CCT395, Week 9

Review
Databases and Objects

Yuri Takhteyev
University of Toronto
November 3, 2010

Announcements

- Proposals & projects
- Schedule & readings
- The exam
- Next class

João's Coffee

The Entities

Coffee shop
Representative
Shipper
Estate
Coffee
Batch
Warehouse
Exchange Rate
Invoice

And there is probably more!

Divide and Conquer

Grouping João's concerns:

- Getting customers the right coffee
- Tracking deliveries
- Tracking money

Divide and Conquer

Getting the customers the right coffee

- Ordering the right coffee
- Delivering the coffee to the right customers

The Coffee

- Estate
  - name, description
- Region
  - name, description
- Variety
  - name, description
- Request
  - quantity, what kind, who requested
- Shipment
  - quantity, what kind of coffee

Region

---

name
description

Estate

---

name
description

Variety

---

name
description

Shipment

---

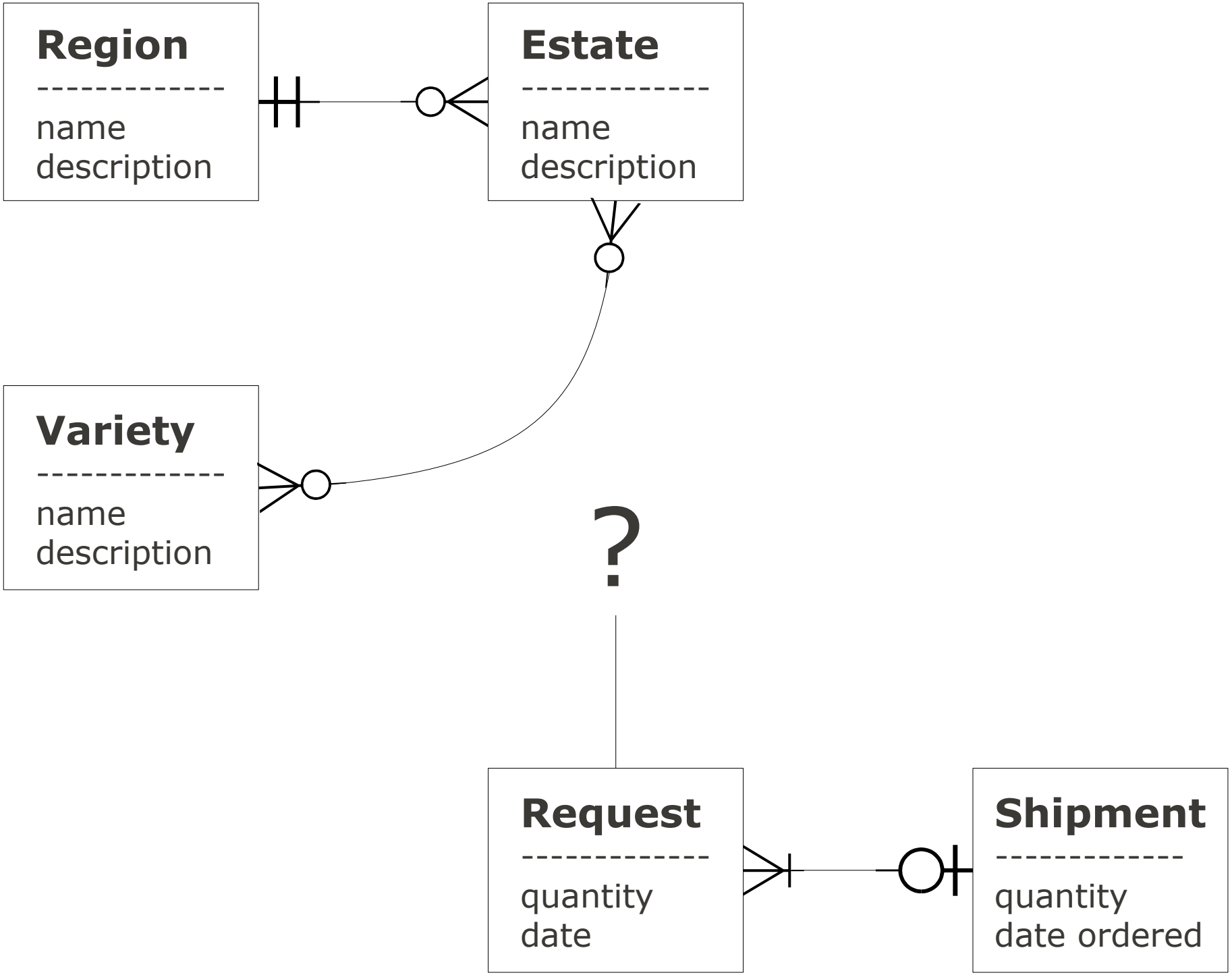
quantity
date ordered

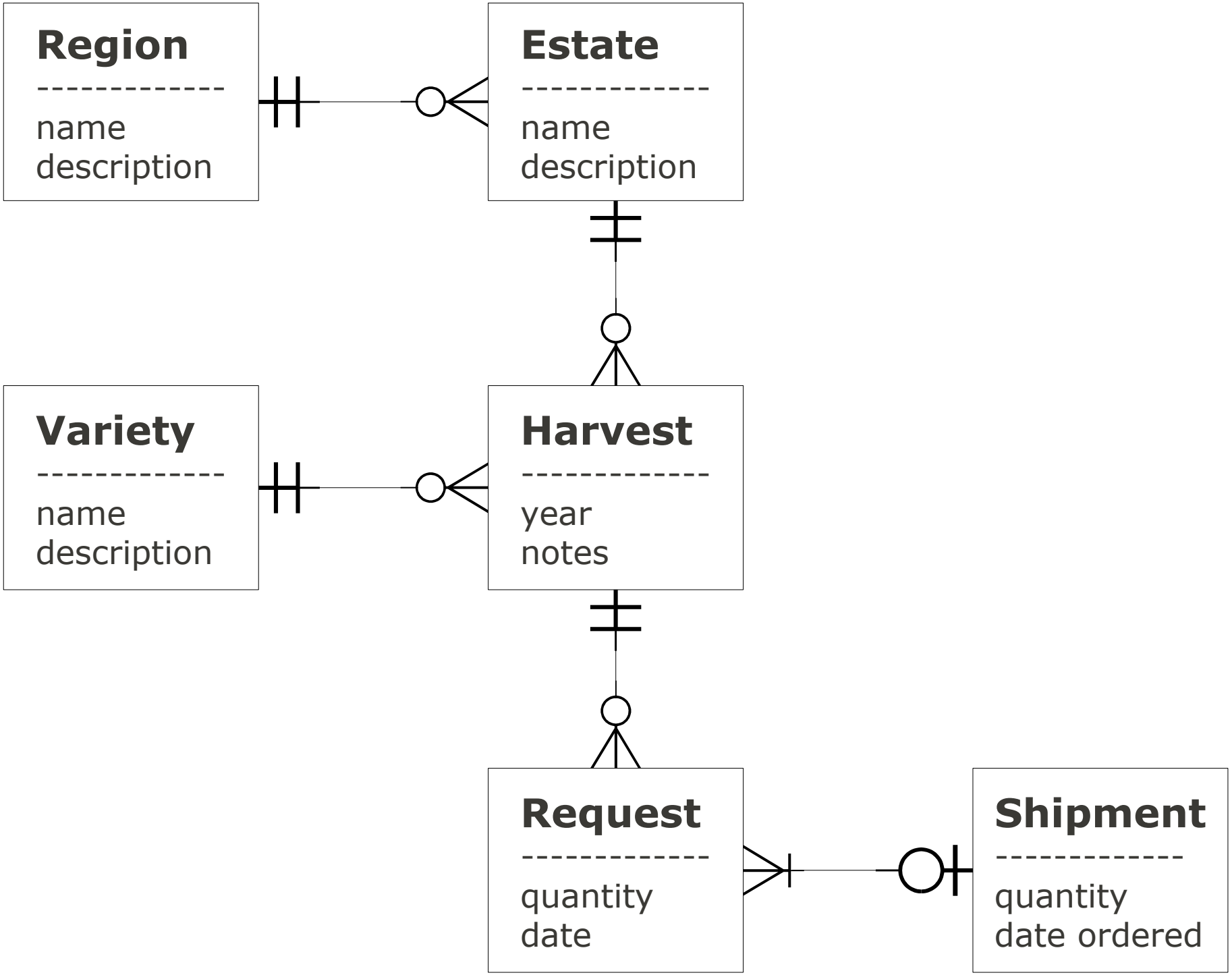
Request

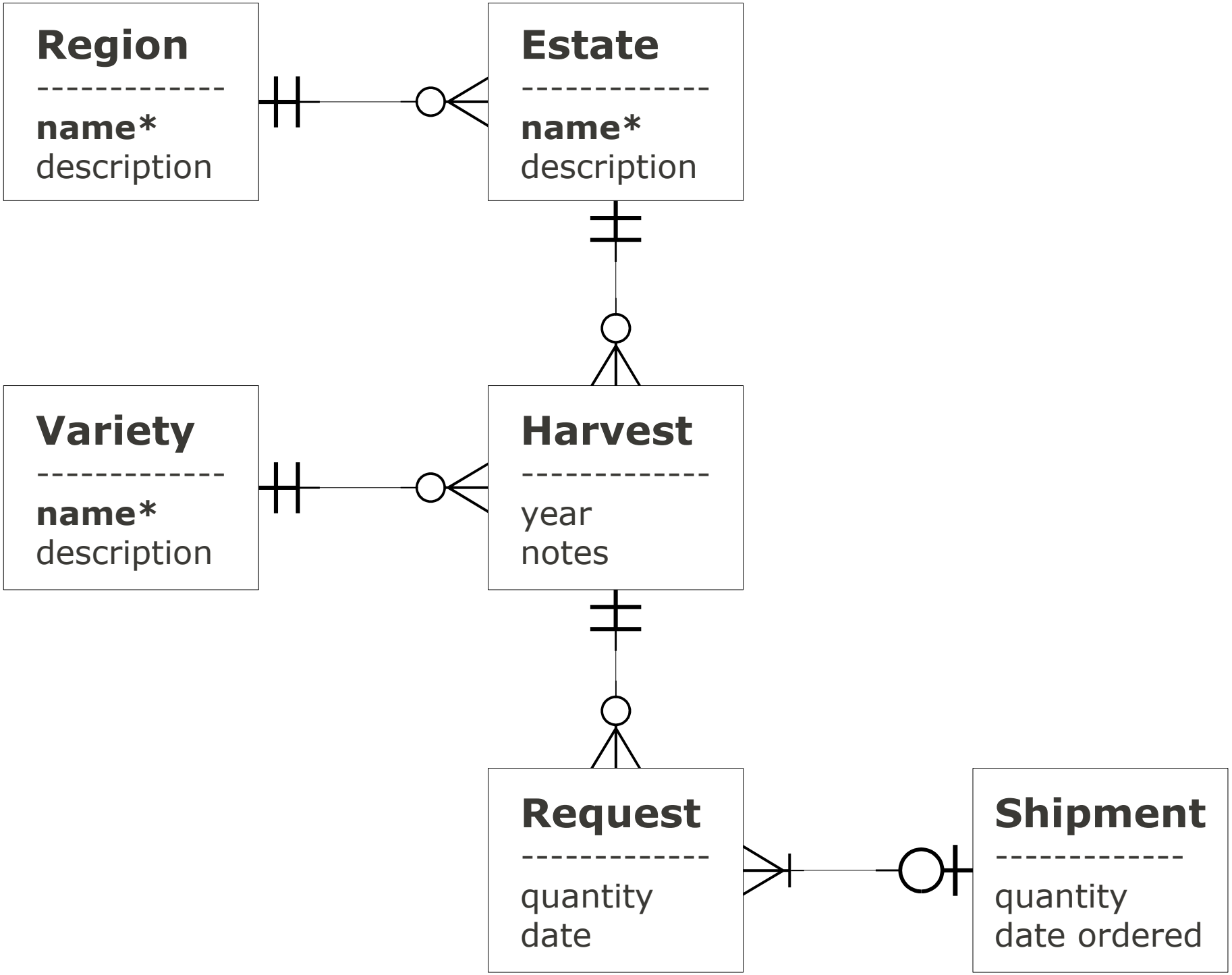
