we are calling a new `Charts::ApplicantsChart` class to run the queries needed for the applicants chart, and using the data the `generate` method returns to set the `categories` and `series` values, transformed to `json` for use by `ApexCharts` on the frontend.

Before this will work, we need to define the `Charts::ApplicantsChart` class. Create the class from your terminal:

```
mkdir app/models/charts
touch app/models/charts/applicants_chart.rb
```

And then update the new class:

app/models/charts/applicants_chart.rb

```
class Charts::ApplicantsChart
  def initialize(account_id)
    @account_id = account_id
  end

  def generate
    applicants = query_data
    zero_fill_dates(applicants)
  end
```

```
  private

  def query_data
    Applicant
      .includes(:job)
      .for_account(@account_id)
      .where('applicants.created_at > ?', 90.days.ago)
      .group('date(applicants.created_at)')
      .count
  end

  def zero_fill_dates(applicants)

(90.days.ago.to_date..Date.today.to_date).each_with_objec
do |date, hash|
      hash[date] = applicants.fetch(date, 0)
    end
  end
end
```

Here we have a standard ActiveRecord query to fetch applicants that match the date range we are looking for (hard coded to the last 3 months, for now), grouped into a hash with the day the applicants were created as the keys and the number of applicants that applied that day as the values.

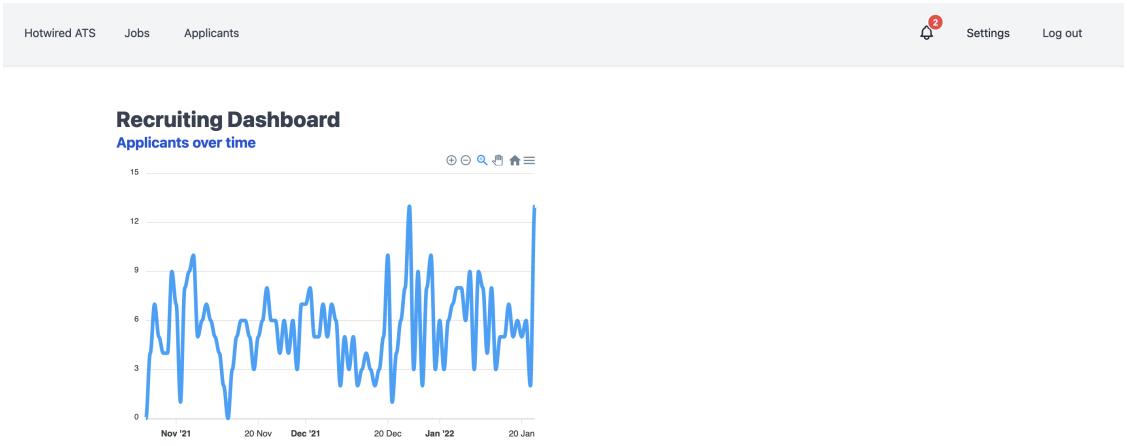
Then we use `zero_fill_dates` to populate the applicant data hash with any days that had zero applicants apply.

Application flow in an applicant tracking system can be very spiky. Especially in a row with zero applicants is common. Without this clean up step, our applicant flow chart could look very strange, with large chunks of time missing with no explanation.

With this new class defined and the `DashboardController` updated, we can head to http://localhost:3000/ and see our nice new line chart rendering.

You should generate some fake data for the applicants table to make the charts a little more interesting. You could use a tool like **faker** for this. Or, to keep things simple, you can run a script like this from the Rails console:

```
account = Account.first # whatever account you are testing
with
500.times do |n|
  Applicant.create(first_name: 'Test', last_name: 'Test',
email: "test#{n}@hotwiringrails.com", job:
account.jobs.sample, stage: Applicant.stages.values.sample,
created_at: rand(0..90).days.ago)
end
```



Before making this chart dynamic, let's create the second chart for the dashboard.

Hiring stages chart

The second chart on the dashboard is a pie chart showing a current snapshot of how applicants are distributed between the four hiring stages, from application to hire.

