Creating Aggregate Objects from Normalised Data We'll get some nulls. (An additional note)

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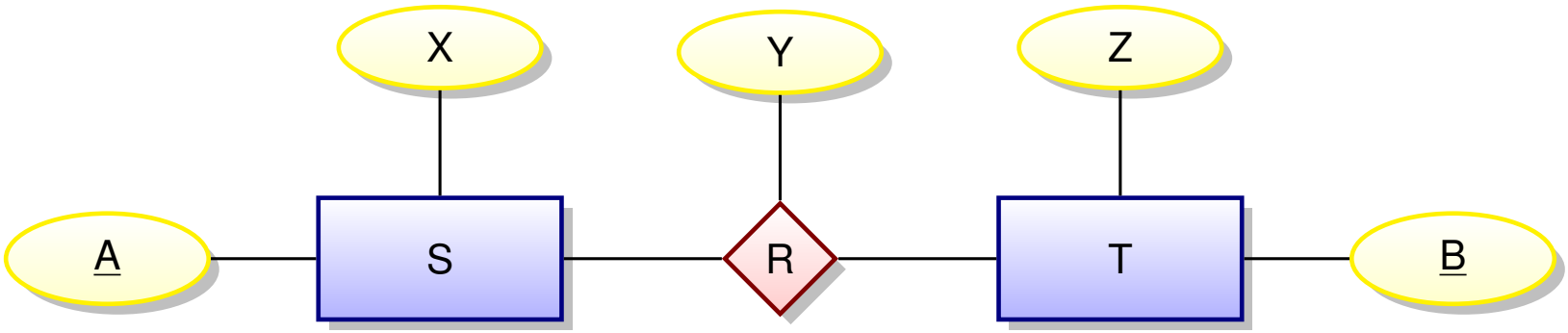
Michaelmas Term, 2022-23

TGG's Thought Experiment

- Let's do a **thought experiment**.
- In the next few slides imagine that we intend to use a relational database to store read-optimised tables generated from a set of write-optimised tables (that is, having little redundancy).
- We will encounter some problems that can be solved by representing our data as aggregate/semi-structured objects.

Start with a simple relationship ...



S is related to T by relation R:

S

A	X
a1	x1
a2	x2
a3	x3

R

A	B	Y
a1	b1	y1
a1	b2	y2
a1	b3	y3
a2	b1	y4
a2	b3	y5

T

B	Z
b1	z1
b2	z2
b3	z3
b4	z4

Imagine that our read-oriented applications can't afford to do joins!

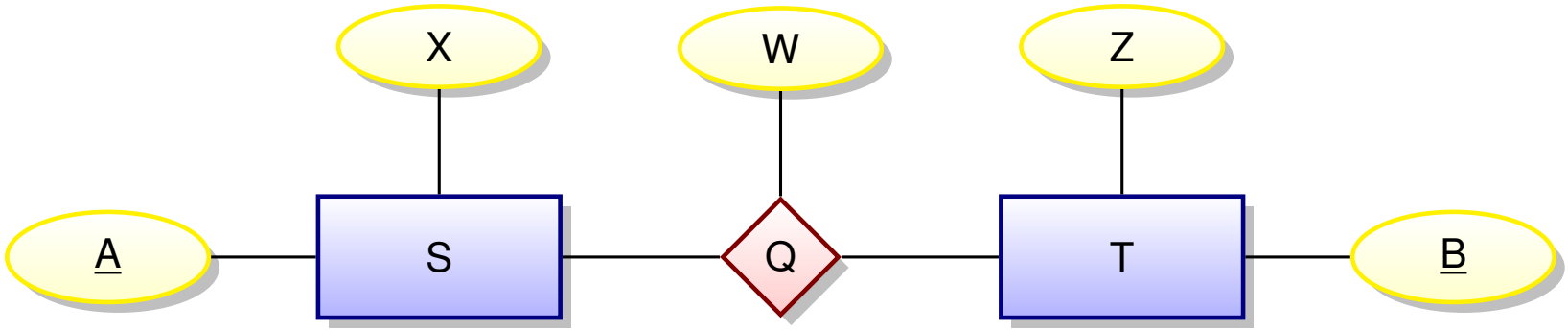
Implement the relationship as one big table?

BigTableOne: An outer join of *S*, *R*, and *T*

A	X	B	Z	Y
a1	x1	b1	z1	y1
a1	x1	b2	z2	y2
a1	x1	b3	z3	y3
a2	x2	b1	z1	y4
a2	x2	b3	z3	y5
a3	x3			
		b4	z4	

- Since we don't update this data, there will be no problems associated with redundancy.
- Notice the null values starting to pop up.

However, there may be many further relationships ...



S is further related to T by relation Q:

S

A	X
a1	x1
a2	x2
a3	x3

Q

A	B	W
a1	b4	w1
a3	b2	w2
a3	b3	w3

T

B	Z
b1	z1
b2	z2
b3	z3
b4	z4

Implement with another big table?

BigTableTwo: An outer join of *S*, *Q*, and *T*

A	X	B	Z	W
a1	x1	b4	z4	w1
a3	x3	b2	z2	w2
a3	x3	b3	z3	w3
a2	x2			
		b1	z1	

Having two tables makes reading a bit more difficult!

Combine into one big table?

BigTable: Derived from *S*, *R*, *Q*, and *T*

A	X	B	Z	Y	W
a1	x1	b1	z1	y1	
a1	x1	b2	z2	y2	
a1	x1	b3	z3	y3	
a1	x1	b4	z4		w1
a2	x2	b1	z1	y4	
a2	x2	b3	z3	y5	
a3	x3	b2	z2		w2
a3	x3	b3	z3		w3

Note that our big tables use a **composite key**.

Problems with BigTable

- We could store BigTable and speed up some queries.
- Note: if we'd also stored further attributes of A in S, that data would be replicated $|B|$ times.
- But suppose that our applications typically access data using either S's key or T's key.
- Creating indices on the A and B columns could speed things up, but our applications may still be forced to gather information from many rows in order to collect all information related to a given key of S or a given key of T.
- It would be better to access all data associated with a given key of S or a given key of T using only **a single database lookup**.

Potential Solution

- Represent the data using aggregate forms.
- This example was highly structured, but the aggregate forms also support semi-structured objects.