---

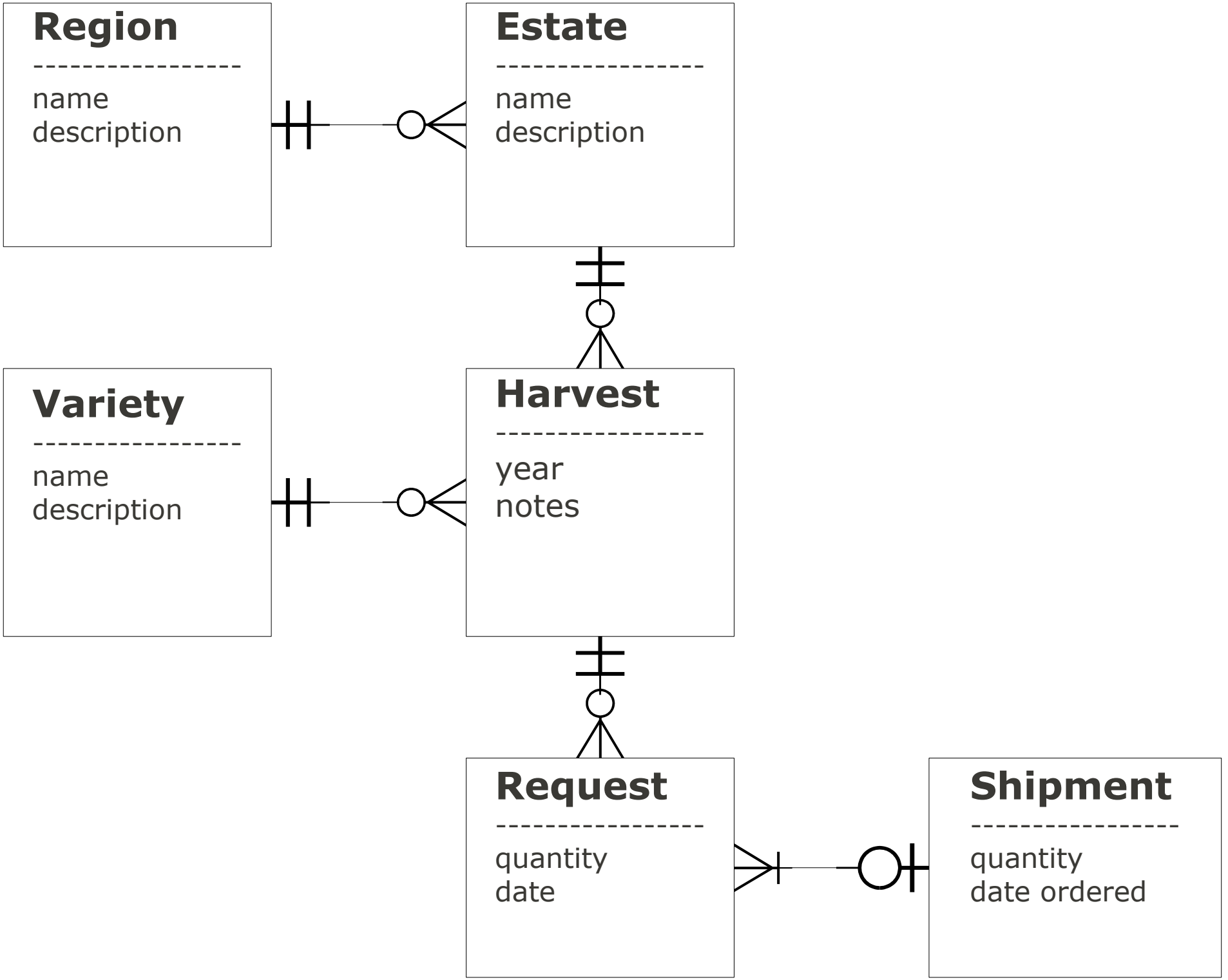
quantity
date

let's leave for later
whose request it is


Region
name
description
Estate
name
description
Variety
name
description
?
Request
quantity
date
Shipment
quantity
date ordered


Region
name
description
Estate
name
description
Variety
name
description
Harvest
year
notes
Request
quantity
date
Shipment
quantity
date ordered


Region
name*
description
Estate
name*
description
Variety
name*
description
Harvest
year
notes
Request
quantity
date
Shipment
quantity
date ordered