Like the applicants chart, the hiring stages chart will rely on StimulusReflex. Generate the reflex from your terminal to get started:

```
rails g stimulus_reflex hiring_stages
rails stimulus:manifest:update
```

And then fill in the `hiring_stages` Stimulus controller:

app/javascript/controllers/hiring_stages_controller.js

```
import ApplicationController from
'./application_controller'
import ApexCharts from "apexcharts"

export default class extends ApplicationController {
  static targets = ["chart"]

  static values = {
    labels: Array,
    series: Array
  }

  initialize() {
    this.chart = new ApexCharts(this.chartTarget,
this.chartOptions);
    this.chart.render();
  }

  get chartOptions() {
    return {
      chart: {
        type: 'pie',
        height: '400px'
      },
      series: this.seriesValue,
      labels: this.labelsValue,
    }
  }
}
```

This is very similar to the applicants chart controller, with different options and values.

Next, create the `hiring_stages_chart` class that we will use to query the database for the data we need to render the chart:

```
touch app/models/charts/hiring_stages_chart.rb
```

And fill that class in:

app/models/charts/hiring_stages_chart.rb

```
class Charts::HiringStagesChart
  def initialize(account_id)
    @account_id = account_id
  end

  def generate
    query_data
  end

  private

  def query_data
    Applicant
      .includes(:job)
      .for_account(@account_id)
      .group('stage')
      .count
  end
end
```

`query_data` returns a hash with stage names as the keys and the number of applicants in each stage as the values.

Update the `DashboardController` to build the data for the hiring stage chart:

app/controllers/dashboard_controller.rb

```
class DashboardController < ApplicationController
  before_action :authenticate_user!

  def show
    report_data =
Charts::ApplicantsChart.new(current_user.account_id).gene
    @categories = report_data.keys.to_json
    @series = report_data.values.to_json

    stage_data =
Charts::HiringStagesChart.new(current_user.account_id).ge
    @stage_labels =
stage_data.keys.map(&:humanize).to_json
    @stage_series = stage_data.values.to_json
  end
end
```

This action is getting a little messy. We will refactor it later in this chapter, but before refactoring our code, let's get the charts fully functional.

Next up, add the hiring stages partial from your terminal:

```
touch app/views/dashboard/_hiring_stages_chart.html.erb
```

And fill the new partial in:

app/views/dashboard/_hiring_stages_chart.html.erb

```
<div
  data-controller="hiring-stages"
  data-hiring-stages-labels-value="<%= stage_labels %>"
  data-hiring-stages-series-value="<%= stage_series %>"
  id="stage-chart-container"
>
  <div class="flex justify-between">
    <h3 class="text-xl font-bold text-blue-
700">Applicants by hiring stage</h3>
```

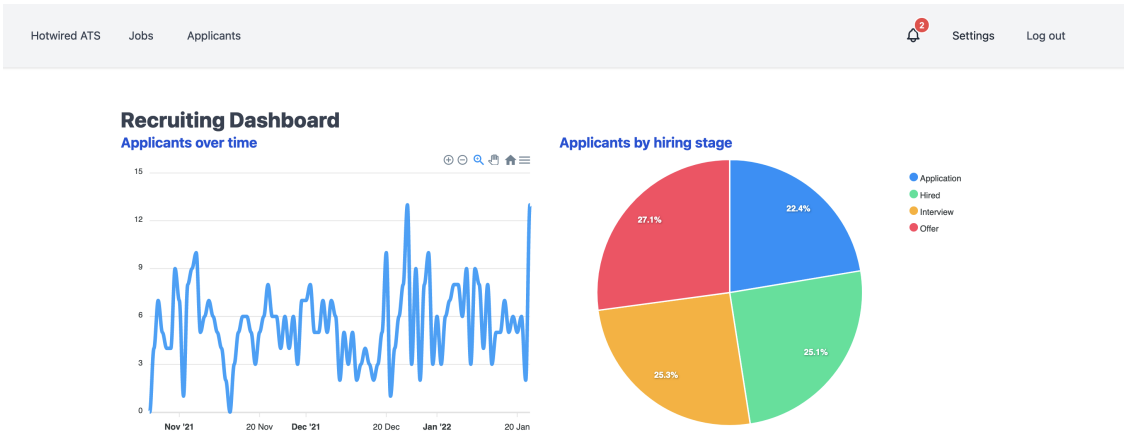
```
  </div>
  <div data-hiring-stages-target="chart"></div>
</div>
```

This is very similar to the applicants chart partial. Let's render this partial on the Dashboard show page:

app/views/dashboard/show.html.erb

```
<div>
  <h2 class="mt-6 text-3xl font-extrabold text-gray-
700">
    Recruiting Dashboard
  </h2>
</div>
<div class="flex w-full space-x-8 sm:flex-col md:flex-
row flex-1">
  <div class="sm:w-full md:w-1/2">
    <%= render "applicants_chart", categories:
@categories, series: @series %>
  </div>
  <div id="hiring-stages-chart" class="sm:w-full md:w-
1/2">
    <%= render "hiring_stages_chart", stage_labels:
@stage_labels, stage_series: @stage_series %>
  </div>
</div>
```

At this point, both of the charts we built display correctly when we visit the dashboard, but there is no way for the user to interact with them.



