

Flatfile, Relational

This is a flat-file database.

SID	SFName	SLName	SteleNum	CID	CName	TID	Trainer	TteleNum
1	Mary	Hinkle	555.123.4567	101	Data Basics	T01	Charles Hill	555.987.6542
2	Paul	Litz	555.258.8963	101	Data Basics	T01	Charles Hill	555.987.6542
1	Mary	Hinkle	555.123.4567	102	Web Design	T02	Glen Barber	555.879.4652
3	Dee	Coleman	555.357.9514	203	Relational Design	T03	Rick Dobson	555.324.2986
4	Don	Charney	555.369.8741	204	VBA Programming	T03	Rick Dobson	555.324.2986

One (or few) tables.

Lots of information in each field.

Many entities together.

Mary Hinkle has a new phone number. What needs to change?

SID	SFName	SLName	SteleNum	CID	CName	TID	Trainer	TteleNum
1	Mary	Hinkle	555.123.4567	101	Data Basics	T01	Charles Hill	555.987.6542
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4	Don	Charney	555.369.8741	204	VBA Programming	T03	Rick Dobson	555.324.2986

2 Things!?!?!?

There could be an **UPDATE anomaly** where we miss one of them.

Then, our database will lack integrity.

We have a new instructor. Ida Knowe. Add her.

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1	Mary	Hinkle	555.123.4567	101	Data Basics	T01	Charles Hill	555.987.6542
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Ummm, we can't.

A trainer has to be teaching a course to appear in the table.

Ida isn't yet so we can add her.

This is an **insertion anomaly**.

We want to delete the 204 VBA Programming course.

SID	SFName	SLName	SteleNum	CID	CName	TID	Trainer	TteleNum
1	Mary	Hinkle	555.123.4567	101	Data Basics	T01	Charles Hill	555.987.6542
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Uh oh. This isn't good.

If we delete the record with 204 VBA, we also delete Don Charney, the student.

This is a **deletion anomaly**.

Sort by the Trainer's Last Name.

SID	SFName	SLName	SteleNum	CID	CName	TID	Trainer	TteleNum
1	Mary	Hinkle	555.123.4567	101	Data Basics	T01	Charles Hill	555.987.6542
2	Paul	Litz	555.258.8963	101	Data Basics	T01	Charles Hill	555.987.6542
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Good luck with that.

You can sort by first name, but the last name isn't stored separately.

In short, flat file databases are difficult to :

- Update
- Add new records
- Delete records
- Search
- Sort (order by)
- Summarize (using aggregates, group by)

Since those are all the functions of a database, flat file databases aren't the best.

Instead we use relational databases.

To move a flat-file database to a relational one, we **NORMALIZE** the tables.

What are the entities?

SID	SFName	SLName	SteleNum	CID	CName	TID	Trainer	TteleNum
1	Mary	Hinkle	555.123.4567	101	Data Basics	T01	Charles Hill	555.987.6542
2	Paul	Litz	555.258.8963	101	Data Basics	T01	Charles Hill	555.987.6542
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Student

Course

Trainer

What are the attributes?

