



W4111 – 02: Introduction to Databases

Lecture 3,4: ER Modeling, SQL, Relational

*Donald F. Ferguson
dff9@columbia.edu*

Today's Lecture – What You Need for HW 1

- Programming and No-Programming HW/Projects Direction
- Entity-Relationship Modeling:
 - Subset of Chapter 6 from recommended textbook.
 - Slides should be enough and there is a lot of online material.
- Crow's Foot Notation:
 - Simpler and more compact.
 - Very similar to what MySQL uses.
 - Demo of MySQL tools.
- Introduction to Some Patterns in SQL DDL
- Some Details on SQL DML SELECT.
- Interwoven with Some Demos.

GoT Characters.json

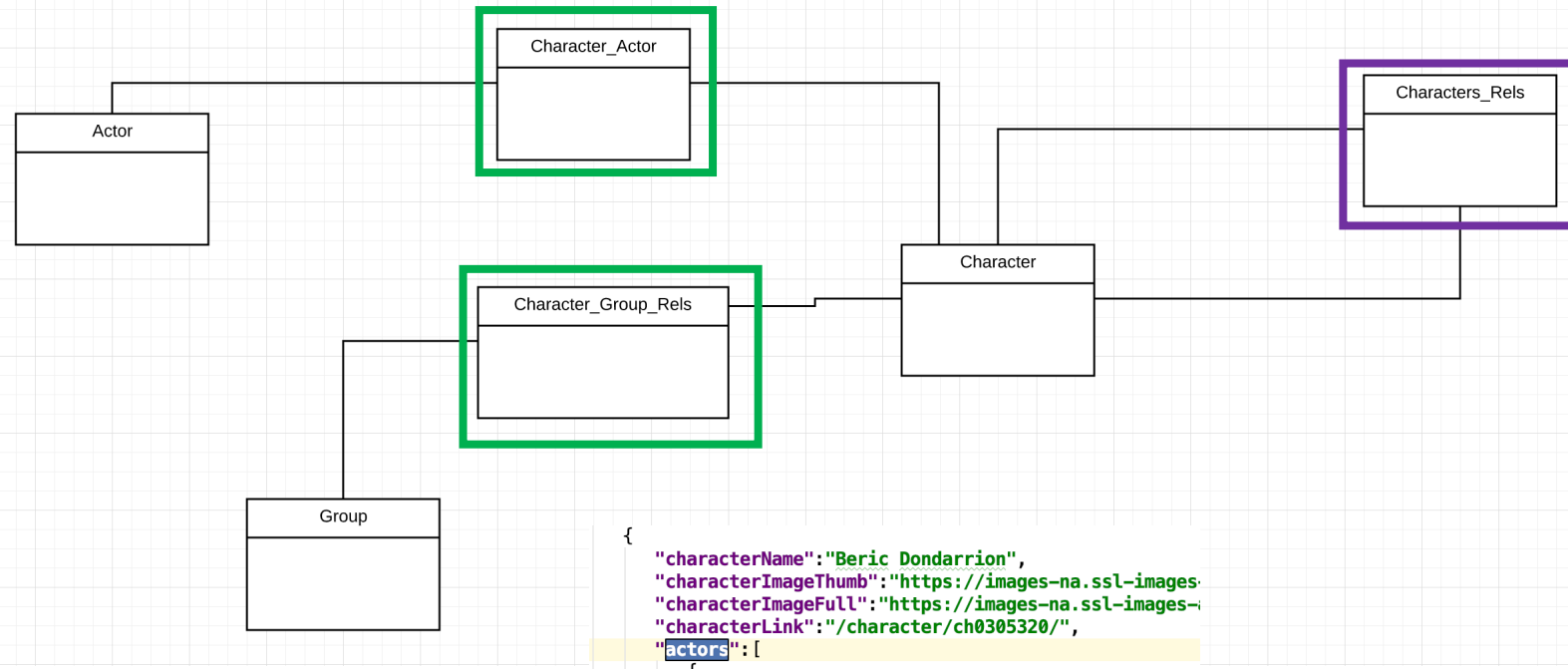
```
{
  "atomic": {
    "characterName": "<class 'str'>",
    "characterLink": "<class 'str'>",
    "actorName": "<class 'str'>",
    "actorLink": "<class 'str'>",
    "character_id": "<class 'str'>",
    "royal": "<class 'bool'>",
    "characterImageThumb": "<class 'str'>",
    "characterImageFull": "<class 'str'>",
    "nickname": "<class 'str'>",
    "kingsguard": "<class 'bool'>"
  },
  "compound": {
    "parents": "<class 'list'>",
    "siblings": "<class 'list'>",
    "killedBy": "<class 'list'>",
    "killed": "<class 'list'>",
    "servedBy": "<class 'list'>",
    "parentOf": "<class 'list'>",
    "marriedEngaged": "<class 'list'>",
    "serves": "<class 'list'>",
    "guardedBy": "<class 'list'>",
    "actors": "<class 'list'>",
    "houseName": "<class 'list'>",
    "guardianOf": "<class 'list'>",
    "allies": "<class 'list'>",
    "abductedBy": "<class 'list'>",
    "abducted": "<class 'list'>",
    "sibling": "<class 'list'>"
  }
}
```

There are some strange things ...

