

VERDIS (simple examples for parallel composition and equivalence checking)

(Robert Meolic, 1999, 2000, 2013)

This is a collection of small examples to test the implementation of equivalence checking.

File **menjava.dat** is a simple description of ATM machine.

```

SORT sortMenjava PUT10T,GET52T,PRZ,JEZ

```

```

PROCESS AVT
SORT sortMenjava
INITIAL STATE c1
TRANSITIONS c1 = PUT10T?.c2
              c2 = GET52T!.c3
              c3 = TAU.c1 + TAU.c4
              c4 = PRZ!.c5

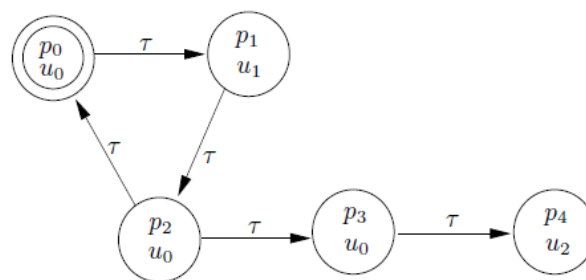
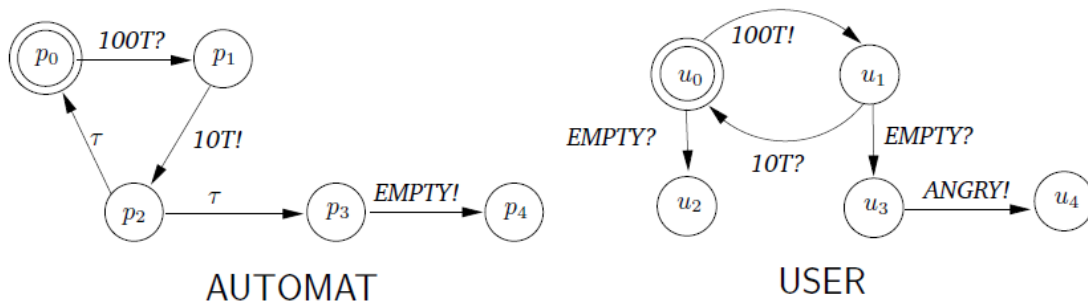
```

```

PROCESS UPR
SORT sortMenjava
INITIAL STATE u1
TRANSITIONS u1 = PUT10T!.u2 + PRZ?.u3
              u2 = GET52T?.u1 + PRZ?.u4
              u4 = JEZ!.u5

```

The system is similar to this one (action names are different):



Parallel composition

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Running on i686 (Linux, 3.2.0-39-generic-pae) with tcl 8.5.11 and tk 8.5.11.

```
Initialization of GUI package... OK
Initialization of BDD package... OK
Initialization of Process_Algebra package... OK
Initialization of Versis package... OK
Initialization of Model checking package... OK
Initialization of Strucval package... OK
Initialization of CCS package... OK
Ready.
```

```
>cd "/home/meolic/est/est-2ed/data/versis"; source "menjava.tcl"; cd "/home/meolic/est/est-2ed/data"
Reading file: menjava.dat
  Sort sortMenjava ... OK
  Process AVT ... OK
  Process UPR ... OK
```

```
Parallel composition (1): S...
Decoding composition:
((c3<AVT>),(u1<UPR>)) --- TAU ----> ((c1<AVT>),(u1<UPR>))
((c1<AVT>),(u1<UPR>)) --- TAU ----> ((c2<AVT>),(u2<UPR>))
((c3<AVT>),(u1<UPR>)) --- TAU ----> ((c4<AVT>),(u1<UPR>))
((c2<AVT>),(u2<UPR>)) --- TAU ----> ((c3<AVT>),(u1<UPR>))
((c4<AVT>),(u1<UPR>)) --- TAU ----> ((c5<AVT>),(u3<UPR>))
```

