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1 |----- MODULE CCTest -----|
  | Test of CC Module |
5 | EXTENDS CC |
6 |-----|
  | Test case: The following histories are from Figure 2 of the POPL'2017 paper. |
  | Naming Conventions: |
  |   - ha: history of Figure 2(a) |
  |   - hasa: session a of history ha |
  | TODO: to automatically generate histories |
17 hasa  $\triangleq$   $\langle W(\text{"x"}, 1, 1), R(\text{"x"}, 2, 2) \rangle$ 
18 hasb  $\triangleq$   $\langle W(\text{"x"}, 2, 3), R(\text{"x"}, 1, 4) \rangle$ 
19 ha  $\triangleq$   $\{hasa, hasb\}$  CM but not CCv
21 hbsa  $\triangleq$   $\langle W(\text{"z"}, 1, 1), W(\text{"x"}, 1, 2), W(\text{"y"}, 1, 3) \rangle$ 
22 hbsb  $\triangleq$   $\langle W(\text{"x"}, 2, 4), R(\text{"z"}, 0, 5), R(\text{"y"}, 1, 6), R(\text{"x"}, 2, 7) \rangle$ 
23 hb  $\triangleq$   $\{hbsa, hbsb\}$  CCv but not CM
25 hcsa  $\triangleq$   $\langle W(\text{"x"}, 1, 1) \rangle$ 
26 hcsb  $\triangleq$   $\langle W(\text{"x"}, 2, 2), R(\text{"x"}, 1, 3), R(\text{"x"}, 2, 4) \rangle$ 
27 hc  $\triangleq$   $\{hcsa, hcsb\}$  CC but not CM nor CCv
29 hdsa  $\triangleq$   $\langle W(\text{"x"}, 1, 1), R(\text{"y"}, 0, 2), W(\text{"y"}, 1, 3), R(\text{"x"}, 1, 4) \rangle$ 
30 hdsb  $\triangleq$   $\langle W(\text{"x"}, 2, 5), R(\text{"y"}, 0, 6), W(\text{"y"}, 2, 7), R(\text{"x"}, 2, 8) \rangle$ 
31 hd  $\triangleq$   $\{hdsa, hdsb\}$  CC, CM, and CCv but no SC
33 hesa  $\triangleq$   $\langle W(\text{"x"}, 1, 1), W(\text{"y"}, 1, 2) \rangle$ 
34 hesb  $\triangleq$   $\langle R(\text{"y"}, 1, 3), W(\text{"x"}, 2, 4) \rangle$ 
35 hesc  $\triangleq$   $\langle R(\text{"x"}, 2, 5), R(\text{"x"}, 1, 6) \rangle$ 
36 he  $\triangleq$   $\{hesa, hesb, hesc\}$  not CC (nor CM, nor CCv)
37 |-----|
38 THEOREM WellFormedTheorem  $\triangleq$  test of well-formedness of histories
39    $\forall h \in \{ha, hb, hc, hd, he\} : \text{WellFormed}(h)$ 
40 |-----|
  | Test of program order |
44 CardOfProgramOrderOfHistory(h)  $\triangleq$ 
45   LET CardOfProgramOrderOfSession(s)  $\triangleq$ 
46     IF Len(s)  $\leq 1$  THEN 0 ELSE Sum(1 .. Len(s) - 1)
47   IN   ReduceSet(LAMBDA s, x : CardOfProgramOrderOfSession(s) + x, h, 0)
49 THEOREM ProgramOrderCardinalityTheorem  $\triangleq$ 
50    $\forall h \in \{ha, hb, hc, hd, he\} :$ 
51     Cardinality(ProgramOrder(h)) = CardOfProgramOrderOfHistory(h)
53 THEOREM POPastTest  $\triangleq$ 
54    $\wedge \text{POPast}(ha, R(\text{"x"}, 2, 2)) = \{W(\text{"x"}, 1, 1)\}$ 

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55       $\wedge POPast(hb, R("y", 1, 6)) = \{W("x", 2, 4), R("z", 0, 5)\}$ 
56       $\wedge POPast(hc, W("x", 2, 2)) = \{\}$ 
57       $\wedge POPast(hd, R("x", 1, 4)) = \{W("x", 1, 1), R("y", 0, 2), W("y", 1, 3)\}$ 
58       $\wedge POPast(he, W("x", 2, 4)) = \{R("y", 1, 3)\}$ 
59  |-----|
      | Test of axioms
63  |-----|
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