SID	SFName	SLName	SteleNum	CID	CName	TID	Trainer	TteleNum
1	Mary	Hinkle	555.123.4567	101	Data Basics	T01	Charles Hill	555.987.6542
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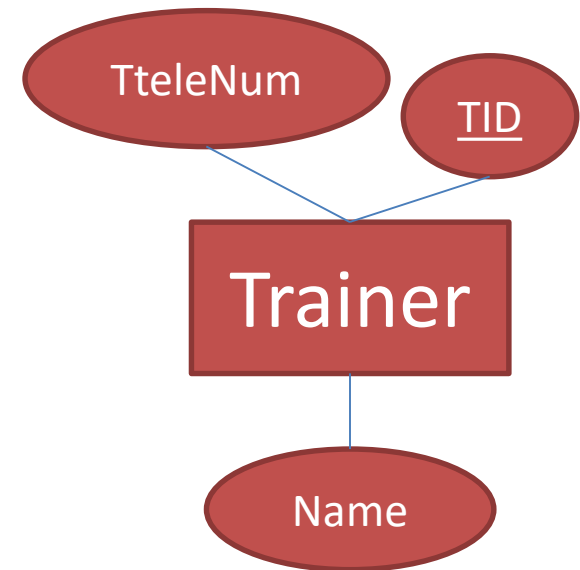
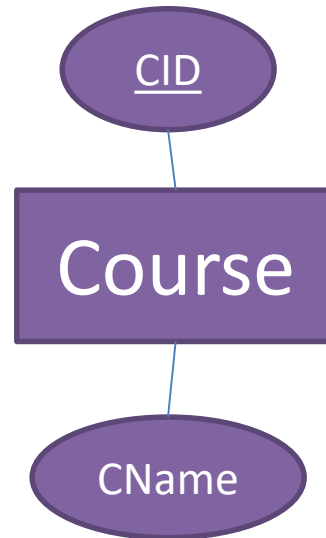
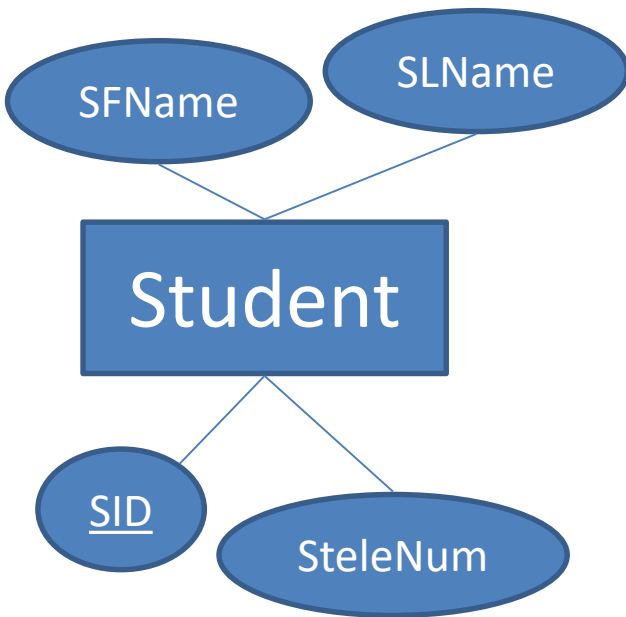
Student

