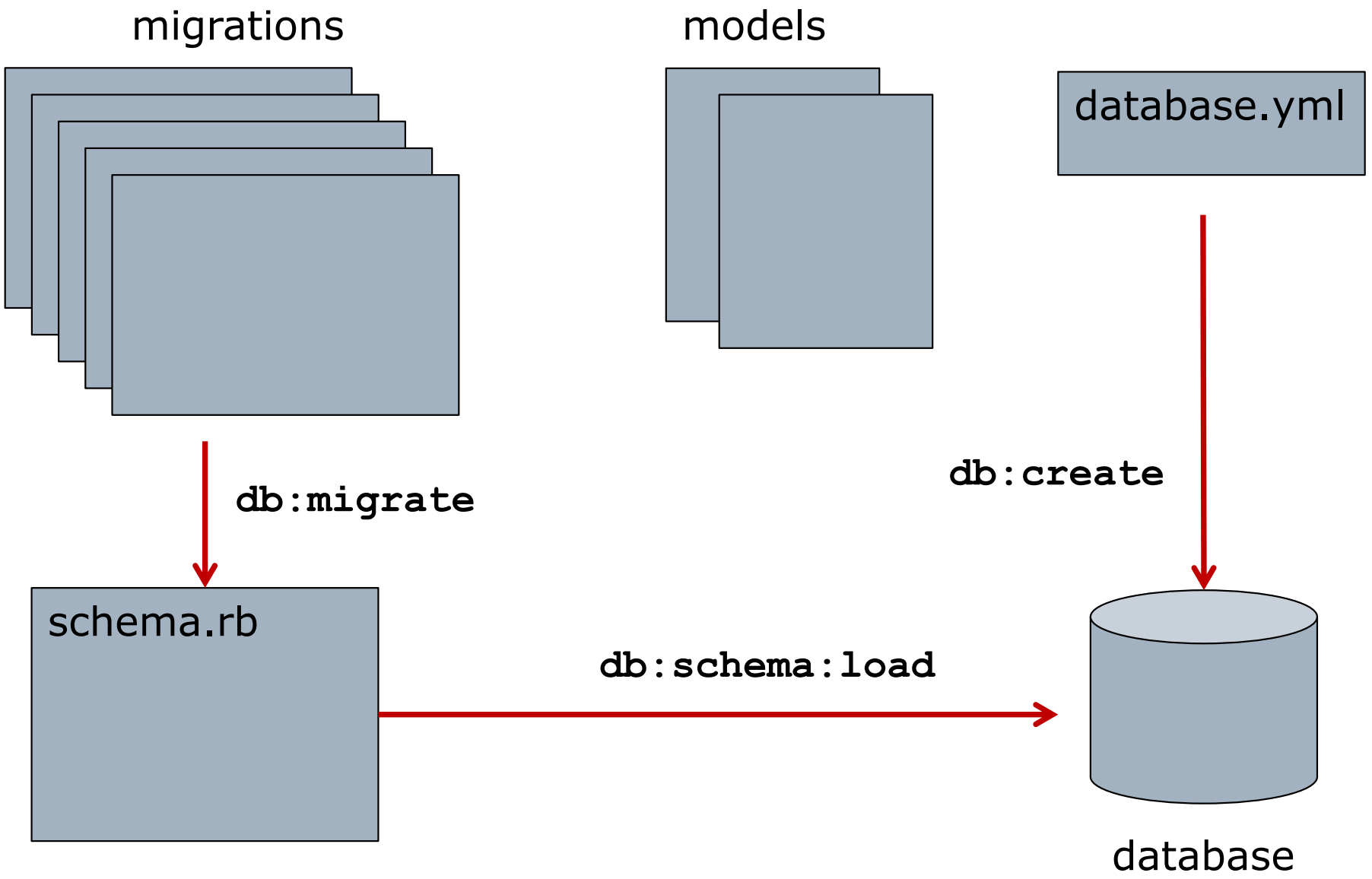
Rails: Associations and Validation

Lecture 29

Schemas, Migrations, Models



Recall: Migrations


```
class CreatePosts < ActiveRecord::Migration
  def change
    create_table :posts do |t|
      t.string :name
      t.string :title
      t.text :content

      t.timestamps
    end
  end
end
```

Recall: Models


```
class Post < ApplicationRecord
    # attr_accessible :name, :title, :content
end
```