Charts are not very useful unless they can be adjusted to drill down (or zoom out) to the data the user cares about. Fortunately, with a little bit more StimulusReflex we can add filtering options to both charts. Let's tackle the hiring stages chart first.

Filter hiring stages chart

Most of the time, a user in an applicant tracking system is not interested in all of the data in their account. Instead, they are often interested in what is happening with a single job or type of job. In this section, we are going to add a job filter to the hiring stage chart so that users can see the current hiring stage breakdown for applicants in one job at a time.

Begin by updating the hiring stages partial to add a form with a select input above the chart:

app/views/dashboard/_hiring_stages.html.erb

```
<div
  data-controller="hiring-stages"
  data-hiring-stages-labels-value="<%= stage_labels %>"
  data-hiring-stages-series-value="<%= stage_series %>"
  id="stage-chart-container"
>
```

```
  <div class="flex justify-between">
    <h3 class="text-xl font-bold text-blue-
700">Applicants by hiring stage</h3>
    <form>
      <%= select_tag "job_id",
        options_for_select(

Job.for_account(current_user.account).order(:title).pluck
:id)
        ),
        include_blank: "All jobs",
        data: {
          action: "change->hiring-stages#update"
        } %>
    </form>
  </div>
  <div data-hiring-stages-target="chart"></div>
</div>
```

Notice that the form tag does not have an action. This is because we are never actually going to submit this filter form. Instead, in the `select` tag, we have a `data-action` attribute that triggers `hiring-stages#update` each time the input changes.

Next, define `update` in the hiring stages Stimulus controller:

app/javascript/controllers/hiring_stages_controller.js

```
update(event) {
  this.stimulate("HiringStages#update", event.target, {
serializeForm: true })
}

afterUpdate() {
  this.chart.updateOptions(this.chartOptions);
}
```

`update` triggers the server-side `HiringStages#update` method, passing in the element that triggered the `update` call. In this case, `event.target` because the `change` event on that input is what triggers the `update` method. We also include the `serializeForm` option, which, combined with our dummy `<form>` tag in the markup, allows us to easily access the current values of all form inputs in the server-side reflex.

`afterUpdate` uses StimulusReflex **lifecycle callbacks** to trigger ApexCharts' **updateOptions** method which will cause the chart to re-render in the UI after the `update` reflex runs.

Let's see what this looks like on the server-side now.

First, we need to update the `Charts::HiringStagesChart` class to handle the new job filter option. Update `HiringStagesChart` like this:

app/models/charts/hiring_stages_chart.rb

```
1  class Charts::HiringStagesChart
2    def initialize(account_id, job_id = nil)
3      @account_id = account_id
4      @job_id = job_id
5    end
6
7    def generate
8      query_data
9    end
10
11   def query_data
12     Applicant
13       .includes(:job)
14       .for_account(@account_id)
15       .for_job(@job_id)
16       .group('stage')
17       .count
18   end
19 end
```

Here, we added the `job_id` parameter to the `initialize` method and then updated `query_data` to use the existing `for_job` scope. We added this scope back in the chapter on filtering the applicants page and it works perfectly for this purpose too.