Course

Trainer

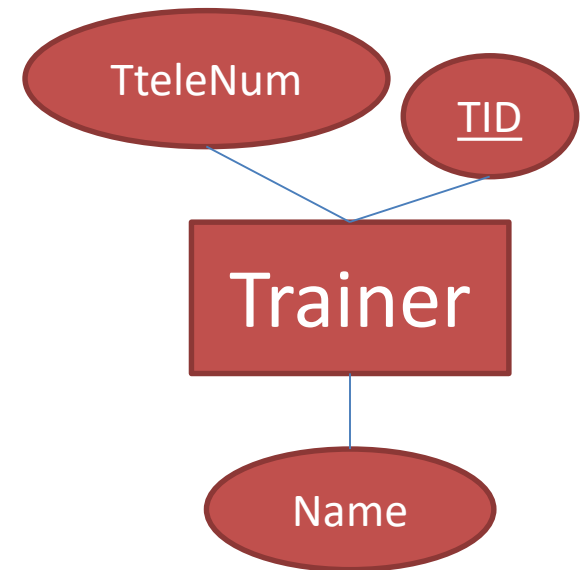
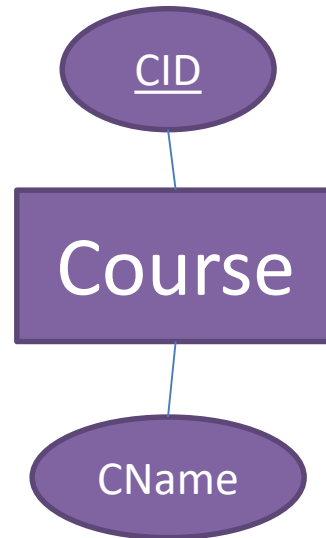
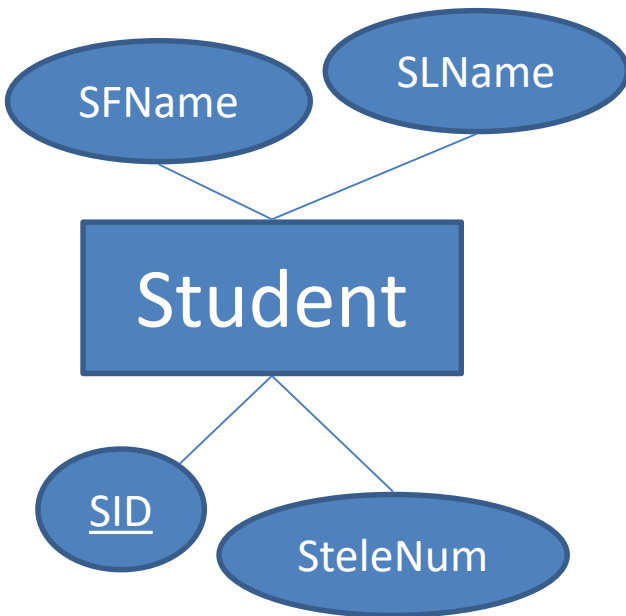
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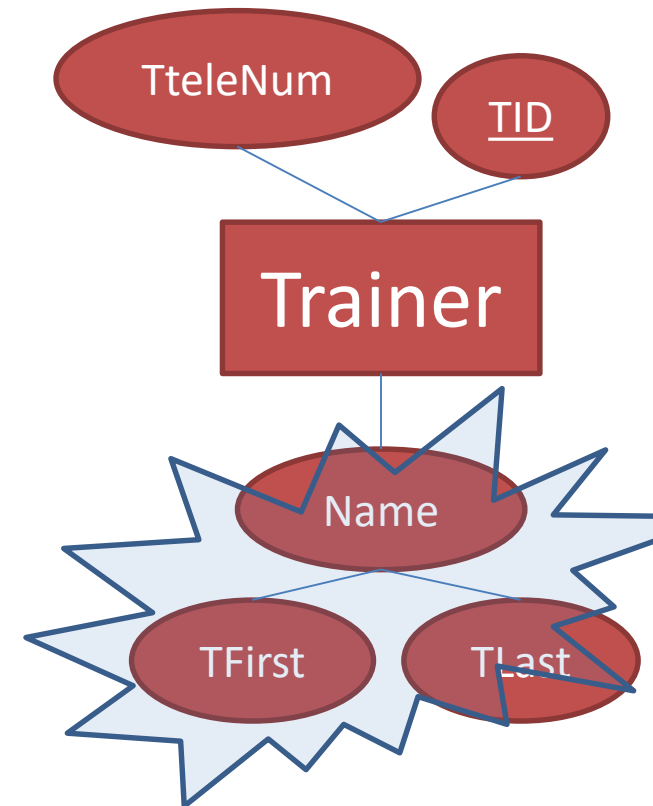
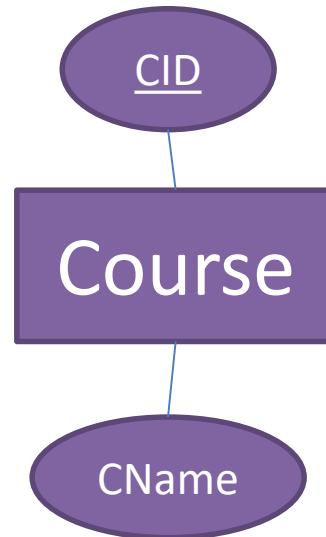
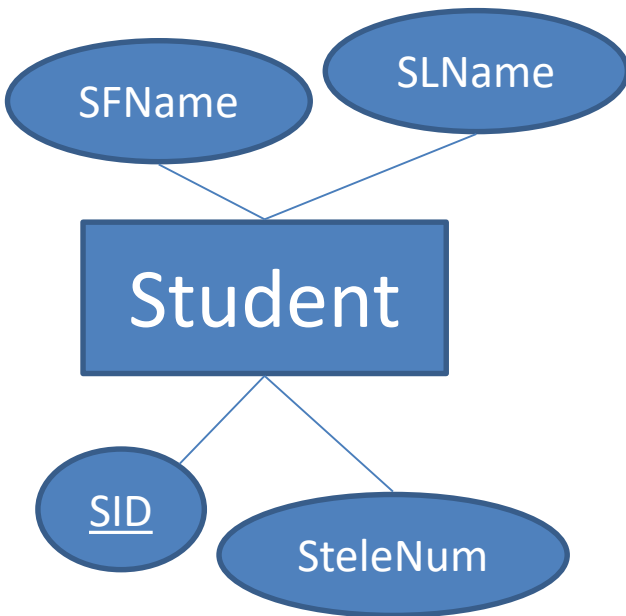
Do we need to “blow out” any fields?

