Mobile Application Development

Higher Diploma in Science in Computer Science

Produced by

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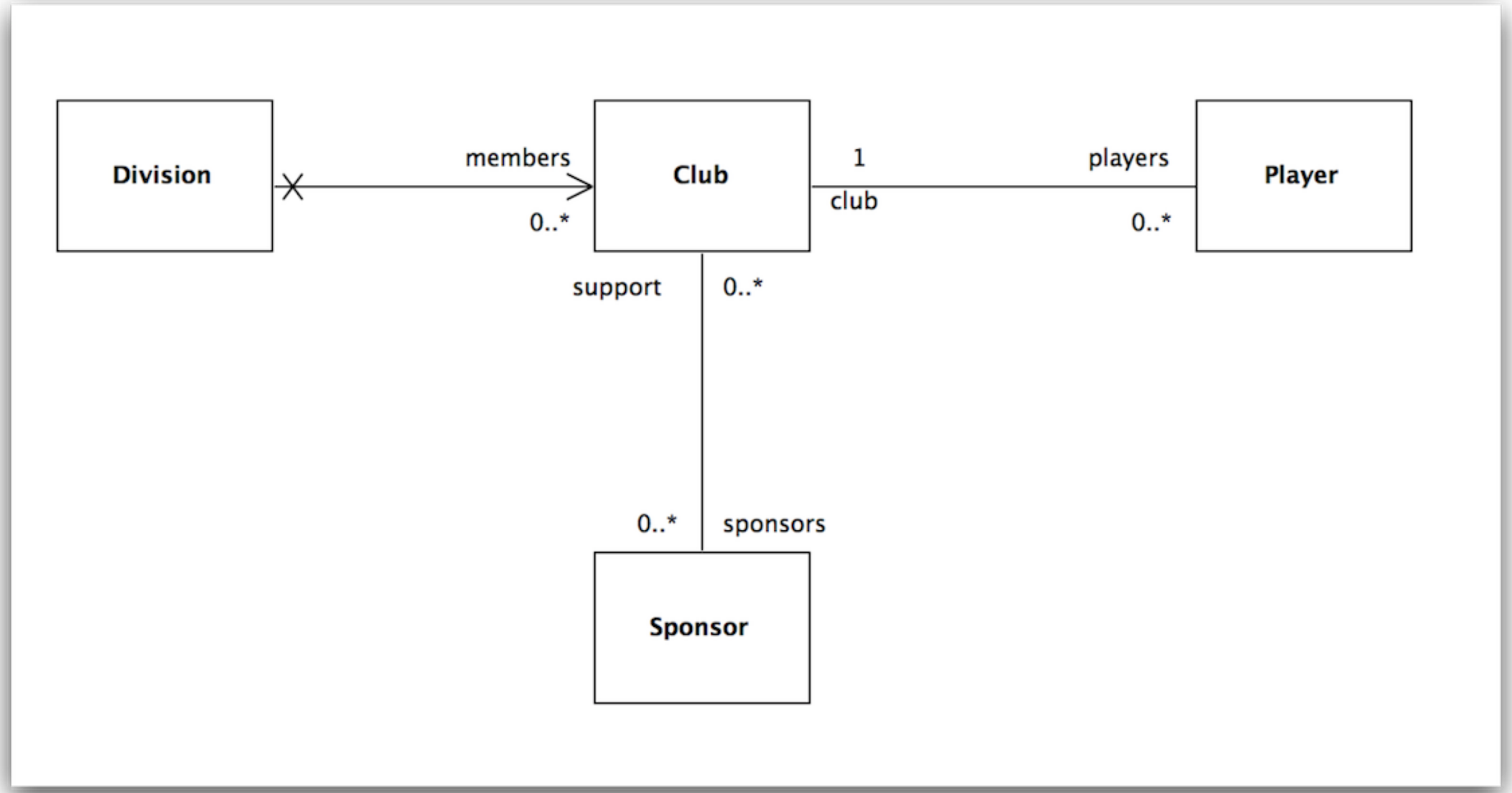
eLearning support unit