Head to `app/reflexes/hiring_stages_reflex.rb`:

app/reflexes/hiring_stages_reflex.rb

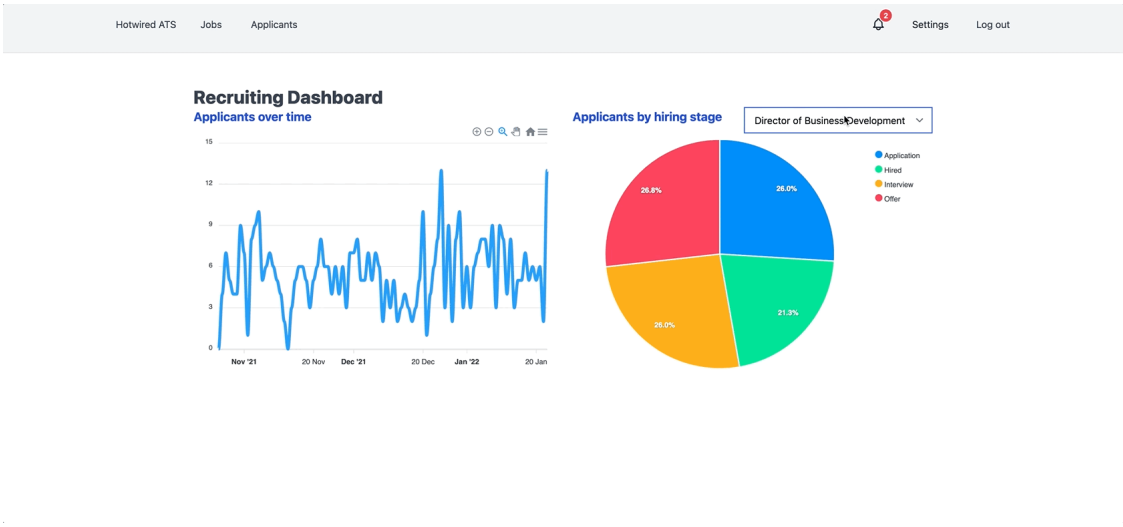
```
class HiringStagesReflex < ApplicationReflex
  def update
    data = retrieve_data(params[:job_id])
    stage_labels, stage_series = assign_data(data)

    cable_ready
      .set_dataset_property(name:
'hiringStagesLabelsValue', selector: '#stage-chart-
container', value: stage_labels)
      .set_dataset_property(name:
'hiringStagesSeriesValue', selector: '#stage-chart-
container', value: stage_series)
      .broadcast

    morph :nothing
  end

  def retrieve_data(job_id)

Charts::HiringStagesChart.new(current_user.account_id,
job_id).generate
  end

  def assign_data(data)
    [data.keys.map(&:humanize).to_json,
data.values.to_json]
  end
end
```

`retrieve_data` and `assign_data` fetch the data we need to build the chart. Once the data is ready, CableReady's `set_dataset_property` operation allows us to update the `hiring-stages-labels` and `hiring-stages` data attributes in the DOM.

Since ApexCharts uses those data attributes to display the chart's data, all we need to change are those two attributes. Once we broadcast those operations, we finish the reflex with a `nothing` morph.

After this reflex runs, the `afterUpdate` callback in the Stimulus controller runs and, because we updated the data attributes during the reflex, the chart updates with the new data.

Thanks to ApexCharts, it also nicely animates the transition:



Magical.

Next, add a date range filter to the applicants chart. This filter will allow users to view data for a specific period of time.

Filter applicants chart

We do not want to ask our users to figure out how to type in valid dates for the date range filter, so we will add flatpickr to the project to build usable date

picker inputs. Helpfully, there is a **Stimulus flatpickr wrapper**, which we will use to interact with flatpickr.

Add both of those projects, and create a new Stimulus controller from your terminal:

```
yarn add stimulus-flatpickr flatpickr
rails g stimulus flatpickr
```

And then import the flatpickr css into **`app/assets/stylesheets/application.tailwind.css`**:

app/assets/stylesheets/application.tailwind.css

```
@import "flatpickr/dist/flatpickr.css"
```

Head to the new **`flatpickr_controller`** and update it:

app/javascript/controllers/flatpickr_controller.js

```
import Flatpickr from 'stimulus-flatpickr'

export default class extends Flatpickr {
  static targets = ["start", "end"]

  connect() {
    flatpickr(this.startTarget)
    flatpickr(this.endTarget)
  }

  disconnect() {}
}
```

The **`flatpickr`** controller expects a **`start`** and **`end`** target, and initializes both targets as flatpickr inputs.

We use separate start and end targets since we may want to interact with those inputs separately in the future.