Region
name
description
Estate
name
description
Variety
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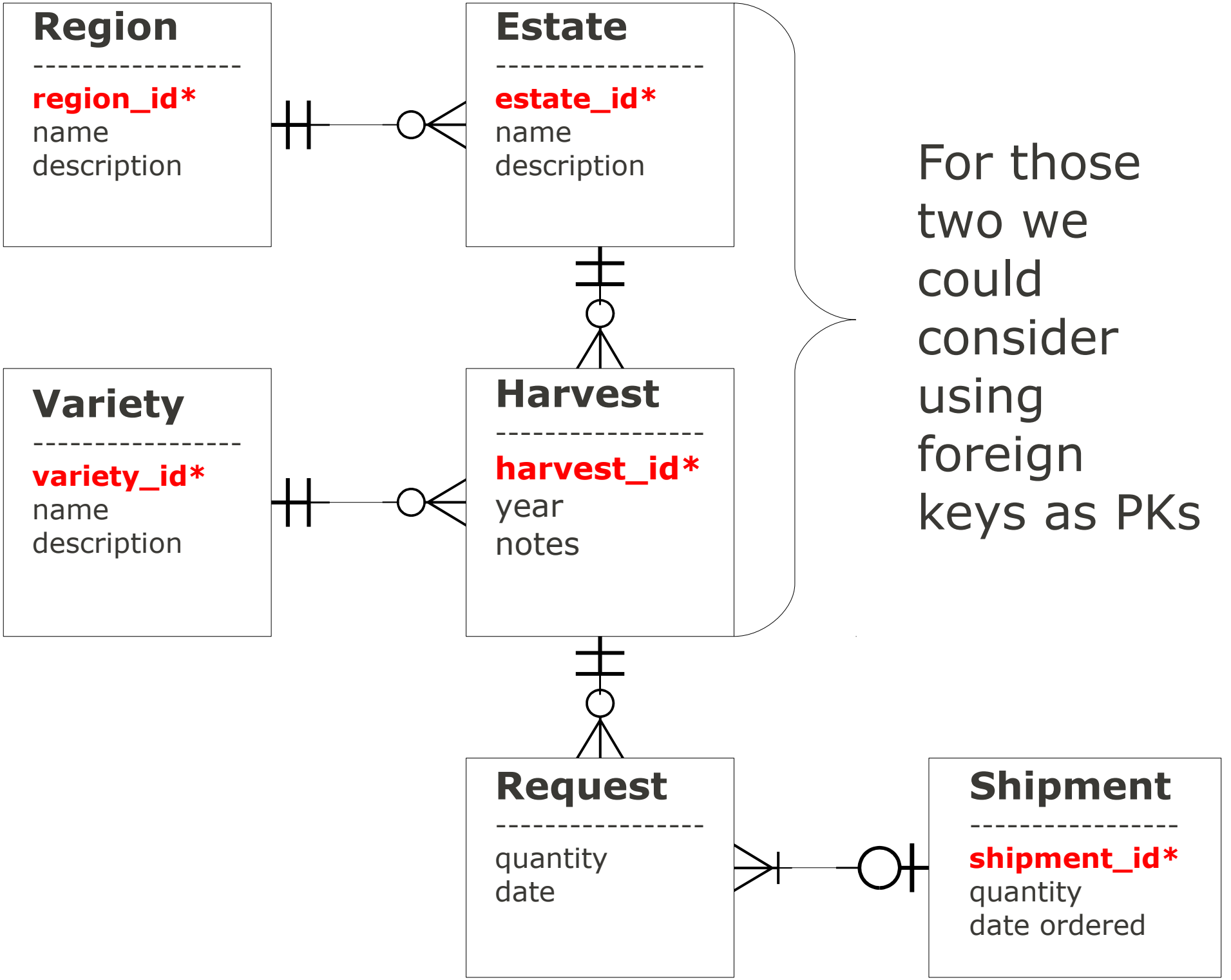