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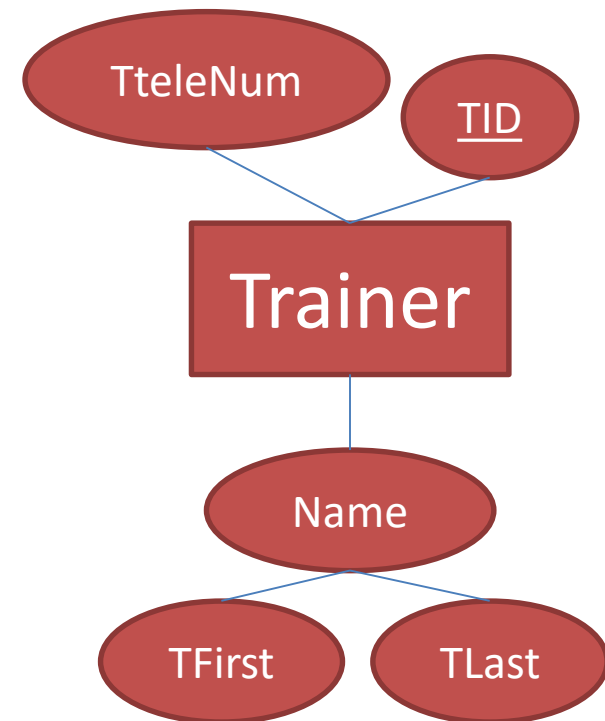
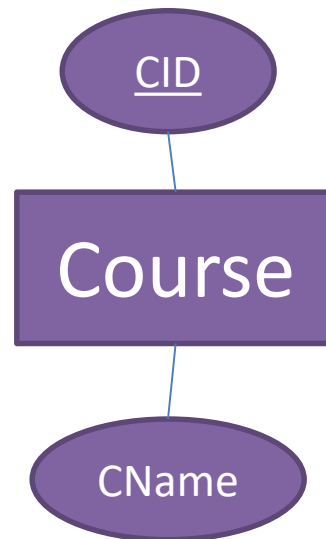
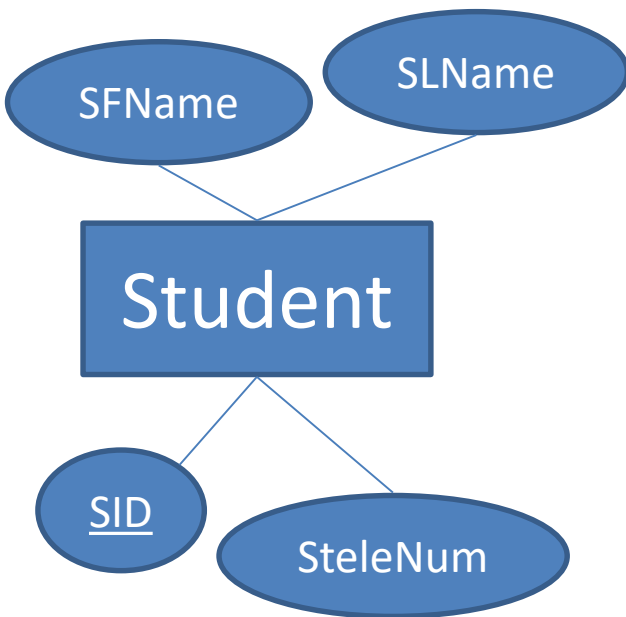
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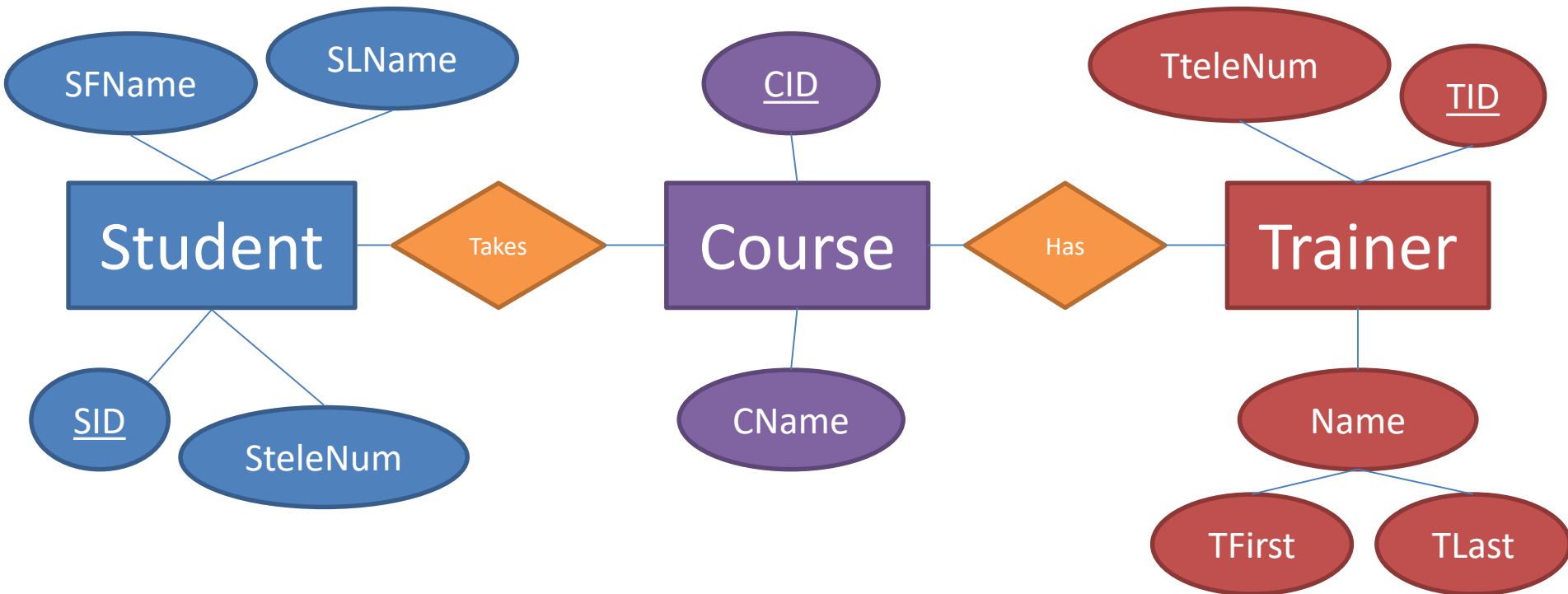
Relationships?