Update the `**applicants_chart**` partial to add the date range filter options with flatpickr connected to the inputs:

app/views/dashboard/_applicants_chart.html.erb

```
<div
  data-controller="applicants-chart"
  data-applicants-chart-categories-value="<%=
categories %>"
  data-applicants-chart-series-value="<%= series %>"
  id="applicants-chart-container"
>
  <div class="flex justify-between">
    <h3 class="text-xl font-bold text-blue-
700">Applicants by hiring stage</h3>
    <form>
      <fieldset class="mb-2">
        <div class="flex justify-between" data-
controller="flatpickr">
          <%= text_field_tag "start_date",
            nil,
            class: "w-1/2 input rounded-none mr-2",
            placeholder: "Start date",
            value: 90.days.ago,
            data: {
              flatpickr_date_format: "Y-m-d",
              action: "change->applicants-
chart#update",
              flatpickr_target: "start"
          } %>
          <%= text_field_tag "end_date",
            nil,
            class: "w-1/2 input rounded-none mr-2",
            placeholder: "End date",
            value: Time.zone.now.to_date,
            data: {
              flatpickr_date_format: "Y-m-d",
```

```
                action: "change->applicants-
chart#update",
                flatpickr_target: "end"
            } %>
          </div>
        </fieldset>
      </form>
    </div>
    <div data-applicants-chart-target="chart"></div>
  </div>
```

Similar to the hiring stages chart, we have a dummy `form` wrapping the inputs. Both inputs are connected to the `flatpickr` controller, and both have the same `data-action` to trigger `applicants-chart#update` on change events.

Update the applicants chart Stimulus controller to add the `update` and `afterUpdate` methods:

app/javascript/controllers/applicants_chart_controller.js

```
update() {
  this.stimulate('ApplicantsChart#update',
event.target, { serializeForm: true })
}

afterUpdate() {
  this.chart.updateOptions({
    series: [{
      data: this.seriesValue
    }],
    xaxis: {
      categories: this.categoriesValue
    }
  });
}
```

app/reflexes/applicants_chart_reflex.rb

```ruby
class ApplicantsChartReflex < ApplicationReflex
  def update
    report_data =
retrieve_data(current_user.account_id, params)
    categories, series = assign_data(report_data)

    cable_ready
      .set_dataset_property(name:
'applicantsChartCategoriesValue', selector:
'#applicants-chart-container', value: categories)
      .set_dataset_property(name:
'applicantsChartSeriesValue', selector: '#applicants-
chart-container', value: series)
      .broadcast

    morph :nothing
  end

  def retrieve_data(account_id, params)
    Charts::ApplicantsChart.new(account_id,
params).generate
  end

  def assign_data(data)
    [data.keys.to_json, data.values.to_json]
  end
end
```

Seeing a pattern here, right? Query for the data and then use CableReady broadcasts to update the data-attributes in the DOM.

We are passing in `**params**` to the `**ApplicantsChart**`. We need to update the `**ApplicantsChart**` to use the passed in `**params**`:

app/models/charts/applicants_chart.rb

```ruby
class Charts::ApplicantsChart
  def initialize(account_id, params = {})
    @account_id = account_id
```

```
    @start_date = params[:start_date].presence ||
default_start_date
    @end_date = params[:end_date].presence ||
Date.today.end_of_day
  end

  def generate
    applicants = query_data
    zero_fill_dates(applicants)
  end

  def query_data
    Applicant
      .includes(:job)
      .for_account(@account_id)
      .where(applicants: { created_at:
@start_date..@end_date })
      .group('date(applicants.created_at)')
      .count
  end

  def zero_fill_dates(applicants)

(@start_date.to_date..@end_date.to_date).each_with_object
do |date, hash|
      hash[date] = applicants.fetch(date, 0)
    end
  end

  def default_start_date
    90.days.ago
  end
end
```

Here, we added the `@start_date` and `@end_date` instance variables. These instance variables are read from params when present and otherwise falling back to default values.

We also updated `query_data` to use the `@start_date` and `@end_date` values.

Whew. With that last piece in place, we can now visit the dashboard and apply a start and end date to the applicants chart and, if all has gone well, the chart will update automatically as we apply the filters.

Great work on this! We will finish up this chapter — and this book! — by refactoring our code a bit. Right now, our controller action is doing more than it should, and we have a lot of duplicate code between the applicants chart and the hiring stages chart.

Refactoring charts

Our charts work — they display on the dashboard and users can change the filters and get updated data right away — but we have a few things we can do to make the experience better for us as developers and for our users.

The first thing you may have noticed is that when compared to all of the other pages in the application, the dashboard is slow. If you add a few thousands applicants to the database visiting the dashboard starts to drag a bit, even in a development environment.