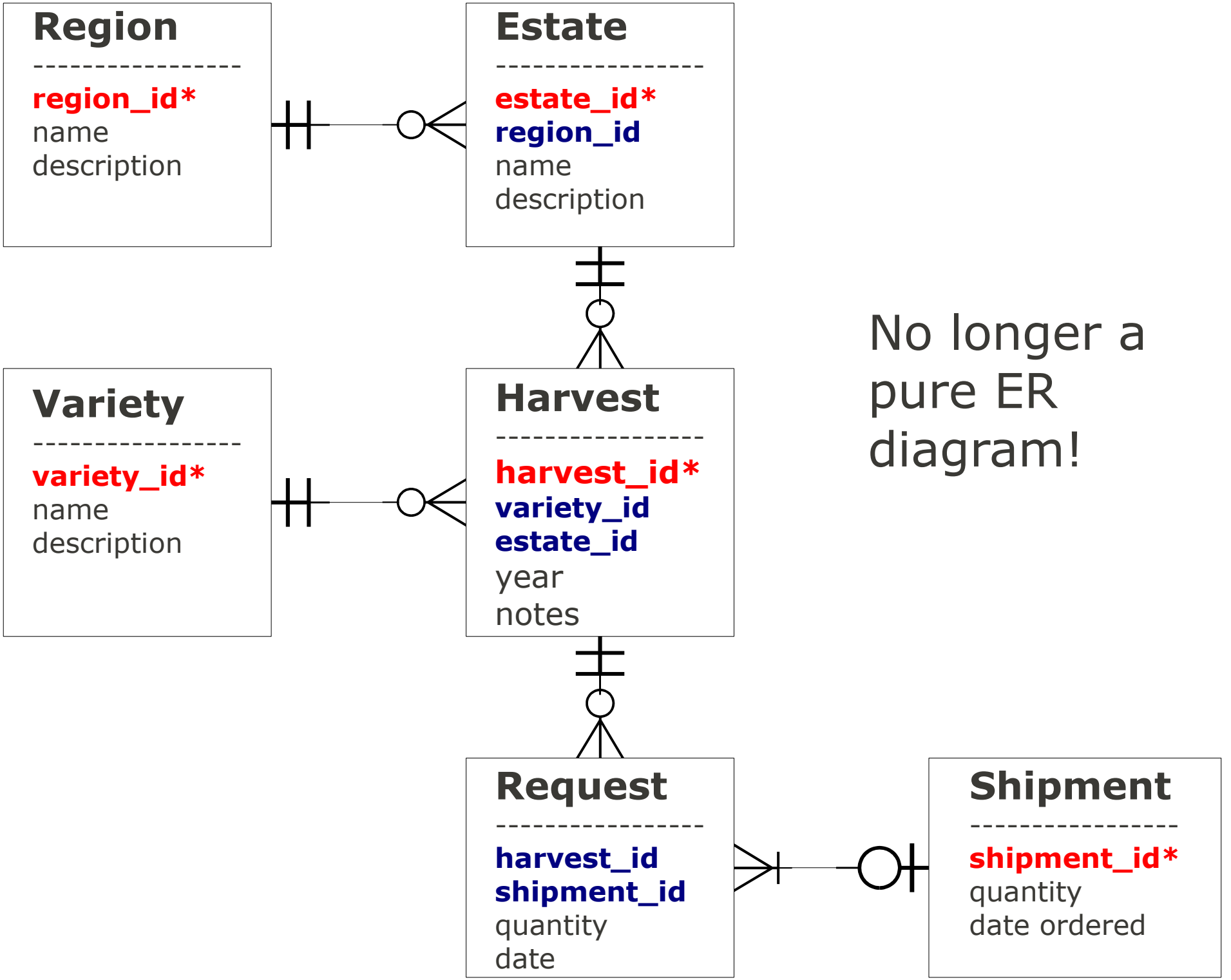
description
Harvest
year
notes
Request
quantity
date
Shipment
quantity
date ordered