- There are *siblings* and *sibling*.
A little analysis indicates that this must be a typo.
- There are
 - *actors* and *actorName*.
 - There is also *actorLink*.
- The remainder seem to be relationships/associations between characters.
 - Some are unidirectional but paired, e.g. *killed*, *killedBy*.
 - Bi-directional, *allies*, *siblings*.
 - At least one relationship, *actors*, has properties.
- *characterName* is “mostly” unique but there are some entities that have the same character name.

GoT Characters.json – Conceptual Model Decisions

Initial Conceptual Model (Partial)



```
{
  "characterName": "Beric Dondarrion",
  "characterImageThumb": "https://images-na.ssl-images-
  "characterImageFull": "https://images-na.ssl-images-
  "characterLink": "/character/ch0305320/",
  "actors": [
    {
      "actorName": "Richard Dormer",
      "actorLink": "/name/nm0233807/",
      "seasonsActive": [
        3,
        6,
        7,
        8
      ]
    },
    {
      "actorName": "David Michael Scott",
      "actorLink": "/name/nm2364108/",
      "seasonsActive": [
        1
      ]
    }
  ]
},
]
```

- Collapse things like:
 - Killed, killedBy into
 - Kill with source, target
 - IsBidirectional
 - This is actually more at the logical level.
- Replace things like:
 - Siblings, House, Allies into the same concept
 - Membership in a group.
- The use of entities sets to implement relationships helps with:
 - Many-to-Many
 - Properties on relationships

episodes.json – Data File Analysis

Example Episode

```
{
  "seasonNum": 1,
  "episodeNum": 2,
  "episodeTitle": "The Kingsroad",
  "episodeLink": "/title/tt1668746/",
  "episodeAirDate": "2011-04-24",
  "episodeDescription": "While Bran recovers from his fall,",
  "openingSequenceLocations": [
    "King's Landing",
    "Winterfell",
    "The Wall",
    "Vaes Dothrak"
  ],
  "scenes": [...]
```

Example Scene

```
{
  "sceneStart": "0:18:50",
  "sceneEnd": "0:21:42",
  "location": "The Crownlands",
  "subLocation": "King's Landing",
  "characters": [
    {
      "name": "Rodrik Cassel",
      "weapon": [
        {
          "action": "gives",
          "name": "Valyrian Steel Dagger"
        }
      ]
    },
    {
      "name": "Catelyn Stark"
    },
    {
      "name": "Petyr Baelish"
    },
    {
      "name": "Lord Varys",
      "weapon": [
        {
          "action": "receives",
          "name": "Valyrian Steel Dagger"
        }
      ]
    }
  ]
}
```