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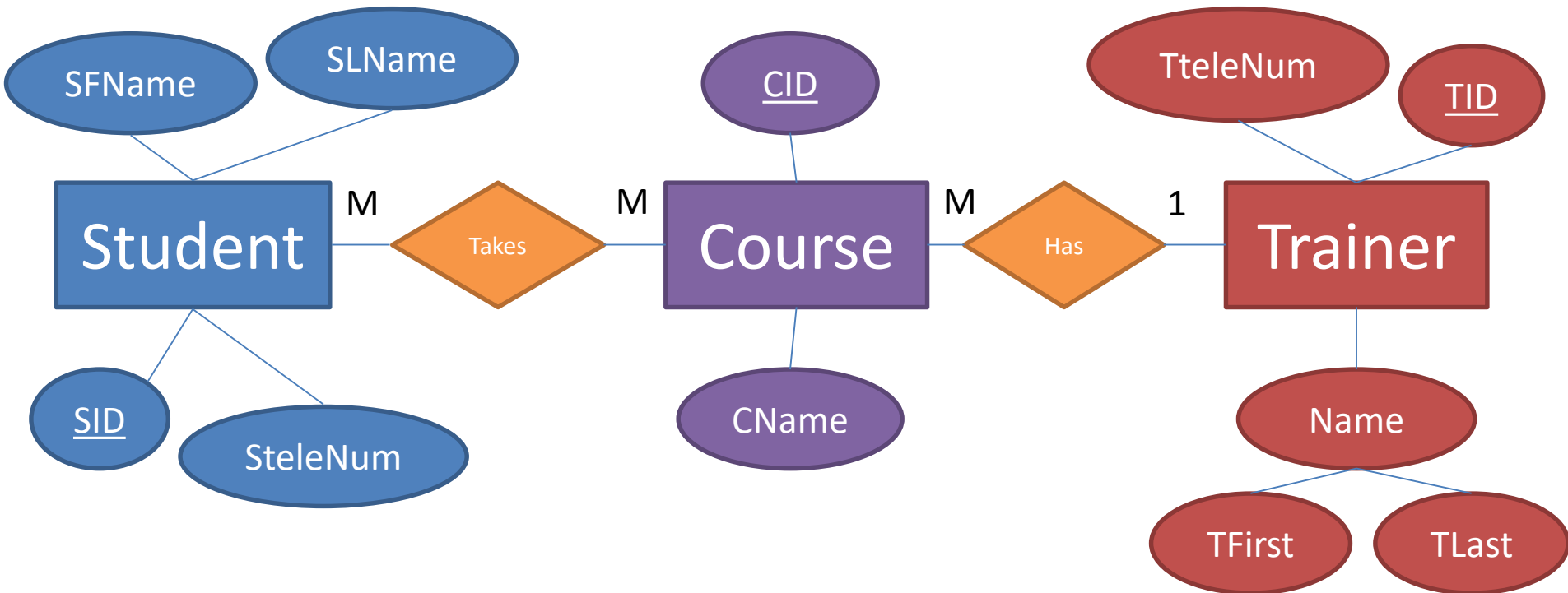