Generating Code: rails generate

- Notice: Two blobs of Ruby code need to be in sync
  - Migration (creates table and columns)
    db/migrate/xxx_create_students.rb
  - Model (with matching name)
    app/models/student.rb
- Easier: Generate *both* simultaneously

```
$ rails generate model Student
    fname:string lname:string buckid:integer
```

  - Use model name (singular) and attributes
  - Note: this does *not* generate the schema.rb (use rails)
- Migrations for table edits can also be generated

```
$ rails generate migration AddNickNameToStudent
nick:string
```

  - Name is meaningful! (starts with add or remove)
  - Creates a migration that changes students table

Result of `generate model`


```
class CreateStudents < ActiveRecord::Migration
  def change
    create_table :students do |t|
      t.string :fname
      t.string :lname
      t.integer :buckid

      t.timestamps
    end
  end
end

class Student < ApplicationRecord
end
```

Demo with rails console


```
$ rails new demo # creates directory
  # no schema, migrations, or models
$ cd demo
$ rails generate model Student \
fname:string lname:string buckid:integer
  # see db/migrate, app/models
$ rails console
> Student.methods # lots available!
> Student.all     # will this work?
> s = Student.new # will this work?
```

Demo with rails console


```
$ rails new demo # creates directory
  # no schema, migrations, or models
$ cd demo
$ rails generate model Student \
fname:string lname:string buckid:integer
$ rails console
> Student.methods # lots available!
> Student.find :all # empty, no table
> s = Student.new # error, no table
$ rails db:migrate # creates schema.rb
$ rails console
> Student.all #=> []
```

Working With Models


```
> s = Student.new
> s2 = Student.new fname: 'Jo'
> s3 = Student.new fname: 'Xi',
          buckid: 23
> Student.all #=> ?
```

Working With Models


```
> s = Student.new
> s2 = Student.new fname: 'Jo'
> s3 = Student.new fname: 'Xi',
          buckid: 23
> Student.all #=> [] still
> s.save
> Student.all #=> [<id: 1, …>]
> s.fname = 'Mary'
> s.save
```

Seeding the Database

- Quickly populate using config/seeds.rb
  - `$ rails db:seed  # runs seeds.rb`
  - `$ rails db:reset # drop then reseed`
- In db/seeds.rb:

```
30.times do
  Student.create!(
    buckid: Faker::Number.unique
                         .number(digits: 9),
    fname: Faker::Name.first_name,
    lname: Faker::Name.last_name)
end
```

- Useful gem: Faker
  - Add to Gemfile: `gem 'faker'`
  - `$ bundle install`

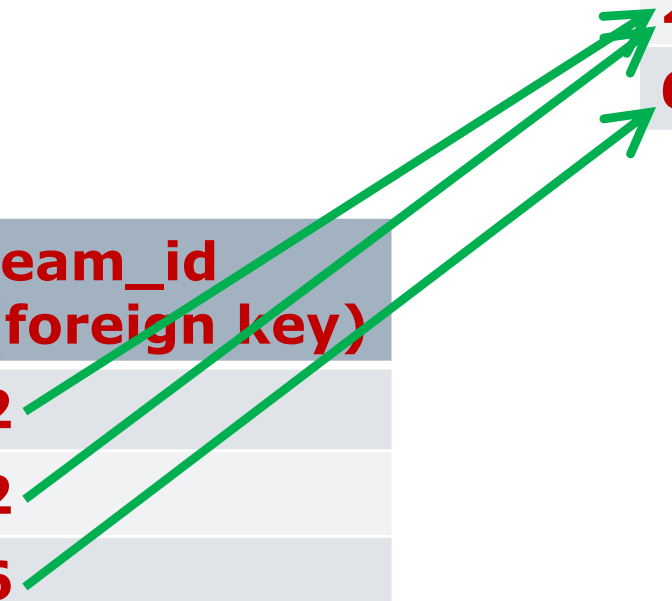
Associations (1:N Relationship)

teams

id (key)	name (string)
1	Wicked Wicky
2	The Happy Crew
6	No Names

students

id (key)	buckid (integer)	team_id (foreign key)
1	22352022	2
3	334432	2
4	34822039	6



Invariants

- A student belongs to exactly 1 team
  - Weaker: A student belongs to *at most* 1 team
- Same representation for either invariant
  - A column (of foreign keys) in *students* table
- Maintaining stronger invariant
  - Students can only be added with team_id set to something valid
  - Deleting a team deletes member students!
- Maintaining weaker invariant
  - Students can be added with null team_id
  - Deleting a team null-ifies members' team_id