Region
region_id*
name
description
Estate
estate_id*
name
description
Variety
variety_id*
name
description
Harvest
harvest_id*
year
notes
Request
quantity
date
Shipment
shipment_id*
quantity
date ordered
For those two we could consider using foreign keys as PKs


Region
region_id*
name
description
Estate
estate_id*
region_id
name
description
Variety
variety_id*
name
description
Harvest
harvest_id*
variety_id
estate_id
year
notes
Request
harvest_id
shipment_id
quantity
date
Shipment
shipment_id*
quantity
date ordered
No longer a pure ER diagram!

A Relation

harvest (harvest_id*, variety_id, estate_id, year, notes**)**

~~**harvest (harvest_id***, year, notes**)**~~

A Relation

harvest (
    harvest_id*,
    variety_id,
    estate_id,
    year,
    notes
)

SQL

```
create table harvest (
   harvest_id int,
   variety_id int,
   foreign key (variety_id)
        references variety(variety_id),
   estate_id int,
   foreign key (estate_id)
        references estate(estate_id),
   year year,
   notes varchar(200),
   primary key (harvest_id),
);
```

to be continued

Projects

- PHP Resources
  - http://www.w3schools.com/php/default.asp
  - the Menagerie Web example
- Get the **database** done first
- Do **basic** features before the advanced
  - The 6th bullet point of section 2.2 is now optional
- Advanced features
  - just do **two**
- Don't hesitate to ask questions!

Advanced Features

- Login
  - Store the password in the database
    - Ideally, use md5() to store a “hash” of a function
  - Have the user enter a username and password
  - Check what the user's password should be
  - Compare this with what they entered
    - If using md5(), compare the hashes.
  - If you can, use PHP sessions to remember the user. Otherwise, just have them enter the password every time.

Advanced Features

- Enabling Modifications
  - Do an INSERT or UPDATE based on the form data
- Backup
  - mysqldump is the simplest option
- XML Output
  - See examples from last week's class
  - Make sure your XML validates:
    - http://www.w3schools.com/xml/xml_validator.asp

Advanced Features

- Transactions
  - Chapter 13 in SQL – we are *not* covering this
- Stored Procedures
  - SQL chapter 14. Again, we are *not* covering this
- Publicly Available Data
  - I.e., using “real” data

Objects

Models

Relational:

- good for retrieval and updates

Document:

- good for exchange of data

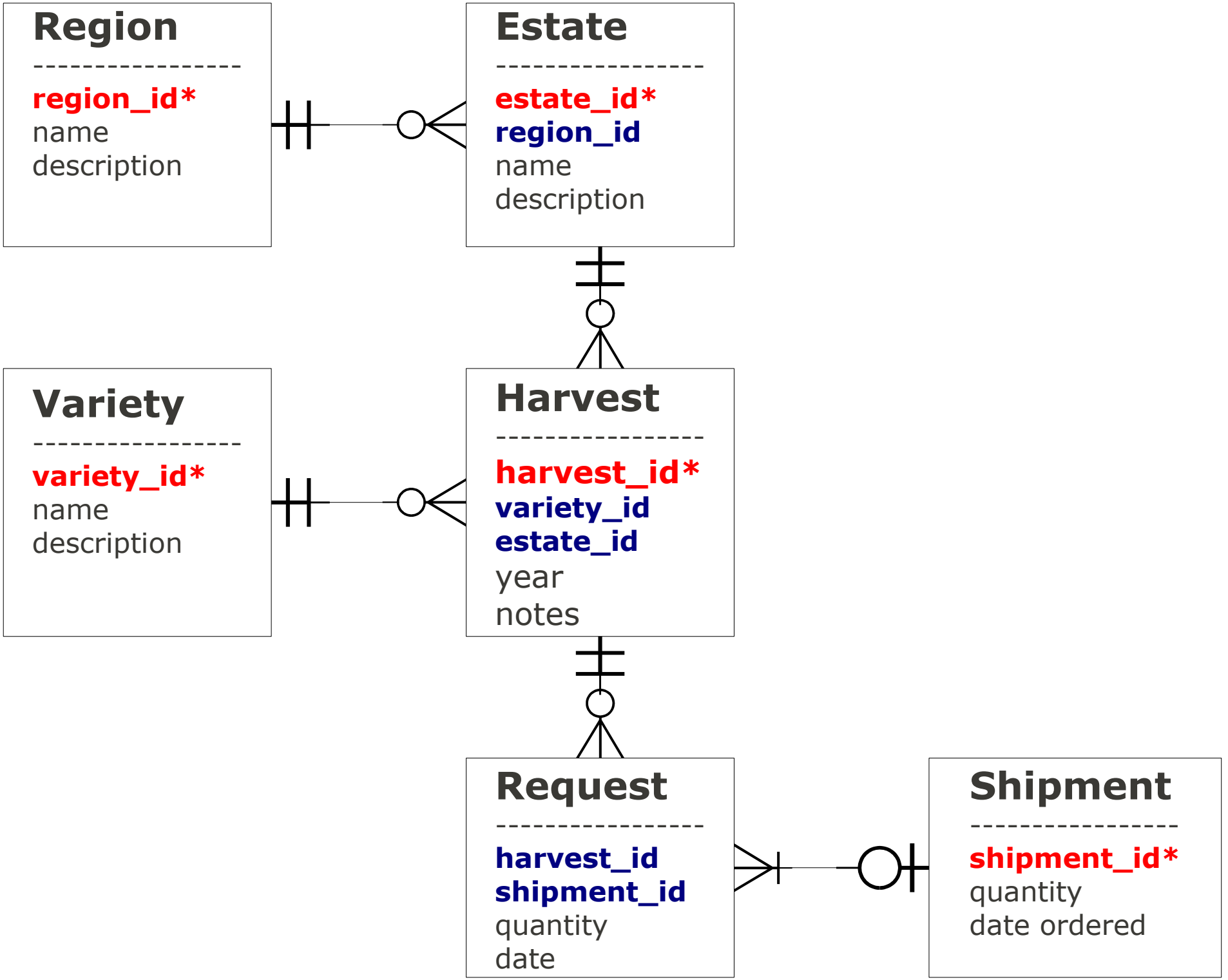
Objects:

