Sailor(sid, sname, city, rating)

Boats(bid, bname, color)

Reserves(sid, bid, day)

Relational Calculus: predicate form

1. Selection

   SQL: select * from sailor

   RA: σ (sailor)

   TRC: { t | t $\in$ sailor } ; where t is a tuple variable defined over the table sailor (defined over tuples of the table sailor)

   DRC: {(s1, s2, s3, s4) | (s1, s2, s3, s4) $\in$ sailor }; where s1, s2, s3 & s4 are domain variables declared over the columns sid, sname, city & status respectively within the table sailor

2. Selection with condition

   SQL: select * from sailor where city='Guntur'

   RA: $\sigma_{city='Guntur'}$ (sailor)

   Tuple Relational Calculus: { t | t $\in$ sailor ^ t.city='Guntur'}

   Domain Relational Calculus:

   {(s1, s2, s3, s4) | (s1, s2, s3, s4) $\in$ sailor ^ s3='Guntur'}

   or

   {(s1, s2, 'Guntur', s4) | (s1, s2, 'Guntur', s4) $\in$ sailor}

   SQL: select * from sailor where city='Guntur' and rating > 3

   RA: $\sigma_{city='Guntur' \wedge rating > 3}$ (sailor)

   TRC: { t | t $\in$ sailor ^ t.city='Guntur' ^ t.rating > 3}

   DRC:

   {(s1, s2, s3, s4) | (s1, s2, s3, s4) $\in$ sailor ^ s3='Guntur' ^ s4>3 }

   {(s1, s2, 'Guntur', >3) | (s1, s2, 'Guntur',>3) $\in$ sailor }

3. Projection

SQL: select sid, sname from sailor

RA: $\pi_{sid, sname}$ (sailor)

TRC: { t1 | t ∈ sailor ^ t1.sid = t.sid ^ t1.sname = t.sname}

DRC: { (s1, s2) | (s1, s2, s3, s4) ∈ sailor }

4. Projection with condition

SQL: select sid, sname from sailor where rating > 3

RA: $\pi_{sid, sname}$ ($\sigma_{rating>3}$ (sailor))

TRC:

{ t1 | t ∈ sailor ^ t.rating>3 ^ t1.sid=t.sid ^ t1.sname = t.sname}

DRC:

{(s1, s2) | (s1, s2, s3, s4) ∈ sailor ^ s4>3 }

Or

{(s1, s2) | (s1, s2, s3, >3) ∈ sailor}

5. Cartesian Product

SQL: select * from sailor, reserve

RA: σ (sailor X reserve)

TRC: { (s,r) | s ∈ sailor ^ r ∈ reserve }

DRC: {(s1,s2,s3,s4,r1,r2,r3) |(s1,s2,s3,s4) ∈ sailor ^ (r1,r2,r3) ∈ reserve }

6. Join

SQL: select * from sailor, reserve where sailor.sid=reserve.sid

RA: $\sigma_{sailor.sid=reserve.sid}$ (sailor X reserve)

σ (Sailor $\bowtie$ reserve)

TRC: {(s,t) | s $\in$ sailor $\wedge$ r $\in$ reserve $\wedge$ s.sid=r.sid}

DRC:

{(s1,s2,s3,s4,r1,r2,r3) | (s1,s2,s3,s4) $\in$ sailor $\wedge$ (r1,r2,r3) $\in$ reserve $\wedge$ s1=r1}

{(a,s2,s3,s4,a,r2,r3) | (a,s2,s3,s4) $\in$ sailor $\wedge$ (a,r2,r3) $\in$ reserve}

7. Join with projection

SQL: select sailor.sid, sname, day from sailor, reserve where sailor.sid=reserve.sid

RA:

$\pi_{sailor.sid,\ sname,day}$ ($\sigma_{sailor.sid=reserve.sid}$ (sailor X reserve))

TRC:

{ (s1,t1) | s$\in$ sailor $\wedge$ r $\in$ reserve $\wedge$ s.sid=r.sid $\wedge$ s1.sid=s.sid $\wedge$ s1.sname=s.sname $\wedge$ r1.day=r.day}

DRC:

{(s1,s2,r3) | (s1,s2,s3,s4) $\in$ Sailor $\wedge$ (r1,r2,r3) $\in$ reserve $\wedge$ s1=r1}

or

{(a,s2,r3) | (a,s2,s3,s4) $\in$ Sailor $\wedge$ (a,r2,r3) $\in$ reserve}