JPA II - ManyToMany

OneToMany, ManyToOne, ManyToMany



OneToMany

```
public class Division extends Model
{
  public String name;

  @OneToMany(cascade=CascadeType.ALL)
  public List<Club> members;

  public Division(String name)
  {
    this.name = name;
    members = new ArrayList<Club>();
  }

  public void addClub(Club club)
  {
    members.add(club);
  }

  public String toString()
  {
    return name;
  }

  public static Division findByName(String name)
  {
    return find("name", name).first();
  }
}
```

```
public class Club extends Model
{
  public String name;

  @OneToMany(mappedBy="club", cascade=CascadeType.ALL)
  public List<Player> players;

  @ManyToMany
  public List<Sponsor> sponsors;

  public Club(String name)
  {
    this.name = name;
    this.players = new ArrayList<Player>();
    this.sponsors = new ArrayList<Sponsor>();
  }
  public String toString()
  {
    return name;
  }
  public static Club findByName(String name)
  {
    return find("name", name).first();
  }
  public void addPlayer(Player player)
  {
    player.club = this;
    players.add(player);
  }
  public void addSponsor(Sponsor company)
  {
    sponsors.add(company);
  }
  public void removePlayer(Player player)
  {
    players.remove(player);
  }
}
```

ManyToOne

```
public class Club extends Model
{
  public String name;

  @OneToMany(mappedBy="club", cascade=CascadeType.ALL)
  public List<Player> players;

  //..
}
```

```
public class Player extends Model
{
  public String name;

  @ManyToOne
  public Club club;

  public Player(String name)
  {
    this.name = name;
  }

  public String toString()
  {
    return name;
  }

  public static Player findByName(String name)
  {
    return find("name", name).first();
  }
}
```

ManyToMany

```
public class Sponsor extends Model
{
  public String name;

  @ManyToMany (mappedBy="sponsors")
  public List<Club> support;

  public Sponsor(String name)
  {
    this.name = name;
    support = new ArrayList<Club>();
  }

  public void addSuport(Club club)
  {
    support.add(club);
  }

  public String toString()
  {
    return name;
  }
}
```

```
public class Club extends Model
{
  public String name;

  @OneToMany(mappedBy="club", cascade=CascadeType.ALL)
  public List<Player> players;

  @ManyToMany
  public List<Sponsor> sponsors;

  public Club(String name)
  {
    this.name = name;
    this.players = new ArrayList<Player>();
    this.sponsors = new ArrayList<Sponsor>();
  }
  public String toString()
  {
    return name;
  }
  public static Club findByName(String name)
  {
    return find("name", name).first();
  }
  public void addPlayer(Player player)
  {
    player.club = this;
    players.add(player);
  }
  public void addSponsor(Sponsor company)
  {
    sponsors.add(company);
  }
  public void removePlayer(Player player)
  {
    players.remove(player);
  }
}
```

Tests

- For more complex models, create fixtures in data.yml.
- These models can be loaded in unit tests

data.yml

```
Club(dunmore):
    name: dunmore

Club(tramore):
    name: tramore

Club(fenor):
    name: fenor

Player(jim):
    name: jim
    club: dunmore

Player(mary):
    name: mary
    club: dunmore

Player(sam):
    name: sam
    club: tramore

Player(john):
    name: john
    club: tramore

Player(mike):
    name: mike
    club: fenor

Player(linda):
    name: john
    club: fenor

Division(senior):
    name: senior
    members:
            - tramore
            - dunmore

Division(junior):
    name: junior
    members:
            - fenor

Sponsor(newsagent):
    name: newsagent

Sponsor(pub):
    name: pub
```

data.yml

```
Club(dunmore):
    name: dunmore

Club(tramore):
    name: tramore

Club(fenor):
    name: fenor

Player(jim):
    name: jim
    club: dunmore

Player(mary):
    name: mary
    club: dunmore

Player(sam):
    name: sam
    club: tramore

Player(john):
    name: john
    club: tramore

Player(mike):
    name: mike
    club: fenor

Player(linda):
    name: john
    club: fenor

Division(senior):
    name: senior
    members:
            - tramore
            - dunmore

Division(junior):
    name: junior
    members:
            - fenor

Sponsor(newsagent):
    name: newsagent

Sponsor(pub):
    name: pub
```