Cardinality?

- A student has many courses.
 - A course has many students.
 - Many to many.
-
- A course has one trainer.
 - A trainer has many courses.
 - One to many.

Add cardinality.

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Make Tables.

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CID	CName
101	Data Basics
101	Data Basics
102	Web Design
203	Relational Design
204	VBA Programming

TID	TFirst	TLast	TteleNum
T01	Charles	Hill	555.987.6542
T01	Charles	Hill	555.987.6542
T02	Glen	Barber	555.879.4652
T03	Rick	Dobson	555.324.2986
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Delete duplicates

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3	Dee	Coleman	555.357.9514
4	Don	Charney	555.369.8741

TID	TFirst	TLast	TteleNum
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T03	Rick	Dobson	555.324.2986

CID	CName
101	Data Basics
102	Web Design
203	Relational Design
204	VBA Programming

Handle the 1:M Relationship.

Course: Trainer

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CID	CName
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102	Web Design
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204	VBA Programming

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Course: Trainer

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CID	CName	TID
101	Data Basics	T01
102	Web Design	T02
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Handle the M:M Relationship.

Course: Student

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3	Dee	Coleman	555.357.9514
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102	Web Design	T02
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1	101
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CID	CName	TID
101	Data Basics	T01
102	Web Design	T02
203	Relational Design	T03
204	VBA Programming	T03

Voila!

It's normalized.

- Separate information – one entity per table.
- One piece of information per field.
- For many to many relationships, make separate tables.
- For relationships, add foreign keys to allow you to reconnect.
- Outside of foreign keys, repeat as little information as possible.

Mary Hinkle has a new phone number. What needs to change?

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3	Dee	Coleman	555.357.9514
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T03	Rick	Dobson	555.324.2986

SID	CID
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2	101
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SID	CID
1	101
2	101
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3	203
4	204

CID	CName	TID
101	Data Basics	T01
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One thing. We're in business.

We have a new instructor. Ida Knowe. Add her.

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T01	Charles	Hill	555.987.6542
T02	Glen	Barber	555.879.4652
T03	Rick	Dobson	555.324.2986
T04	Ida	Knowe	555.786.3456

SID	CID
1	101
2	101
1	102
3	203
4	204

CID	CName	TID
101	Data Basics	T01
102	Web Design	T02
203	Relational Design	T03
204	VBA Programming	T03

No problem. Update done.

We want to delete the 204 VBA Programming course.

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1	101
2	101
1	102
3	203
4	204

CID	CName	TID
101	Data Basics	T01
102	Web Design	T02
203	Relational Design	T03
204	VBA Programming	T03

OK, so do it. Don Charney remains a student.

Sort by the Trainer's Last Name.

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1	Mary	Hinkle	555.123.4567
2	Paul	Litz	555.258.8963
3	Dee	Coleman	555.357.9514
4	Don	Charney	555.369.8741

TID	TFirst	TLast	TteleNum
T01	Charles	Hill	555.987.6542
T02	Glen	Barber	555.879.4652
T03	Rick	Dobson	555.324.2986

SID	CID
1	101
2	101
1	102
3	203
4	204

CID	CName	TID
101	Data Basics	T01
102	Web Design	T02
203	Relational Design	T03
204	VBA Programming	T03

Sort by the Trainer's Last Name.

