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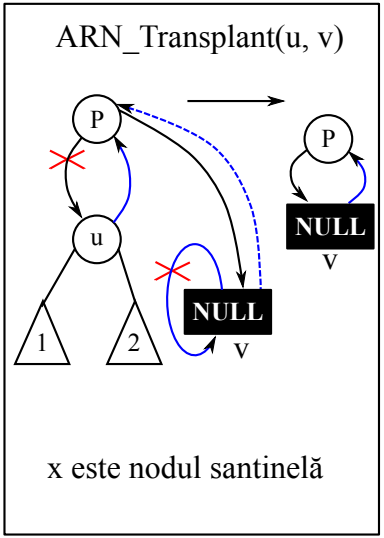
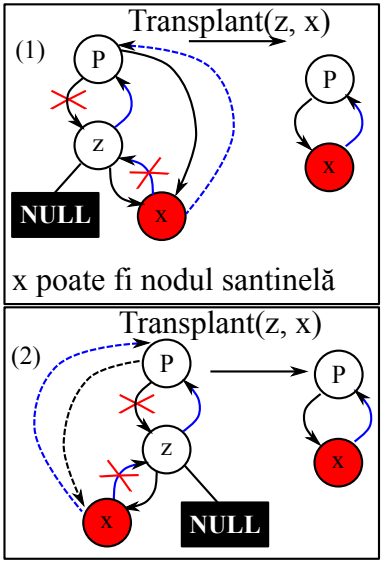
Algoritmul pentru ștergerea unui nod



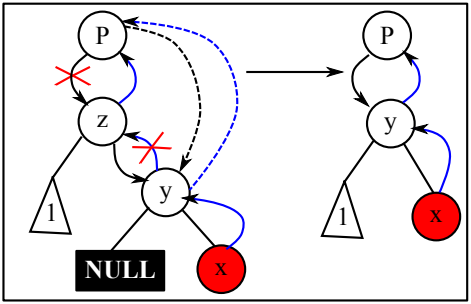

```
ARN_TRANSPLANT(T, u, v)
    daca u.p = T.NIL atunci
        T.rad = v
    altfel
        daca u = u.p.st atunci
            u.p.st = v
        altfel
            u.p.dr = v
        sfarsit daca
    sfarsit daca
    v.p = u.p
RETURN
```

Algoritmul pentru ștergerea unui nod

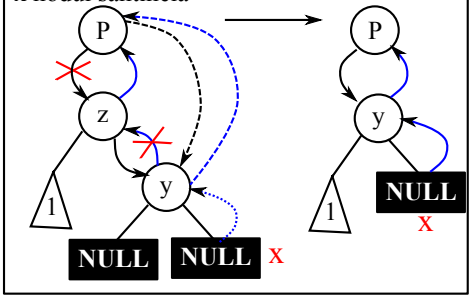



```
ARN_DELETE(T, z)
    color = z.color
    daca z.st = T.NIL atunci
          x = z.dr
          ARN_TRANSPLANT(T, z, x)
    altfel
          daca z.dr = T.NIL atunci
                x = z.st
                ARN_TRANSPLANT(T,z,x)
                altfel
```

Algoritmul pentru ștergerea unui nod



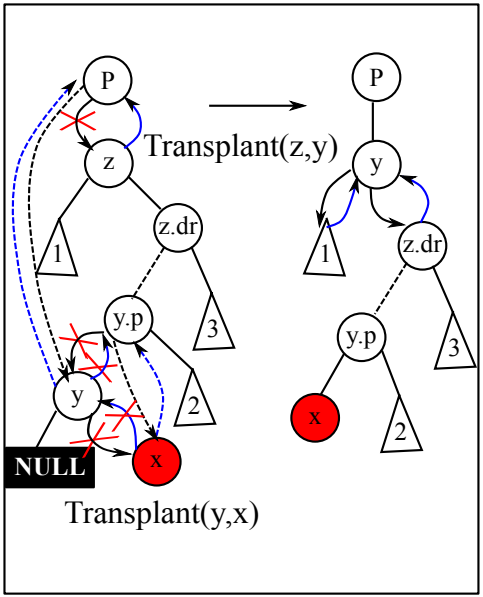
x nodul santinelă



refacerea proprietăților RN începe de la x

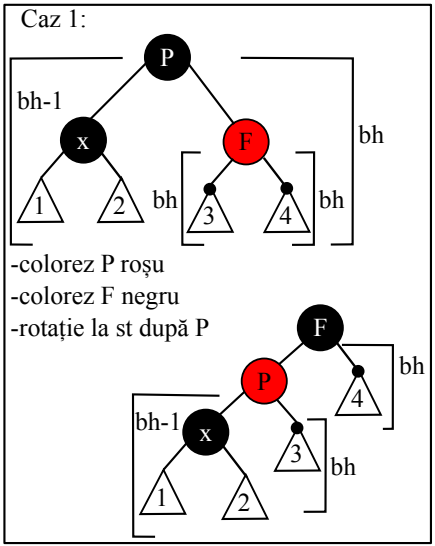
```
[...]  altfel
                    y = SUCCESOR(T, z)
                    color = y.color
                    x = y.dr
                    daca y.p = z atunci
                          x.p = y
                    altfel
```