- good for active manipulation
- good for changing software

Encapsulation

"Need to know" basis

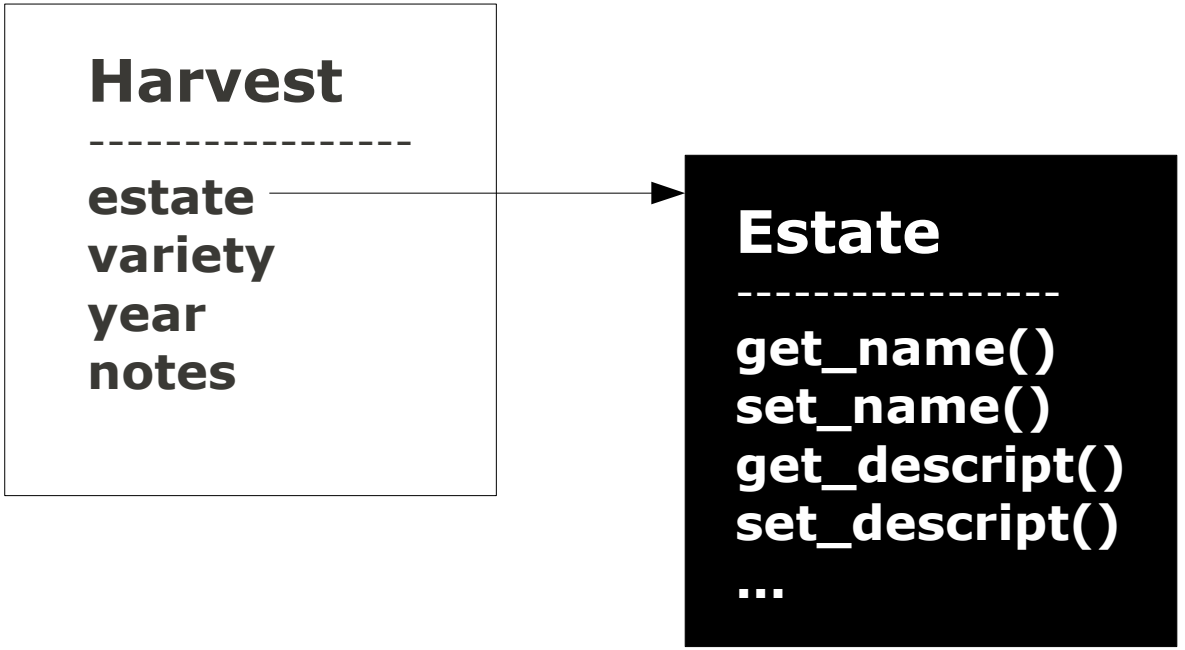
(fewer assumptions →
easier to make changes)


Region
region_id*
name
description
Estate
estate_id*
region_id
name
description
Variety
variety_id*
name
description
Harvest
harvest_id*
variety_id
estate_id
year
notes
Request
harvest_id
shipment_id
quantity
date
Shipment
shipment_id*
quantity
date ordered

