COMP 330: Relational Databases 2

Chris Jermaine and Kia Teymourian
Rice University
Relational Calculus

Nothing more than a FOL predicate...

Embedded within a set constructor
Example: Bad Beer People

LIKES (DRINKER, BEER)
FREQUENTS (DRINKER, BAR)
SERVES (BAR, BEER)

Query: Who goes to a bar serving Pabst Blue Ribbon (PBR)?
Example: Bad Beer People

LIKES (DRINKER, BEER)
FREQUENTS (DRINKER, BAR)
SERVES (BAR, BEER)

Query: Who goes to a bar serving Pabst Blue Ribbon (PBR)?

\{ f.DRINKER \mid FREQUENTS(f) \land \exists(s)(SERVES(s) \\
\land s.BEER = "PBR" \land s.DRINKER = f.DRINKER) \}
Example: Not Bad Beer People

LIKES (DRINKER, BEER)
FREQUENTS (DRINKER, BAR)
SERVES (BAR, BEER)

Query: Who has not gone to a bar serving Pabst Blue Ribbon (PBR)?
Example: Not Bad Beer People

LIKES (DRINKER, BEER)

FREQUENTS (DRINKER, BAR)

SERVES (BAR, BEER)

Query: Who has not gone to a bar serving Pabst Blue Ribbon (PBR)?

\[ \{ f.DRINKER \mid \text{FREQUENTS}(f) \land \neg \exists(s)(\text{SERVES}(s) \land s.BEER = "PBR" \land s.DRINKER = f.DRINKER) \} \]
Example: People Who Like to Drink

LIKES (DRINKER, BEER)
FREQUENTS (DRINKER, BAR)
SERVES (BAR, BEER)

Query: Who goes to a bar that serves a beer they like?
Example: People Who Like to Drink

LIKES (DRINKER, BEER)
FREQUENTS (DRINKER, BAR)
SERVES (BAR, BEER)

Query: Who goes to a bar that serves a beer they like?

\{ f.DRINKER \mid FREQUENTS(f) \land \exists(s, l)(SERVES(s) \land LIKES(l) \\
\land s.BEER = l.BEER \land s.BAR = f.BAR) \}
Example: Super Cool Bars

LIKES (DRINKER, BEER)
FREQUENTS (DRINKER, BAR)
SERVES (BAR, BEER)

Query: Which bars serve all of the beers that Chris likes?
Example: Super Cool Bars

LIKES (DRINKER, BEER)
FREQUENTS (DRINKER, BAR)
SERVES (BAR, BEER)

Query: Which bars serve all of the beers that Chris likes?

\{ s.BAR | SERVES(s) \land \forall (l)(\text{if } l \text{ is from LIKES and corresponds to “Chris”, then the bar serves it}) \}
Example: Super Cool Bars

LIKES (DRINKER, BEER)
FREQUENTS (DRINKER, BAR)
SERVES (BAR, BEER)

Query: Which bars serve all of the beers that Chris likes?

\[ \{ s \text{.BAR} \mid \text{SERVES}(s) \land \forall(l)(\text{LIKES}(l) \land l\text{.DRINKER} = \text{“Chris”} \rightarrow \exists(s_2)(\text{SERVES}(s_2) \land s_2\text{.BAR} = s\text{.BAR} \land s_2\text{.BEER} = l\text{.BEER})) \} \]

Note: we invariably have a “→” within a ∀ quantifier. Why?
Example: People Who Avoid Bad Bars

LIKES (DRINKER, BEER)
FREQUENTS (DRINKER, BAR)
SERVES (BAR, BEER)

Query: Which people only go to bars that serve a beer they like?
Example: People Who Avoid Bad Bars

LIKES (DRINKER, BEER)

FREQUENTS (DRINKER, BAR)

SERVES (BAR, BEER)

Query: Which people only go to bars that serve a beer they like?

\{ f.DRINKER \mid \text{FREQUENTS}(f) \land \forall (f_2) (\text{if } f_2 \text{ tells us a bar that } f.DRINKER \text{ goes to then that bar needs to serve a beer that } f.DRINKER \text{ likes}) \}
Example: People Who Avoid Bad Bars

LIKES (DRINKER, BEER)
FREQUENTS (DRINKER, BAR)
SERVES (BAR, BEER)

Query: Which people only go to bars that serve a beer they like?

\{ f.DRINKER | FREQUENTS(f) \land \forall (f_2)(FREQUENTS(f_2)
\land f.DRINKER = f_2.DRINKER \rightarrow \exists (s, l)(SERVES(s) \land LIKES(l)
\land s.BAR = f_2.BAR \land l.BEER = s.BEER
\land l.DRINKER = f_2.DRINKER)) \}\n
• Why do we need both $f$ and $f_2$ here?
Questions?