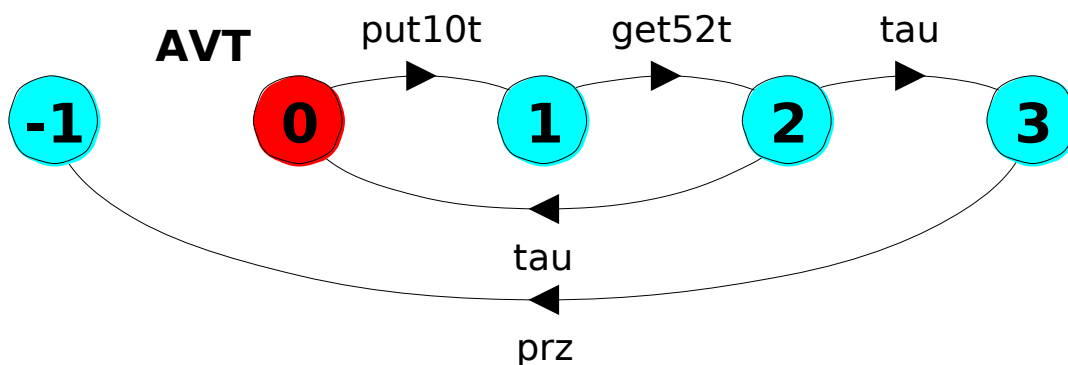
```
Creating process from composition: S... OK
```

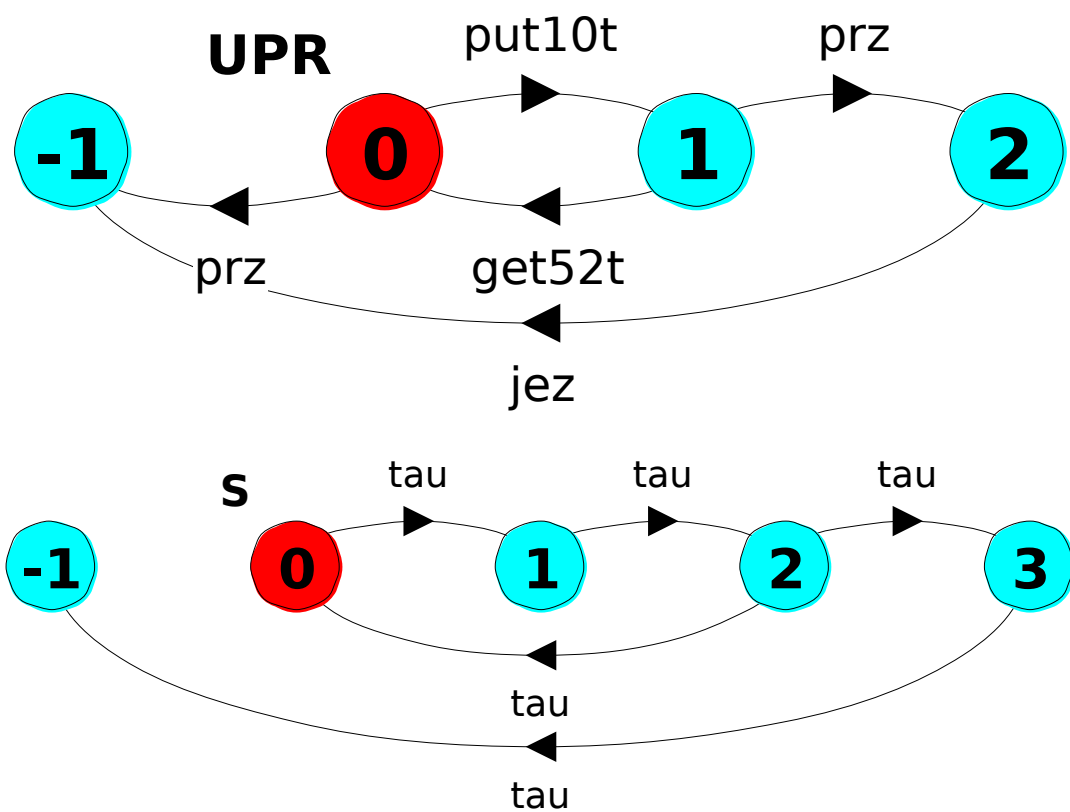
```
PROCESS S
SORT sortMenjava
INITIAL STATE S2
TRANSITIONS
S1 = TAU . S2
S2 = TAU . S3
S1 = TAU . S4
S3 = TAU . S1
S4 = TAU . S5
```

```
Initial state: S2<S>
Composed of: ((c1<AVT>),(u1<UPR>))
```