SID	SFName	SLName	SteleNum
1	Mary	Hinkle	555.123.4567
2	Paul	Litz	555.258.8963
3	Dee	Coleman	555.357.9514
4	Don	Charney	555.369.8741

TID	TFirst	TLast	TteleNum
T02	Glen	Barber	555.879.4652
T03	Rick	Dobson	555.324.2986
T01	Charles	Hill	555.987.6542

SID	CID
1	101
2	101
1	102
3	203
4	204

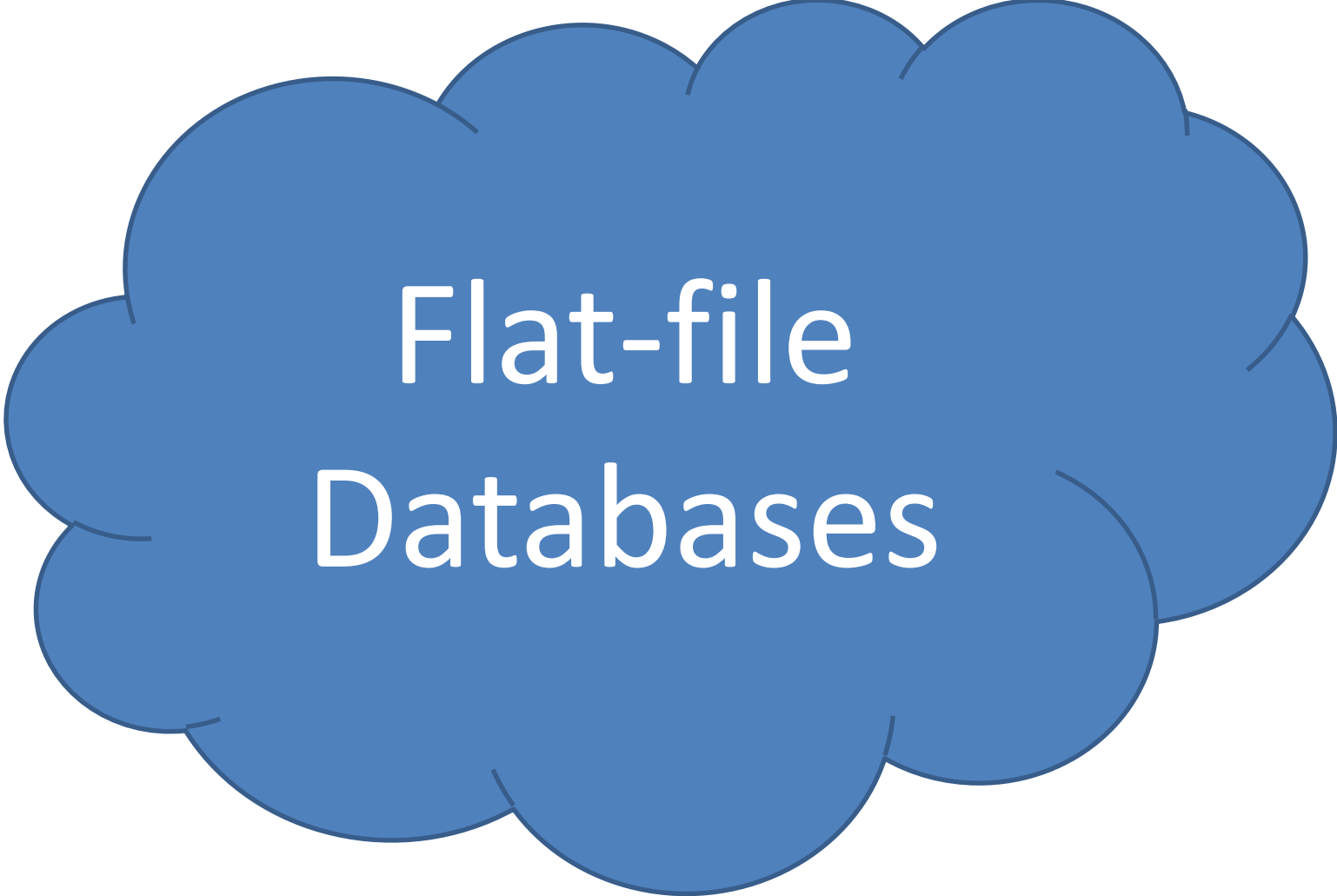
CID	CName	TID
101	Data Basics	T01
102	Web Design	T02
203	Relational Design	T03
204	VBA Programming	T03

Whatever floats your boat. It's done.