ComprehensiveTest

```
public class ComprehensiveTest extends UnitTest
{
  @Before
  public void setup()
  {
    Fixtures.loadModels("data.yml");
  }

  @After
  public void teardown()
  {
    Fixtures.deleteAllModels();
  }
```

```
Club(dunmore):
    name: dunmore

Club(tramore):
    name: tramore

Club(fenor):
    name: fenor

Player(jim):
    name: jim
    club: dunmore

Player(mary):
    name: mary
    club: dunmore

Player(sam):
    name: sam
    club: tramore

Player(john):
    name: john
    club: tramore

Player(mike):
    name: mike
    club: fenor

Player(linda):
    name: john
    club: fenor

Division(senior):
    name: senior
    members:
            - tramore
            - dunmore

Division(junior):
    name: junior
    members:
            - fenor

Sponsor(newsagent):
    name: newsagent

Sponsor(pub):
    name: pub
```

SELECT * FROM CLUB;

ID	NAME
1	dunmore
2	tramore
3	fenor

(3 rows, 3 ms)

SELECT * FROM PLAYER;

ID	NAME	CLUB_ID
1	jim	1
2	mary	1
3	sam	2
4	john	2
5	mike	3
6	linda	3

(6 rows, 2 ms)

SELECT * FROM SPONSOR;

ID	NAME
1	newsagent
2	pub

(2 rows, 2 ms)

SELECT * FROM DIVISION;

ID	NAME
1	senior
2	junior

(2 rows, 1 ms)

SELECT * FROM DIVISION_CLUB;

DIVISION_ID	MEMBERS_ID
1	2
1	1
2	3

(3 rows, 3 ms)

Yaml file - Froward References

- Test data in Yaml file cannot refer to objects that have not been seen in the file yet (reading from top to bottom)

- Bidirectional references can be included by including the objects twice

  - Once at top (partial)

  - Once at end (complete)

```
Sponsor(pub):
    name: pub

Sponsor(newsagent):
    name: newsagent
```

```
Club(tramore):
    name: tramore
    sponsors:
          - pub
          - newsagent

Club(fenor):
    name: fenor
    sponsors:
          - newsagent
```

```
Sponsor(newsagent):
    name: newsagent
    support:
         - tramore
         - fenor

Sponsor(pub):
    name: pub
    support:
         - tramore
```

Test Strategy

- For each relationship:
  - ‘short’ test - quick sanity check
  - ‘long’ test - full exercise of relationship, in both directions if present
  - ‘edit’ test - perform change on objects

Test Data

```
Sponsor(pub):
    name: pub

Sponsor(newsagent):
    name: newsagent

Club(tramore):
    name: tramore
    sponsors:
          - pub
          - newsagent

Club(fenor):
    name: fenor
    sponsors:
          - newsagent

Player(jim):
    name: jim
    club: dunmore

Player(mary):
    name: mary
    club: dunmore

Player(sam):
    name: sam
    club: tramore
///
Sponsor(newsagent):
    name: newsagent
    support:
         - tramore
         - fenor

Sponsor(pub):
    name: pub
    support:
         - tramore
```

```
public class ComprehensiveTest extends UnitTest
{

  @Before
  public void setup()
  {
    Fixtures.loadModels("data.yml");
  }
```

‘Sanity’ Tests

```
@Test
public void testPlayerClub()
{
  Club   dunmore = Club.find("byName", "dunmore").first();
  Player jim     = Player.find("byName", "jim").first();
  Player mary    = Player.find("byName", "mary").first();
  assertNotNull(mary);

  assertTrue (dunmore.players.contains(jim));
  assertTrue (dunmore.players.contains(mary));
}

@Test
public void testDivisionClub()
{
  Division senior  = Division.find("byName", "senior").first();
  Club     dunmore = Club.find("byName", "dunmore").first();
  Club     tramore = Club.find("byName", "tramore").first();

  assertTrue (senior.members.contains(dunmore));
  assertTrue (senior.members.contains(tramore));
}

@Test
public void testClubSponsorShort()
{
  Sponsor  newsagent = Sponsor.find("byName", "newsagent").first();
  Club     dunmore   = Club.find("byName", "dunmore").first();
  Club     tramore   = Club.find("byName", "tramore").first();

  assertTrue(newsagent.support.contains(dunmore));
  assertTrue(newsagent.support.contains(tramore));

  assertTrue(dunmore.sponsors.contains(newsagent));
  assertTrue(tramore.sponsors.contains(newsagent));
}
```

