

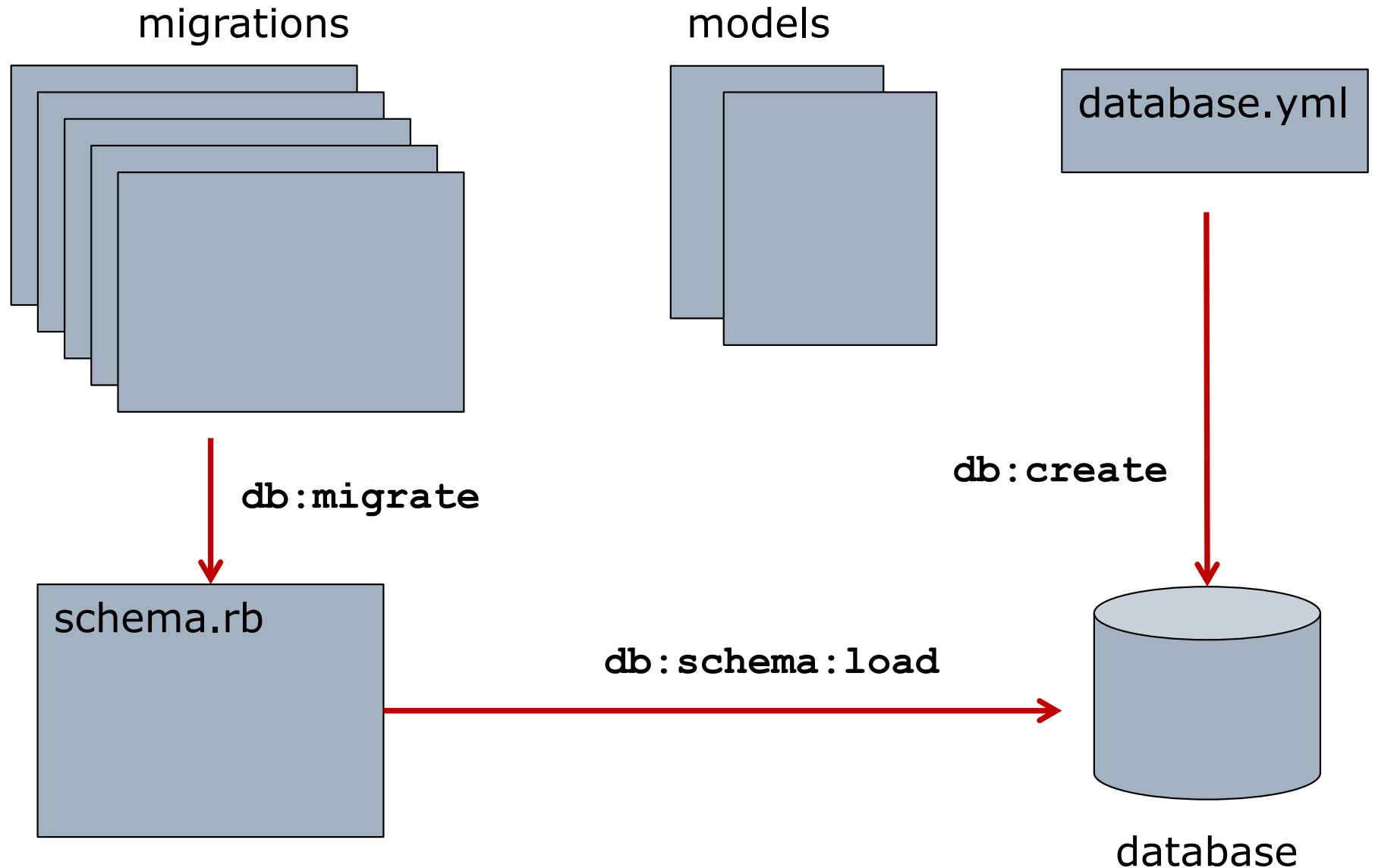
# Rails: Associations and Validation

Computer Science and Engineering ■ College of Engineering ■ The Ohio State University

## Lecture 29

# Schemas, Migrations, Models

Computer Science and Engineering ■ The Ohio State University



# 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

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

students

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



# 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