We can speed up the initial visit to the dashboard by moving the charts out into their own turbo lazy-loaded turbo frames. This move will also have the benefit of cleaning up the dashboard show controller which is already pretty messy with only two charts to display.

To move the charts to lazy loaded turbo frames, we need to create a route to use for the `src` value for the turbo frame. To handle this new requirement, start with a new controller.

From your terminal:

```
rails g controller Charts show
```

And then update the routes file to name the `charts#show` route for convenience:

config/routes.rb

```
13 | get 'charts/show', as: :chart
```

Fill in the new `ChartsController`:

app/controllers/charts_controller.rb

```
1  | class ChartsController < ApplicationController
2  |   before_action :set_chart
3  |   before_action :authenticate_user!
4  |
5  |   def show
6  |     report_data =
7  | @chart.constantize.new(current_user.account_id).generate
8  |     @labels = report_data.keys.to_json
9  |     @series = report_data.values.to_json
10 |     @chart_partial = chart_to_partial
11 |   end
12 |
13 |   private
14 |
15 |   def set_chart
16 |     @chart = params[:chart_type]
17 |   end
18 |
19 |   def chart_to_partial
20 |     @chart.gsub('Charts::', '').underscore
21 |   end
   | end
```

The controller has just one action, `show`, which uses a little Ruby magic to render any chart we add to our application.

The first key piece to notice is the `@chart.constantize.new` call in `show`. We are going to pass a string representation of the class name of the chart we want to render as the `chart_type` param. `constantize` converts that string to a Ruby class so we can then instantiate a new instance of the class and `generate` new chart data.

The other piece of Ruby that's important to catch is the `chart_to_partial` method, where we again use the `chart_type` params to translate the chart into a matching partial path. We will use `@chart_partial` on the front end to render the matching partial in `charts/show.html.erb`

Let's see that in action by updating the charts show view:

app/views/charts/show.html.erb

```
<%= turbo_frame_tag @chart_partial do %>
  <%= render @chart_partial, labels: @labels, series:
@series %>
<% end %>
```

We use the `@chart_partial` instance variable to render the right partial and, importantly, we also use it to set the id for the Turbo Frame that should be replaced each time `charts#show` is rendered.

Next, update `app/views/dashboard/show.html.erb` to replace the inline charts with lazy loaded Turbo Frames pointing to `charts#show`:

app/views/dashboard/show.html.erb

```
<div>
  <h2 class="mt-6 text-3xl font-extrabold text-gray-
700">
    Recruiting Dashboard
  </h2>
</div>
<div class="flex w-full space-x-8 sm:flex-col md:flex-
row flex-1">
  <div class="sm:w-full md:w-1/2">
```

```
    <%= turbo_frame_tag "applicants_chart", src:
chart_path(chart_type: "Charts::ApplicantsChart"),
loading: "lazy" %>
  </div>
  <div class="sm:w-full md:w-1/2">
    <%= turbo_frame_tag "hiring_stages_chart", src:
chart_path(chart_type: "Charts::HiringStagesChart"),
loading: "lazy" %>
  </div>
</div>
```

Note that we have two Turbo Frames now, one for each chart. Each frame has an id that will match the `@chart_partial` value for the chart, and each frame sets the `src` value to point to `charts#show` with the correct `chart_type` param.

Now that the Dashboard is rendering empty Turbo Frames on the initial page load, we can update the `DashboardController` like this:

app/controllers/dashboard_controller.rb

```
class DashboardController < ApplicationController
  before_action :authenticate_user!

  def show; end
end
```

The `DashboardController` now just renders the `show` view without querying for chart data.

Move the chart partials from the `dashboard` to the `charts` directory:

```
mv app/views/dashboard/_applicants_chart.html.erb
app/views/charts
mv app/views/dashboard/_hiring_stages_chart.html.erb
app/views/charts
```

Because we standardized the names of the instance variables in the `ChartsController` to be `@labels` and `@series`, we need to update those references in the chart partials. First, update `app/views/charts/_applicants_chart.html.erb`:

app/views/charts/_applicants_chart.html.erb

```
<div
  data-controller="applicants-chart"
  data-applicants-chart-labels-value="<%= labels %>"
  data-applicants-chart-series-value="<%= series %>"
  id="applicants-chart-container"
>
  <!-- Chart content -->
</div>
```