‘Long’ Tests

```
@Test
public void testPlayerClubLong()
{
  Player jim;
  Club   dunmore;

  jim = Player.find("byName", "jim").first();
  assertNotNull(jim);
  assertEquals(jim.name, "jim");

  dunmore = jim.club;
  assertEquals("dunmore", dunmore.name);

  dunmore = Club.find("byName", "dunmore").first();
  assertNotNull(dunmore);
  assertEquals("dunmore", dunmore.name);
  assertEquals(2, dunmore.players.size());

  Player p1 = dunmore.players.get(0);
  assertTrue (p1.name.equals("jim") || p1.name.equals("mary"));
  Player p2 = dunmore.players.get(1);
  assertTrue (p2.name.equals("jim") || p2.name.equals("mary"));
}

@Test
public void testDivisionClubLong()
{
  Division senior = Division.find("byName", "senior").first();
  assertNotNull(senior);
  assertEquals(2, senior.members.size());

  Club c1 = senior.members.get(0);
  Club c2  = senior.members.get(1);

  assertTrue (c1.name.equals("tramore") || c1.name.equals("dunmore"));
  assertTrue (c2.name.equals("tramore") || c2.name.equals("dunmore"));
}
```

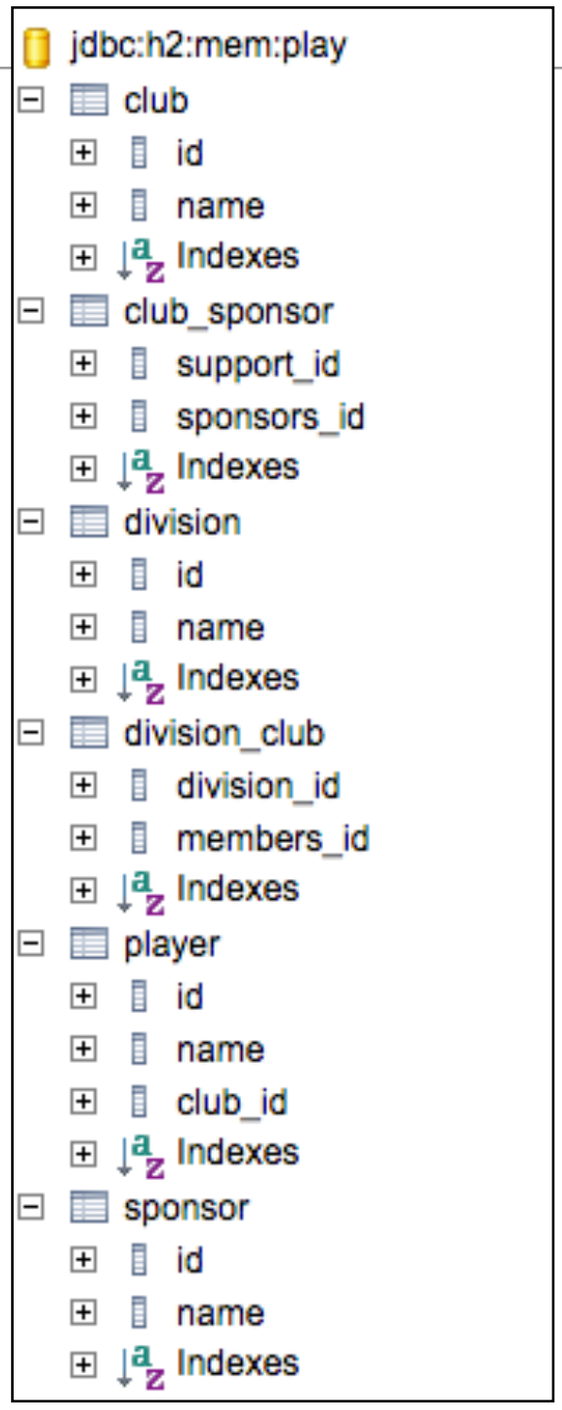
‘Edit’ Tests

```
@Test
public void testEditPlayerClub()
{
  Club   dunmore = Club.find("byName", "dunmore").first();
  Player jim     = Player.find("byName", "jim").first();
  Player mary    = Player.find("byName", "mary").first();

  dunmore.players.remove(mary);
  mary.delete();
  dunmore.save();

  assertEquals (dunmore.players.size(), 1);
  assertTrue (dunmore.players.contains(jim));

  assertEquals(0, Player.find("byName", "mary").fetch().size());

  Player sara     = new Player("sara");
  dunmore.addPlayer(sara);
  dunmore.save();
  assertEquals (dunmore.players.size(), 2);
}

@Test
public void testEditClubSponsor()
{
  Sponsor  newsagent = Sponsor.find("byName", "newsagent").first();
  Club     dunmore   = Club.find("byName", "dunmore").first();

  assertEquals(2, newsagent.support.size());

  newsagent.support.remove(dunmore);
  dunmore.sponsors.remove(newsagent);

  newsagent.save();
  dunmore.save();

  assertEquals(1, newsagent.support.size());
}
```