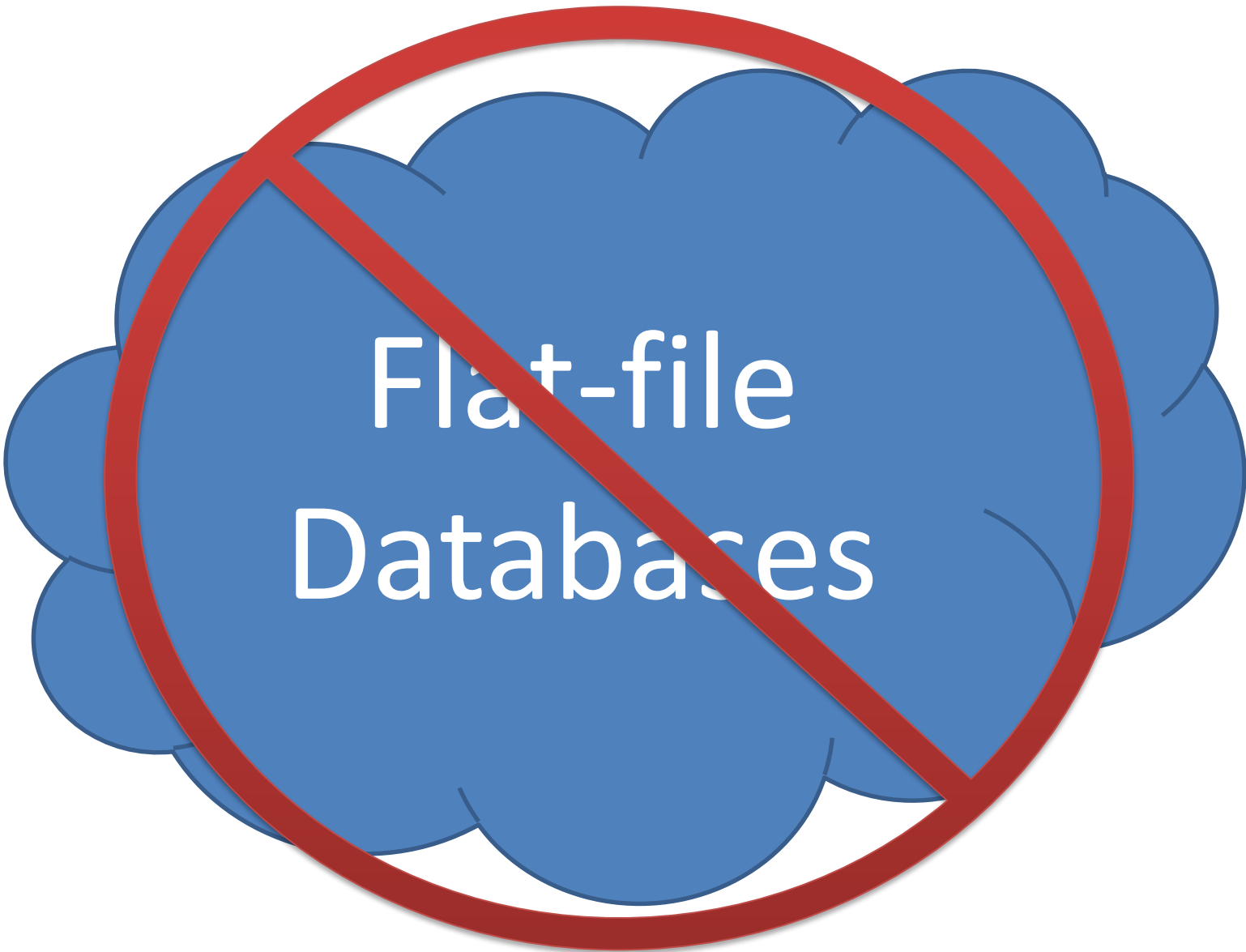
Anomalies are gone.

- Update
- Deletion
- Insertion

Sorting is easy.



Flat-file Databases



Flat-file
Databases



Relational
Databases