And then update the hiring stages chart partial:

app/views/charts/_hiring_stages_chart.html.erb

```
<div
  data-controller="hiring-stages"
  data-hiring-stages-labels-value="<%= labels %>"
  data-hiring-stages-series-value="<%= series %>"
  id="stage-chart-container"
>
  <!-- Chart content -->
</div>
```

Finally, we also changed the name of the `categories` value to `labels` in the `applicants_chart` partial, so we need to update the Stimulus controller and reflex to match:

First the `ApplicantsChart` Stimulus controller>:

app/javascript/controllers/applicants_chart_controller.js

```
import ApplicationController from
'./application_controller'
```

```
import ApexCharts from "apexcharts"

export default class extends ApplicationController {
  static targets = ["chart"]

  static values = {
    labels: Array,
    series: Array
  }

  initialize() {
    this.chart = new ApexCharts(this.chartTarget,
this.chartOptions);
    this.chart.render();
  }

  update() {
    this.stimulate('ApplicantsChart#update',
event.target, { serializeForm: true })
  }

  afterUpdate() {
    this.chart.updateOptions({
      series: [{
        data: this.seriesValue
      }],
      xaxis: {
        categories: this.labelsValue
      }
    })
  }

  get chartOptions() {
    return {
      chart: {
        height: "400px",
        type: 'line',
      },
      series: [{
        name: 'Applicants',
```

```
        data: this.seriesValue
      }],
      xaxis: {
        categories: this.labelsValue,
        type: 'datetime'
      },
      stroke: {
        curve: "smooth"
      }
    }
  }
}
```

And then the corresponding reflex:

app/reflexes/applicants_chart_reflex.rb

```
- .set_dataset_property(name:
'applicantsChartCategoriesValue', selector:
'#applicants-chart-container', value: categories)
+ .set_dataset_property(name:
'applicantsChartLabelsValue', selector: '#applicants-
chart-container', value: categories)
```

With that last update, head to the dashboard page and see that the charts load in after the initial page load and that we can still update them with the filter options.

In the next section, we will DRY up our Stimulus controllers a bit by extending controllers.

Base charts controller

Right now, both the **`applicants_chart`** and **`hiring_stages_chart`** Stimulus controller have a significant amount of identical code. Both import the

`ApexCharts` library, both declare the same targets and values, and they have identical `initialize` methods.

Instead of duplicating that code across every chart, we can instead move that shared behavior to a new `charts` Stimulus controller, which the `applicants_chart` and `hiring_stages_chart` can then `extend` to share behavior while defining their own options and update methods.

To get started, generate a new Stimulus controller from your terminal:

```
rails g stimulus charts
```

And then update that new controller to pull in the shared code from the existing `applicants_chart` and `hiring_stages_chart`:

app/javascript/controllers/charts_controller.js

```
import ApplicationController from
'./application_controller'
import ApexCharts from "apexcharts"

export default class extends ApplicationController {
  static targets = ["chart"]

  static values = {
    labels: Array,
    series: Array
  }

  initialize() {
    this.chart = new ApexCharts(this.chartTarget,
this.chartOptions);
    this.chart.render();
  }

  afterUpdate() {
    this.chart.updateOptions(this.chartOptions);
```

```
  }
}
```

Now update the two chart-specific controllers to remove the shared code and extend the `ChartsController`.

First the `ApplicantsChart` Stimulus controller:

app/javascript/controllers/applicants_chart_controller.js

```
import ChartsController from './charts_controller'

export default class extends ChartsController {
  update() {
    this.stimulate('ApplicantsChart#update',
event.target, { serializeForm: true })
  }

  get chartOptions() {
    return {
      chart: {
        height: "400px",
        type: 'line',
      },
      series: [{
        name: 'Applicants',
        data: this.seriesValue
      }],
      xaxis: {
        categories: this.labelsValue,
        type: 'datetime'
      },
      stroke: {
        curve: "smooth"
      }
    }
  }
}
```

And then `HiringStagesChart` Stimulus controller:

app/javascript/controllers/hiring_stages_controller.js

```
import ChartsController from './charts_controller'

export default class extends ChartsController {
  update(event) {
    this.stimulate("HiringStages#update", event.target,
{ serializeForm: true })
  }

  get chartOptions() {
    return {
      chart: {
        type: 'pie',
        height: '400px'
      },
      series: this.seriesValue,
      labels: this.labelsValue,
    }
  }
}
```

In both controllers, we swapped the imports out with a single `import ChartsController` and then removed the targets, values, the `initialize` method, and the `afterUpdate` method all of which are now provided by the `ChartsController`.

