

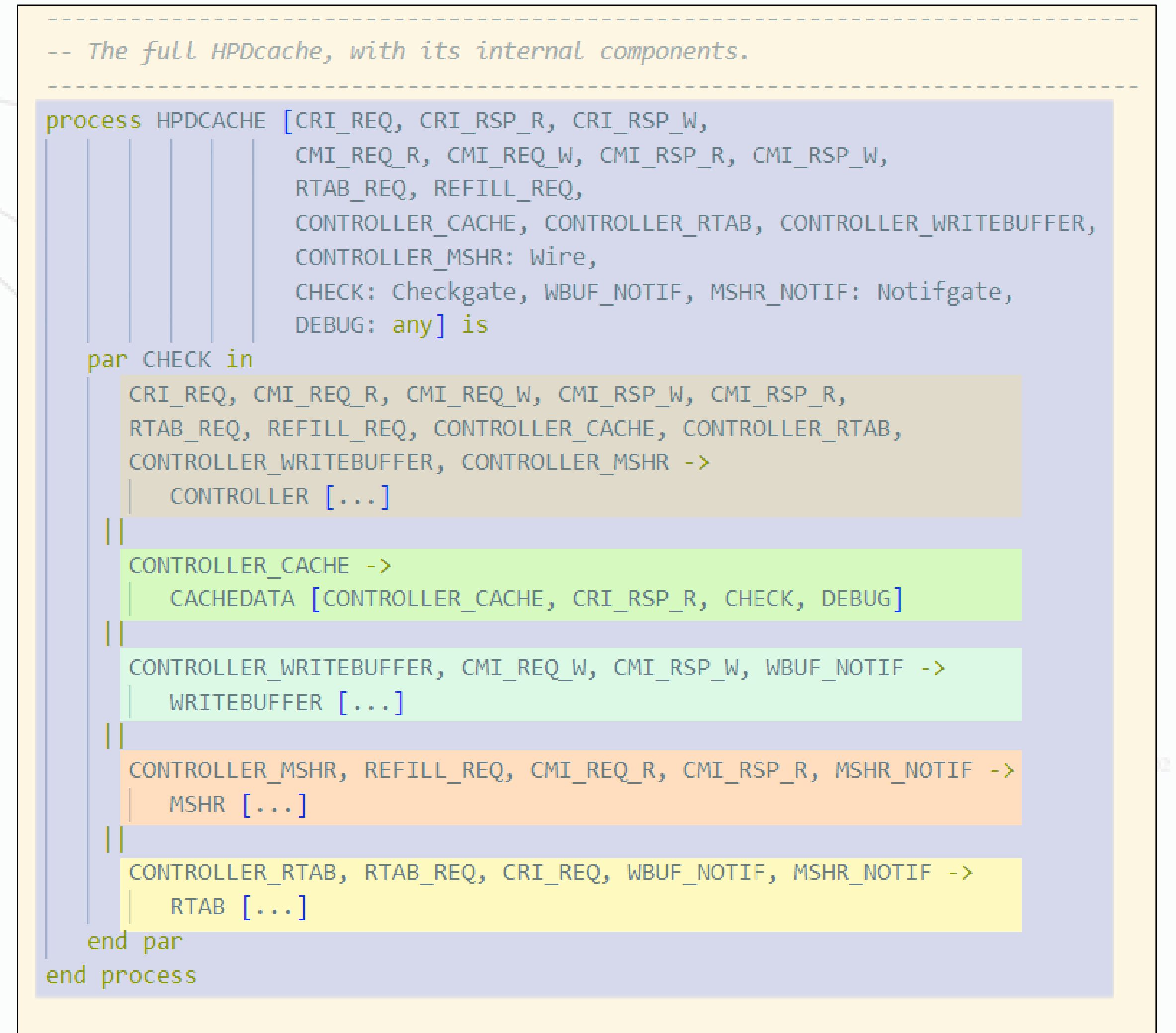
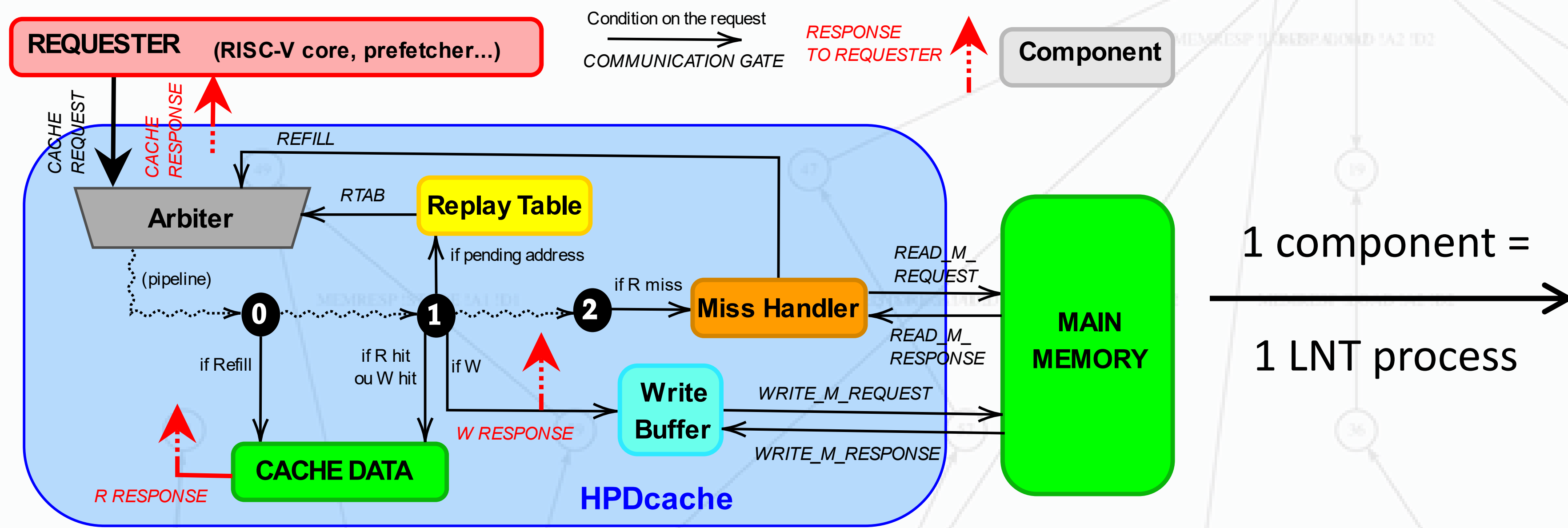
On Benefits of Modeling the HPDcache in LNT