Exploring the Database

```
Sponsor(pub):
    name: pub

Sponsor(newsagent):
    name: newsagent

Club(dunmore):
    name: dunmore

Club(tramore):
    name: tramore
    sponsors:
          - pub
          - newsagent

Club(fenor):
    name: fenor
    sponsors:
          - newsagent

Division(senior):
    name: senior
    members:
          - tramore
          - dunmore

Division(junior):
    name: junior
    members:
          - fenor

Sponsor(newsagent):
    name: newsagent
    support:
         - tramore
         - fenor

Sponsor(pub):
    name: pub
    support:
         - tramore
```

```
Player(jim):
    name: jim
    club: dunmore

Player(mary):
    name: mary
    club: dunmore

Player(sam):
    name: sam
    club: tramore

Player(john):
    name: john
    club: tramore

Player(mike):
    name: mike
    club: fenor

Player(linda):
    name: linda
    club: fenor
```



Player & Club

```
Club(dunmore):
    name: dunmore

Club(tramore):
    name: tramore

Club(fenor):
    name: fenor
```

```
Player(jim):
    name: jim
    club: dunmore

Player(mary):
    name: mary
    club: dunmore

Player(sam):
    name: sam
    club: tramore

Player(john):
    name: john
    club: tramore

Player(mike):
    name: mike
    club: fenor

Player(linda):
    name: linda
    club: fenor
```

SELECT * FROM CLUB;

ID	NAME
1	dunmore
2	tramore
3	fenor

(3 rows, 2 ms)

SELECT * FROM PLAYER;

ID	NAME	CLUB_ID
1	jim	1
2	mary	1
3	sam	2
4	john	2
5	mike	3
6	linda	3

(6 rows, 5 ms)

Club & Division

```
 Club(dunmore):
    name: dunmore

Club(tramore):
    name: tramore

Club(fenor):
    name: fenor

Division(senior):
    name: senior
    members:
            - tramore
            - dunmore

Division(junior):
    name: junior
    members:
            - fenor
```

SELECT * FROM CLUB;

ID	NAME
1	dunmore
2	tramore
3	fenor

(3 rows, 2 ms)

SELECT * FROM DIVISION;

ID	NAME
1	senior
2	junior

(2 rows, 2 ms)

SELECT * FROM DIVISION_CLUB;

DIVISION_ID	MEMBERS_ID
1	2
1	1
2	3

(3 rows, 3 ms)

Sponsor & Club

```
Sponsor(pub):
    name: pub

Sponsor(newsagent):
    name: newsagent

Club(dunmore):
    name: dunmore

Club(tramore):
    name: tramore
    sponsors:
          - pub
          - newsagent

Club(fenor):
    name: fenor
    sponsors:
          - newsagent

Sponsor(newsagent):
    name: newsagent
    support:
         - tramore
         - fenor

Sponsor(pub):
    name: pub
    support:
         - tramore
```

SELECT * FROM SPONSOR;

ID	NAME
1	pub
2	newsagent

(2 rows, 1 ms)

Edit

SELECT * FROM CLUB;