With these changes in place, head back to the dashboard one last time and see that everything still works exactly as it did before.

In the last section of this chapter, we will resolve a few nagging issues with charts in the UI.

Cleaning up chart behavior

Our charts work great, but you might notice that there are two subtle issues with our implementation.

First, after you navigate away from the Dashboard to another page, if you check the JavaScript console in your dev tools, you will see some errors thrown by ApexCharts:

```
Unexpected value translate(NaN, 0) scale(1) parsing
transform attribute. apexcharts.common.js:6:405636
Unexpected value NaN parsing height attribute.
apexcharts.common.js:6:376734
Unexpected value NaN parsing height attribute.
apexcharts.common.js:6:27054
```

These errors happen because we are not properly tearing down the charts when we navigate away from the page, so ApexCharts does not know the chart elements no longer exist. We can fix this by updating the `ChartsController` to destroy the chart when the charts leave the DOM:

app/javascript/controllers/charts_controller.js

```
17  disconnect() {
18    this.chart.destroy();
19  }
```

`disconnect()` is a built-in Stimulus **lifecycle method** that is called when the Stimulus controller is removed from the DOM. In it, we use the `destroy` **method** from the `ApexCharts` library to remove the chart element and associated event listeners.

After making this change, refresh the Dashboard and then navigate away from the Dashboard to another page in the application and see that the ApexChart errors are no longer thrown in the JavaScript console.

The second issue occurs if you leave Dashboard and then come back. When you do this, you may notice that the charts flicker. They briefly render fully loaded and then they disappear and animate in like we expect them to when a

user visits the page. The flickering does not prevent the charts from working, but it is pretty distracting!

This issue is caused by Turbo caching the charts before navigating away from the Dashboard. Turbo caches the final, fully rendered svg of the chart and then, when the user visits the Dashboard again, the cached svg is rendered momentarily before the Stimulus controller reinitializes ApexCharts and the chart is re-rendered.

To resolve this flickering issue, we need to tell Turbo Drive to opt the charts out of caching so that they are always rendered from scratch. We can do this by adding a `data-turbo-cache` attribute to both chart elements. This data attribute tells Turbo not to cache the element, as described **in the documentation**.

First, in `app/views/charts/_applicants_chart.html.erb:`

app/views/charts/_applicants_chart.html.erb

```
<div
  data-controller="applicants-chart"
  data-applicants-chart-labels-value="<%= labels %>"
  data-applicants-chart-series-value="<%= series %>"
  id="applicants-chart-container"
  data-turbo-cache="false"
>
<!-- Snip the chart -->
</div>
```

And then in `app/views/charts/_hiring_stages_chart.html.erb:`

app/views/charts/_hiring_stages_chart.html.erb

```
<div
  data-controller="hiring-stages"
  data-hiring-stages-labels-value="<%= labels %>"
  data-hiring-stages-series-value="<%= series %>"
  id="stage-chart-container"
  data-turbo-cache="false"
```

```
7 >
8 <!-- Snip the chart -->
9 </div>
```

In both cases, we added the `` `data-turbo-cache="false"` `` to the chart element. With this change in place, refresh the Dashboard, then navigate away from the Dashboard to another page, and then come back to the Dashboard. You should see the charts animate in as expected with no flickering. Incredible.

Turbo Drive's caching is *usually* very helpful. Every now and then, you need to adjust the behavior and Turbo offers a variety of ways to fine-tune caching behavior. It is worthwhile to review the **Turbo documentation on caching** in full.

Great work in this chapter! We have one chapter left in this book. In it, we will add the ability for users to comment on applicants and, to make things more interesting, we will use StimulusReflex to allow users to mention other users in those comments. This chapter will give us a chance to test our Stimulus and StimulusReflex knowledge and to try out the reusability of the Notification system we built earlier in the book.

To see the full set of changes in this chapter, review **this pull request** on Github.

Change	Date	PR link
Added the **Cleaning up chart behavior** section, adding fixes for chart flickering and tearing down charts with `` `disconnect` `` to prevent JavaScript console errors when leaving the Dashboard.	March 1, 2022	**PR 18 on Github**