The average number of scenes per episode is: 57

episodes.json – Scene Analysis

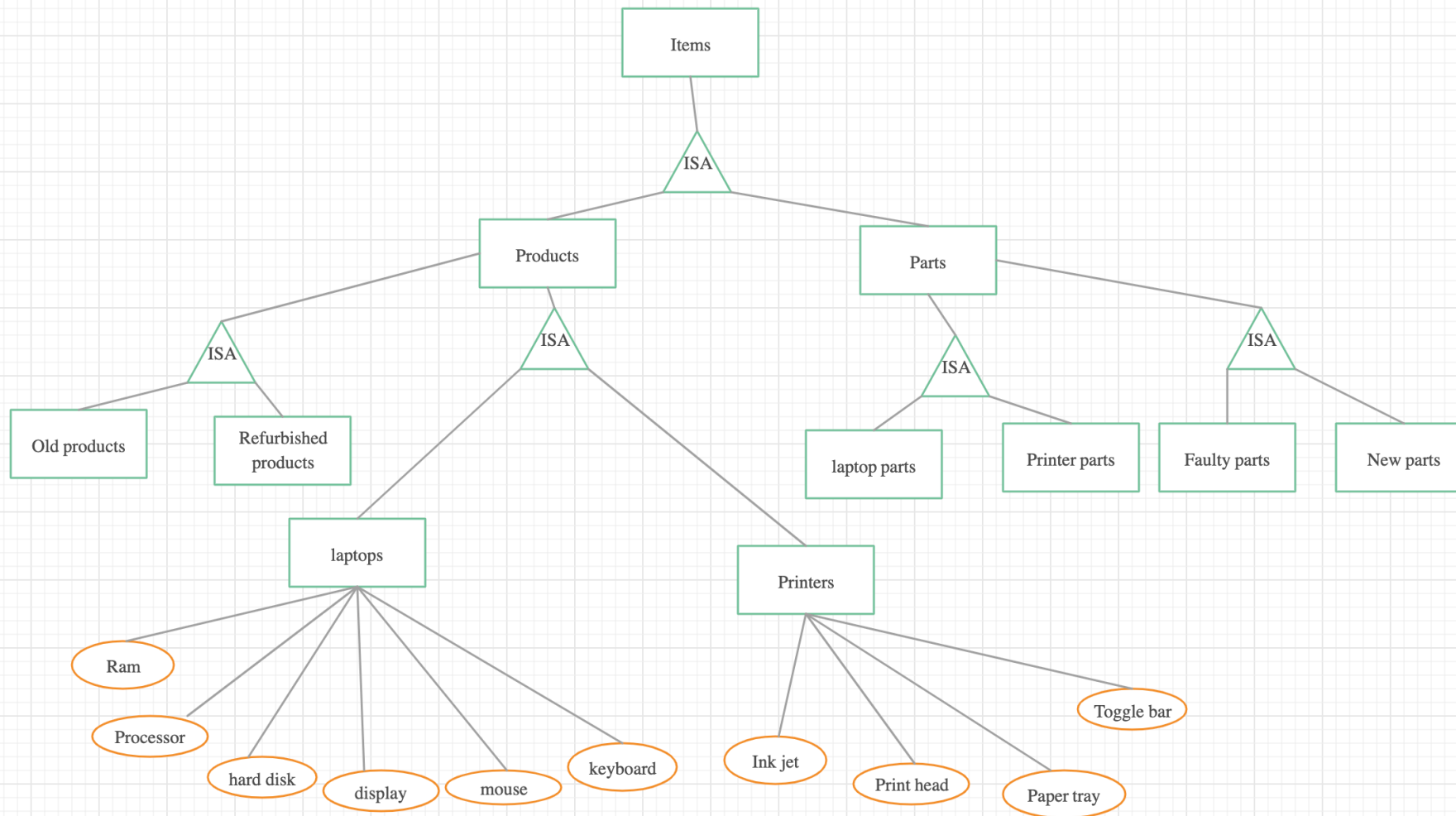
Scene Examples

```
{
  "sceneStart": "0:15:33",
  "sceneEnd": "0:16:17",
  "location": "Braavos",
  "characters": [
    {
      "name": "Arya Stark",
      {
        "name": "Ghita",
        "alive": false,
        "mannerOfDeath": "Poison",
        "killedBy": [
          "Arya Stark"
        ]
      }
    ],
    {
      "name": "Jagen H'ghar"
    }
  ]
}
```

```
{
  "sceneStart": "0:04:41",
  "sceneEnd": "0:05:54",
  "location": "The Wall",
  "subLocation": "Castle Black",
  "characters": [
    {
      "name": "Jon Snow",
      "weapon": [
        {
          "action": "has", "name": "Longclaw",
        },
        {
          "action": "receives", "name": "Dragonglass"
        }
      ]
    },
    {
      "name": "Alliser Thorne",
    },
    {
      "name": "Samwell Tarly",
      "weapon": [
        {
          "action": "gives", "name": "Dragonglass"
        }
      ]
    },
    {
      "name": "Olly",
    },
    {
      "name": "Othell Yarwyck",
    },
    {
      "name": "Bowen Marsh",
    },
    {
      "name": "Tormund Giantsbane",
    },
    {
      "name": "Eddison Tollett"
    }
  ]
}
```

```
{
  "sceneStart": "0:48:18",
  "sceneEnd": "0:50:13",
  "location": "The North",
  "subLocation": "Winterfell",
  "characters": [
    {
      "name": "Sansa Stark",
      "married": {
        "to": "Ramsay Snow",
        "when": "present",
        "type": "arranged",
        "consummated": true
      }
    },
    {
      "name": "Theon Greyjoy",
    },
    {
      "name": "Roose Bolton",
    },
    {
      "name": "Ramsay Snow",
      "married": {
        "to": "Sansa Stark",
        "when": "present",
        "type": "arranged",
        "consummated": true
      }
    },
    {
      "name": "Walda Bolton",
    },
    {
      "name": "Myranda"
    }
  ]
}
```

ER Diagram with Inheritance



Programming and No-Programming Homework Directions

Example I – IMDB