ID	NAME
1	dunmore
2	tramore
3	fenor

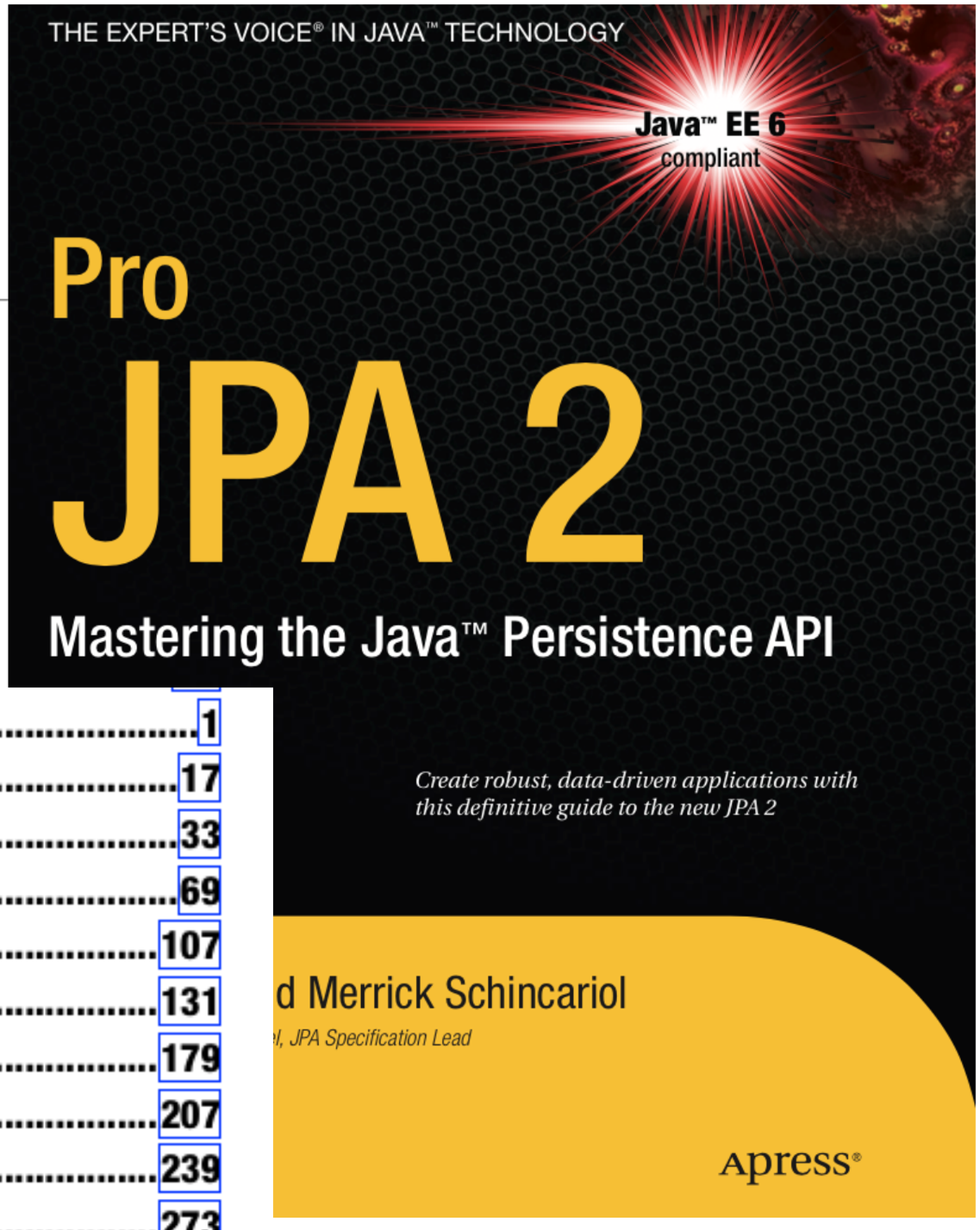
(3 rows, 2 ms)

SELECT * FROM CLUB_SPONSOR;

SUPPORT_ID	SPONSORS_ID
2	1
2	2
3	2

(3 rows, 3 ms)

Definitive Reference



Alternatives?

- NoSQL -
  - Document Oriented
  - Simpler for many use cases
  - Less powerful in some ways “aggregates” instead of “relations”
  - Faster and easier to scale