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LNT MODEL



<https://github.com/openhwgroup/cv-hpdcache/>



```
int rtab_find_ready(int last) {
    int i = (last + 1) mod % RTAB_NENTRIES;
    for (;;) {
        if (rtab[i].valid && rtab[i].ll_head &&
            (rtab[i].deps == 0))
            return i;
        if (i == last)
            return -1;
        i := (i + 1) % RTAB_NENTRIES;
    }
}
```

pseudocode function...

...to LNT function

```
function rtab_find_ready(rtab:RTAB_Array, last:int): int is
var i:int in i := (last + 1) mod RTAB_NENTRIES;
loop
    if rtab[Nat (i)].valid and rtab[Nat (i)].ll_head and
        (rtab[Nat (i)].deps == NoDeps) then
        return i
    elsif i == last then
        return -1
    end if;
    i := (i + 1) mod RTAB_NENTRIES
end loop
end var end function
```

BENEFITS: FORMAL ANALYSIS WITH CADP



ETAPS Test-of-Time Tool
Award Winner in 2023

Model checking (EVALUATOR)

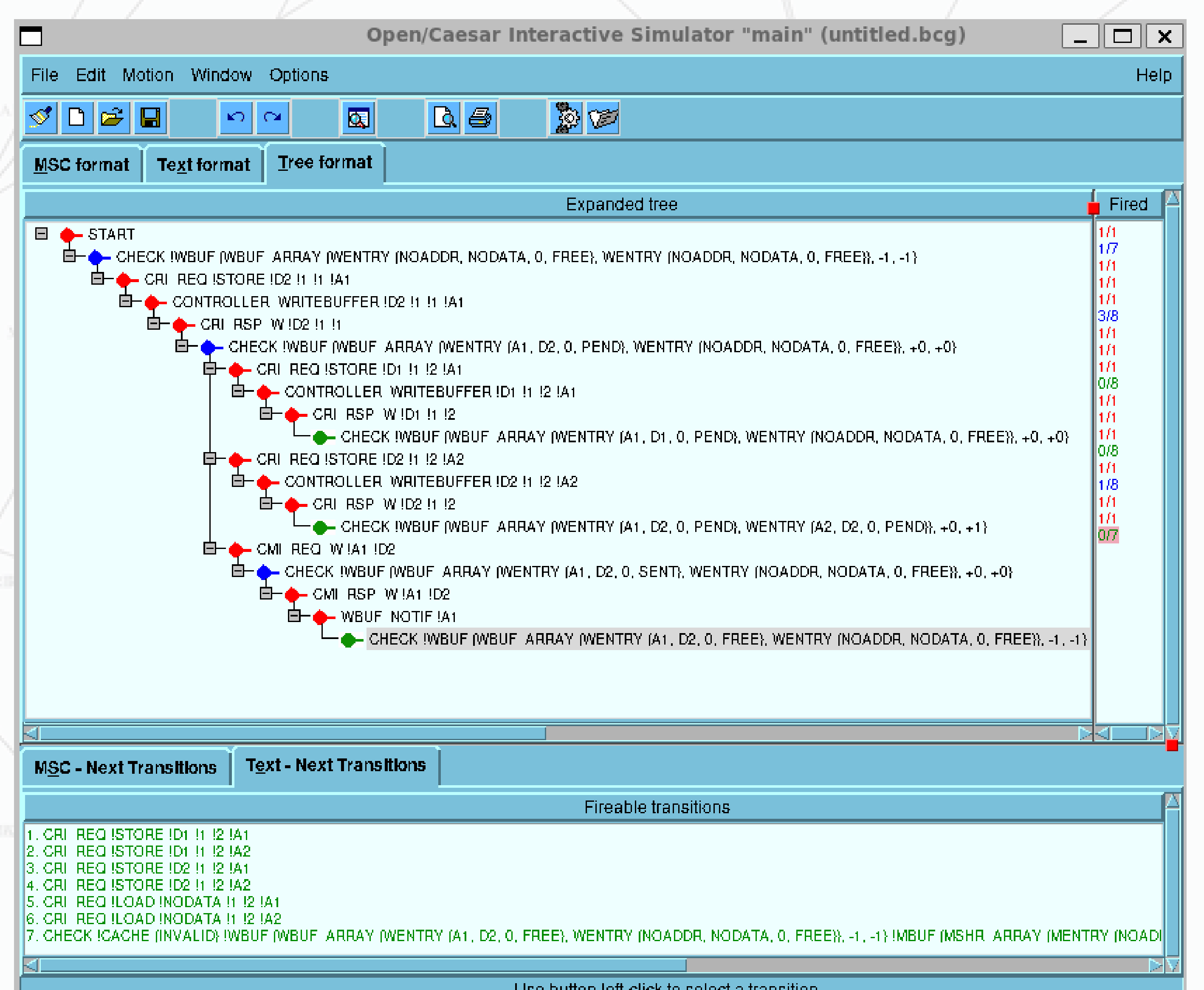
Temporal logic formula: RVWMO safety property

```
[ true*.
  {REQ ?any ?s:nat ?t1:nat ?a:string}.
  not ({RSP_W ?any !s !t1} or {RSP_R ?any !s !t1})*.
  {REQ ?any ?any !s ?t2:nat !a where t1 <> t2}.
  not ({RSP_W ?any !s !t1} or {RSP_R ?any !s !t1})*.
  {RSP_W ?any !s !t2} or {RSP_R ?any !s !t2}
] false
```

Counterexample trace

```
<initial state>
...
"CRI_REQ !STORE !D2 !1 !1 !A2"
"CRI_RSP_W !D2 !1 !1"
"CMI_REQ_W !A2 !D2"
"CRI_REQ !STORE !D2 !1 !2 !A1"
"CRI_RSP_W !D2 !1 !2"
"CRI_REQ !STORE !D2 !1 !3 !A1"
"CRI_REQ !STORE !D2 !1 !4 !A1"
"CMI_RSP_W !A2 !D2"
"CMI_REQ_W !A1 !D2"
"RTAB_REQ !STORE !D2 !1 !3 !A1"
"CMI_RSP_W !A1 !D2"
"RTAB_REQ !STORE !D2 !1 !4 !A1"
"CRI_RSP_W !D2 !1 !4"
<goal state>
```

Interactive step-by-step simulation (OCIS)



PROGRAMME
DE RECHERCHE
CLOUD

