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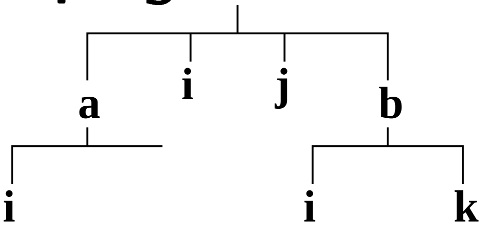
Scoping

Scoping in P.L.

```
begin int i := 1, j := 2
    begin int i := 3
    end
    begin int i := 4, k := 5
    end
end
```

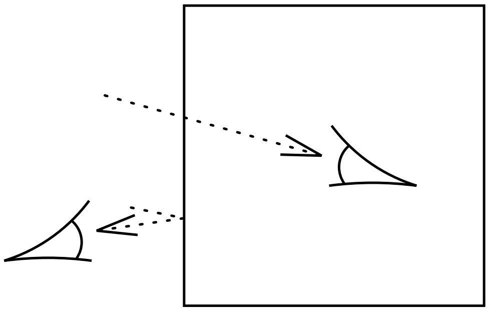
Scoping in O.S.

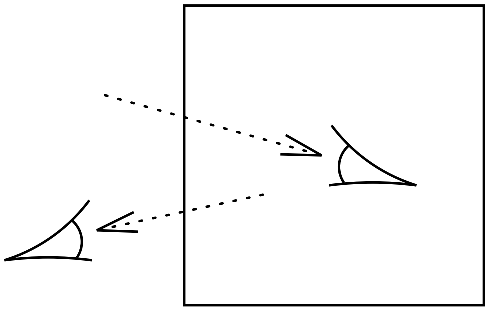


$i, j, a/i, b/i, b/k$

$i, ../i, ../j, ../b/i, ../b/k$

$i, k, ../i, ../j, ../a/i$





DBPL is persistent, interactive:
follow O.S., not P.L.

```
begin relation $i(w,x)$; relation $j(y,z)$
   $i, j, a.i, b.i, b.k$
   begin $a$ relation $i(x,y)$
      $i$, up $i$, up $j$, up $b.i$, up $b.k$
   end
   begin $b$ relation $i(w,z)$, relation $k(x,y)$
      $i, j$, up $i$, up $j$, up $a.i$
   end
end
```

Note resemblance to nested relations:
a database is a scope, is a tuple (but only one).

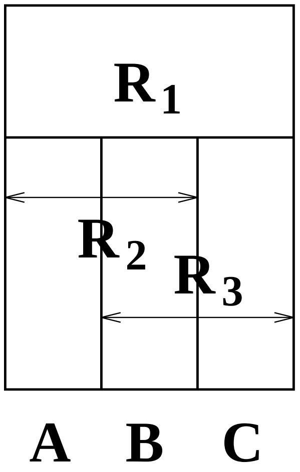
Note *navigational* syntax.

This gives homogenous **multidatabases**.

It can be extended to **distributed databases** using Randell's "UNIX United" (or "the Newcastle Connection")
e.g., as implemented in AFS

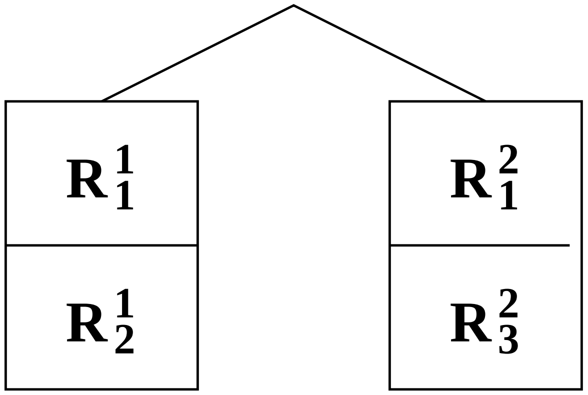
- Each file hierarchy is a tree;
- file hierarchy for many machines is a forest;
- common root unites the forests into a tree.
- (The tree could start with the I.P. address levels.)

Partitioning in Distributed Databases



Fragmentation

$R = R_1$ **ujoin** $(R_2$ **ijoin** $R_3)$



Distribution

R_1 at sites 1, 2

R_2 at site 1

R_3 at site 2

Working from site 1:

R_1^1, R_2^1, **up** $2.R_1^2$, **up** $2.R_3^2$

Working from site 2:

up $1.R_1^1$, **up** $1.R_2^1$, R_1^1, R_3^2,

Now Query It

(the programmer controls locations)

$[B]$ **where** $A = 2$ **and** $C = 1$ **in** R
$= [B]$ **where** $A = 2$ **and** $C = 1$ **in**
$(R_1$ **ujoin** $(R_2$ **ijoin** $R_3)$
$= ([B]$ **where** $A = 2$ **and** $C = 1$ **in** $R_1)$ **ujoin**
$(([B]$ **where** $A = 2$ **in** $R_2)$ **ijoin**
$[B]$ **where** $C = 1$ **in** $R_3)$
$= ([B]$ **where** $A = 2$ **and** $C = 1$ **in** $R_1^1)$ **ujoin**
$(([B]$ **where** $A = 2$ **in** $R_2^1)$ **ijoin**
up $2.[B]$ **where** $C = 1$ **in** $R_3^2)$
$= ([B]$ **where** $A = 2$ **and** $C = 1$ **in** $R_1^2)$ **ujoin**
$(($**up** $1.[B]$ **where** $A = 2$ **in** $R_2^1)$ **ijoin**
$[B]$ **where** $C = 1$ **in** $R_3^2)$

Semijoins for efficiency

S^1 **ijoin** $T^2 =$
  up $1.(S^1$ **ijoin up** $2.[Y]$ **in** $T^2)$ **ijoin** T^2

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