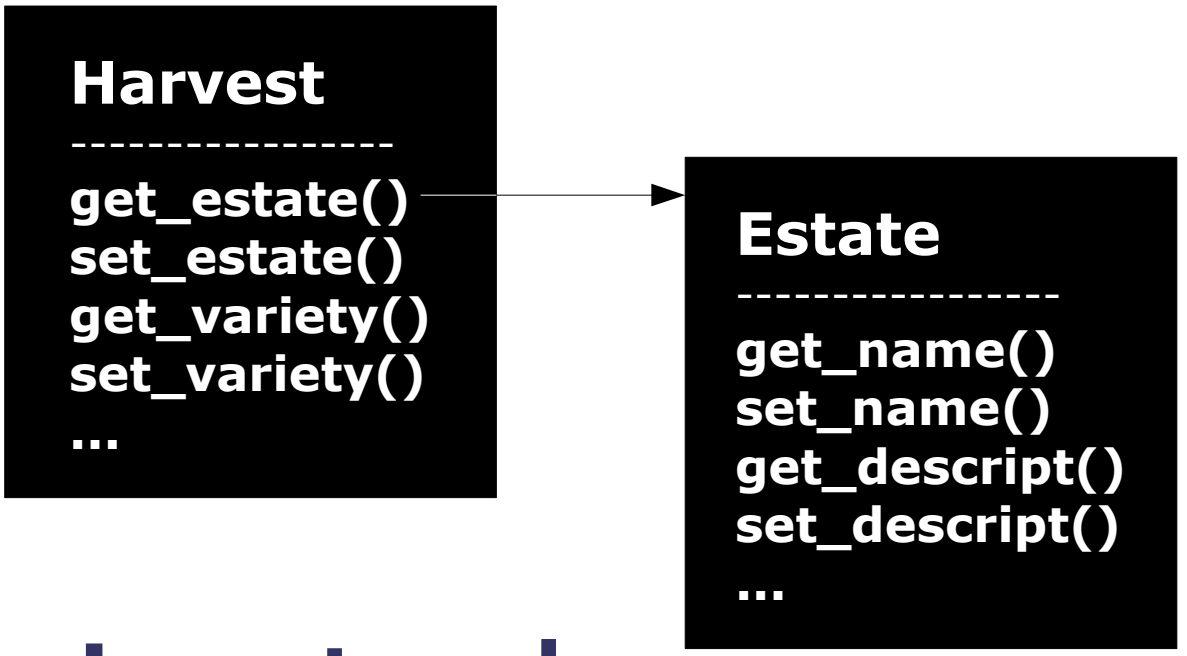
Messages

aka “methods”

The Implementation



```
$harvest = $order->getHarvest();
$estate = $harvest->getEstate();
$estate->setName("Boa Vista");
```



Object-Oriented Programming (OOP)

PHP with MySQL

```
$query = "select name, species from pet where owner='"
          . $owner . "'";
$result = mysql_query($query);
while ($row = mysql_fetch_array($result)) {
  echo "<tr>";
  echo "<td>" . $row['name'] . "</td>";
  echo "<td>" . $row['species'] . "</td>";
  echo "</tr>";
}
```

Don't forge the PHP Tutorial:
http://www.w3schools.com/php/default.asp

Updating the Data

```
$query = "update pet set species='"
         . $species . "' where name='";
         . $name . "'";
$result = mysql_query($query);
echo "ok";
```

Select and Update

```
$query = "select name, species from pet where owner='"
          . $owner . "'";
$result = mysql_query($query);
while ($row = mysql_fetch_array($result)) {
  $name = $row['name'];
  echo "Let's change the species of ";
  echo $name . " from " . $row['species'];
  echo " to " . $new_species;
  $update_query = "update pet set species='"
                  . $new_species . "' where name='";
                  . $name . "'";
  $update_result = mysql_query($query);
}
```

What We Want

```
$pets = $menagerie->get_pets_by_owner($owner);
while ($pet = $pets->next()) {
  echo "Let's change the species of ";
  echo $pet->get_name() . " from " . $pet->get_species();
  echo " to " . $new_species;
  $pet->set_name($new_species);
  $menagerie->save();
}
```

Or Even

```
$pets = $menagerie->get_pets_by_owner($owner);
while ($pet = $pets->next()) {
  echo "Let's change the species of ";
  echo $pet->name . " from " . $pet->species;
  echo " to " . $new_species;
  $pet->name = $new_species;
  $menagerie->save();
}
```

1. Easier / more intuitive
2. Encapsulation simplifies reuse

Too good to be true?

Object-Relational Mapping

Option 1:

Map objects to relations (code → database)

Option 2:

Map relations to objects (database → code)

Option 2

Manual:

We setup a mapping
pet.name → getName($name)
setName($name)

Automatic:

The software figures it out
("introspection")

Examples

Rails / ActiveRecord (Ruby)

Django (Python)

Hibernate (Java)

Doctrine (PHP)

Questions?