

Solution for Exercise 5

Concurrent Algorithms 2010



ÉCOLE POLYTECHNIQUE
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Problem

Implement fetch&inc object using atomic registers and compare&swap objects.

fetch&inc

```
operation fetch&inc()  
    c' = c  
    c = c + 1  
    return c'  
end
```

compare&swap

```
operation cas(old_val, new_val)
    v' = v
    if v = old_val then
        v = new_val
    return v'
end
```

Solution

- Use universal construction
- Simplify
 - there is only one operation

Solution

Shared variables:

C : compare&swap $\langle -1, \dots, -1 \rangle$

R[1,N] : registers $[-2, \dots, -2]$

Local variables:

last_i : $\langle -1, \dots, -1 \rangle$

Solution

```
1 : upon fetch&inc() do
2 :     R[i] ← lasti[i]
3 :     repeat
4 :         for k ← 1 to N do r[k] ← R[k]
5 :         m ← max(r) + 1
6 :         new ← lasti
7 :         for k ← 1 to N do
8 :             if r[k] = lasti[k] then
9 :                 new[k] ← m
10:                 m = m + 1
11:         v ← C.compare&swap(lasti, new)
12:         if v = lasti then lasti ← new
13:         else lasti ← v
14:     until lasti[i] > R[i]
15:     return lasti[i]
```

Questions?