Rails Migration and Models


```
class AddTeamForeignKeys < ActiveRecord::Migration
  def change
    add_reference :students, :team,
                  foreign_key: true
  end
end

class Student < ApplicationRecord
  belongs_to :team   # note singular form
                     # adds Student#team method
end

class Team < ApplicationRecord
  has_many :students   # note plural form
                       # adds Team#students method
end
```

Association Methods

- *Belongs_to* creates method for accessing owner

```
s = Student.find 1 #=> 22352022
s.team #=> "The Happy Crew"
s.team.name = 'The(tm) Happy Crew'
```

- *Has_many* creates method for accessing members

```
t = Team.find 1
t.students #=> array of students
t.students.first
t.students.size
t.students.destroy_all
t.students.any? { |s| ... }
```

Asymmetry in Writes to Assoc.

- Add a student to a team's association: Student is automatically saved (assuming team is stored in database)

```
t = Team.find 1
t.students #=> []
t.students << Student.new # gets an id
t.students #=> [#<Student id: 1, …>]
```

- Assign a team student's association: Student is *not* automatically saved

```
s = Student.find 1
s.team = my_team
s.reload #=> s's team is unchanged!
```

Modifiers for `belongs_to`


```
class Student < ApplicationRecord
  belongs_to :greek_house,
    optional: true
    # allows foreign key to be null
  belongs_to :project_group,
    class_name: 'Team'
    # default is ProjectGroup
  belongs_to :major,
    foreign_key: 'OSU_code'
    # default is major_id
  belongs_to :team,
    touch: :membership_updated
end
```

Modifiers for `has_many`


```
class Team < ApplicationRecord
  has_many :students,
    limit: 5,
    # max number of members
    dependent: :destroy,
    # what happens to students
    # when team is destroyed?
    class_name: 'OSUStudent'
    # default is Student
end
```

More Relationships

- 1:1 (one-to-one)
  - Use **`belongs_to`** with **`has_one`**
    - **`has_one`** is just **`has_many`** with limit of 1
  - Same asymmetry in writing exists
- N:M (many-to-many)
  - A third, intermediary table is used with 2 columns (for foreign keys from two tables)
  - In rails, use **`has_many :through`** association

Validations

- An *invariant* on data in a single table
  - Every student has a (non-null) buckid
  - Buckids are unique
  - Team names are less than 30 characters
  - Usernames match a given regular expression
- To maintain invariant:
  - Must be true initially
  - Must be satisfied by each insertion
- These validations are in the *model*
  - A model instance can be checked
  - Invalid objects can not be saved

```
student = Student.new lname: 'Vee'
student.valid? #=> false (no buckid)
student.save #=> false
```

Example


```
class Post < ApplicationRecord

  validates :name,  presence: true
  validates :title, presence: true,
                    length: { minimum: 5,
                              maximum: 50 }
end
```

Rails Implementation

- Model object has an **`errors`** attribute
  - This attribute is a hash (of problems)
- Failing a validity check adds an item to the errors hash
  - Empty hash corresponds to valid object
  - Each attribute is a key in the errors hash (plus there is a general key, **`:base`**)

```
s.errors[:buckid] = "is not a number"
```

- The **`valid?`** method does the following:
  - Empties errors hash
  - Runs validations
  - Returns **`errors.empty?`**

Validates Method in Model


```
validates :column, condition
```

- Uniqueness

```
uniqueness: true
uniqueness: {message: 'Username already taken'}
```

- Non-nullness (not the same as truth, see next)

```
presence: {message: 'Title needed'}
```

- Truth of a boolean field

```
acceptance: {message: 'Accept the terms'}
```

- Matching a regular expression

```
format: {with: /[A-Z].*/, message: …}
format: /[A-Za-z0-9]+/
```

- Being a number

```
numericality: {only_integer: true}
```

- Having a length

```
length: {minimum: 5}
```

Alternative: Declarative Style

- Special methods for each flavor of validation

```
validates_uniqueness_of :username
validates_presence_of :password
validates_acceptance_of :terms
validates_format_of :name,
                    with: /[A-Z].*/
validates_numericality_of :buckid,
                          only_integer: true
```

Summary

- Code generation
  - Database schema generated by schema.rb
  - Schema.rb generated by rails on migrations
  - Migrations and models can be generated by rails
- Associations
  - 1:N (or 1:1) relationships via foreign keys
  - Rails methods belongs_to, has_many
  - Create association attributes, which can be read and written
  - Asymmetry in writing owner vs member
- Validations
  - Invariants checked before saving
  - Errors hash contains list of problems
  - Declarative style for common case checks
  - Custom validity checkers possible too