Algoritmul pentru ștergerea unui nod



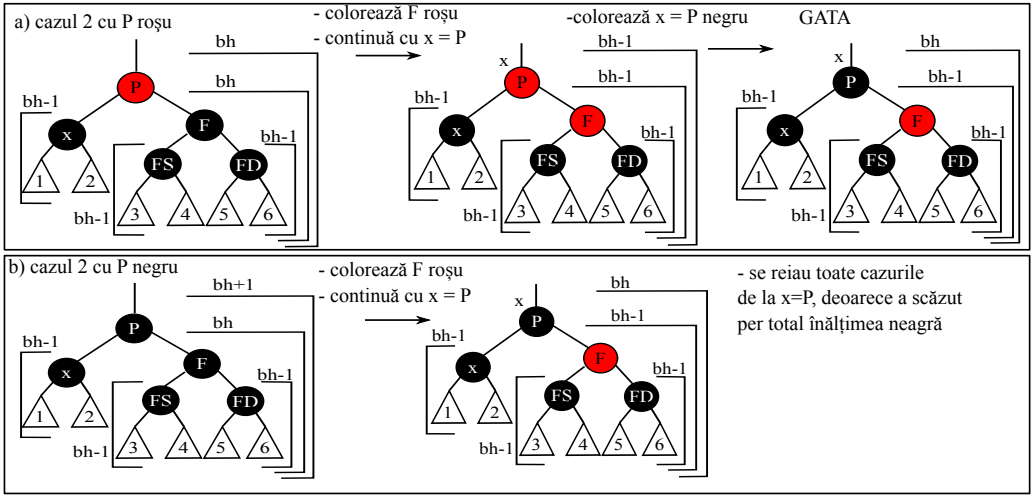

```
  [...]  altfel
                    RB_TRANSPLANT(T, y, x)
                    y.dr = z.dr
                    z.dr.p = y
         sfarsit daca
         RB_TRANSPLANT(T, z, y)
         y.st = z.st
         z.st.p = y
         y.color = z.color
  sfarsit daca
sfarsit daca
daca color = negru atunci
         RB_DELETE_REPARA(T, x)
sfarsit daca
RETURN
```

Algoritmul pentru refacerea proprietăților RN



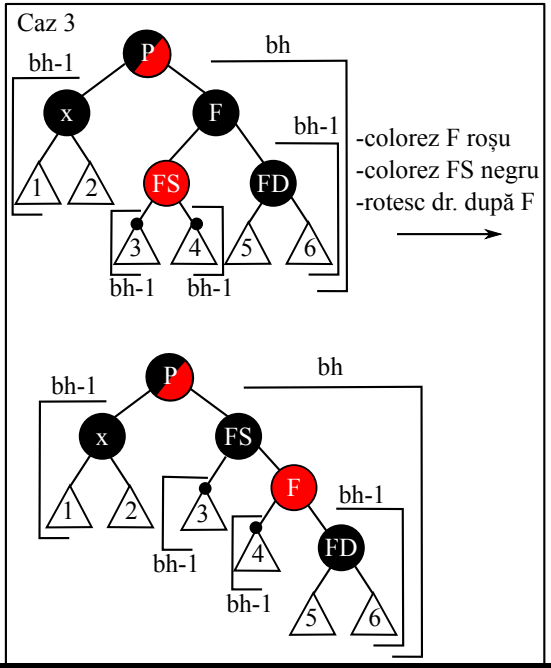

```
RB_DELETE_REPARE(T, x)
   cat timp x ≠ T.rad si x.color = negru
            daca x = x.p.st atunci
                 F = x.p.dr
                 daca F.color = rosu // caz 1
                      F.color = negru
                      x.p.color = rosu
                      ROT_ST(T, x.p)
                      F = x.p.dr
                 sfarsit daca
```

Algoritmul pentru refacerea proprietăților RN



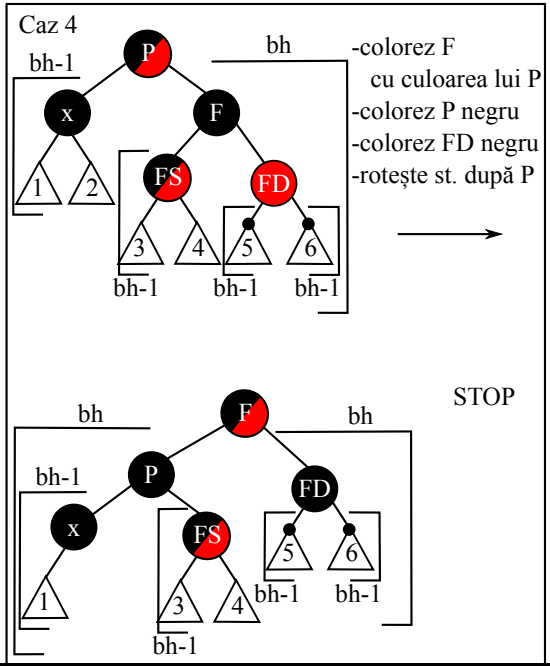

```
[...]daca F.st.color = negru si F.dr.color = negru atunci
          F.color = rosu
          x = x.p
      altfel
```

Algoritmul pentru refacerea proprietăților RN




```
[...]  altfel
           //caz 3
           daca F.dr.color = negru atunci
                F.st.color = negru
                F.color = rosu
                ROT_DR(T, F)
                F=x.p.dr
           sfarsit daca
```

Algoritmul pentru refacerea proprietăților RN




```
  [...]
        F.color = x.p.color
        x.p.color = negru
        F.dr.color = negru
        ROT_ST(T, x.p)
        x = T.rad
 sfarsit daca
 altfel //daca x pe dreapta parintelui
        //se reia algoritmul simetric,
        // inlocuind peste tot dreapta cu
        // stanga si invers
sfarsit cat timp
 x.color = negru
 RETURN
```