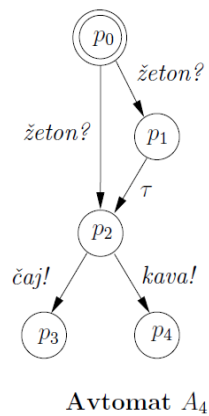
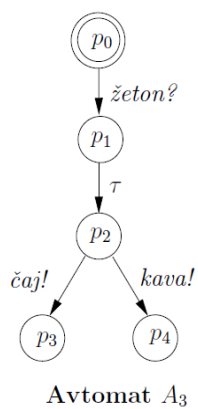
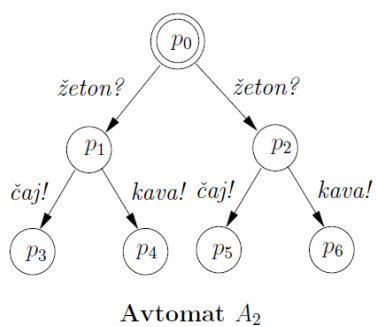
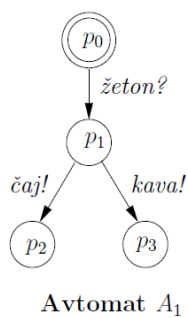
```
REPORT ABOUT STATE S3
((c2<AVT>),(u2<UPR>))
```

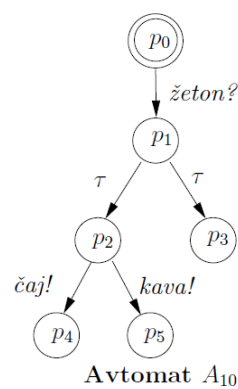
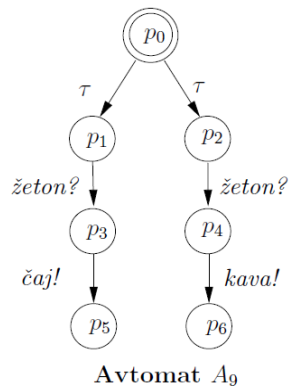
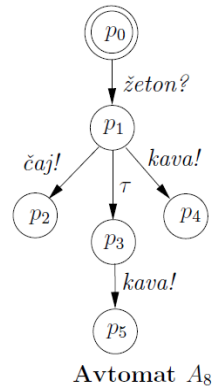
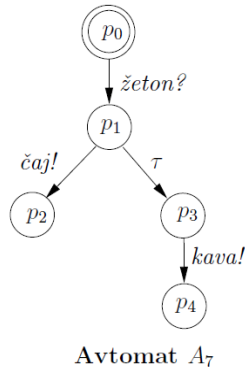
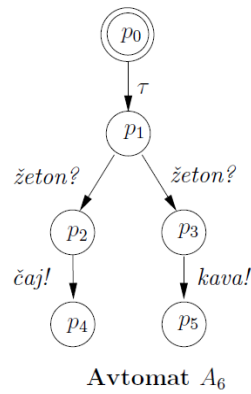
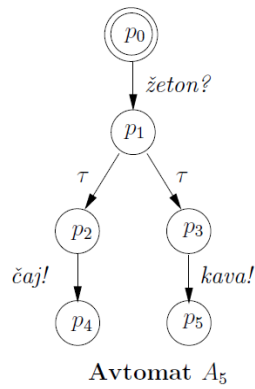
Here are LTSs visualised with LTSA V3.0.





File **kavacaj.dat** is a collection of simple coffee machine descriptions.





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Initialization of GUI package... OK
Initialization of BDD package... OK
Initialization of Process_Algebra package... OK
Initialization of Versis package... OK
Initialization of Model checking package... OK
Initialization of Strucval package... OK
Initialization of CCS package... OK
Ready.

```
>cd "/home/meolic/est/est-2ed/data/versis"; source "kavacaj.tcl"; cd "/home/meolic/est/est-2ed/data"
Reading file: kavacaj.dat
Sort sortKavacaj ... OK
Process A0 ... OK
```

```
Process A1 ... OK
Process A2 ... OK
Process A3 ... OK
Process A4 ... OK
Process A5 ... OK
Process A6 ... OK
Process A7 ... OK
Process A8 ... OK
Process A9 ... OK
Process A10 ... OK
```

STRONG EQUIVALENCE

[illegible]

WEAK EQUIVALENCE

| | | | | | | | | |
|------|---------------|-------------|----------|---------|----|-----|--------|----------------|
| Weak | observational | equivalence | checking | between | A1 | and | A2... | OK |
| Weak | observational | equivalence | checking | between | A1 | and | A3... | OK |
| Weak | observational | equivalence | checking | between | A1 | and | A4... | OK |
| Weak | observational | equivalence | checking | between | A1 | and | A5... | NOT EQUIVALENT |
| Weak | observational | equivalence | checking | between | A1 | and | A6... | NOT EQUIVALENT |
| Weak | observational | equivalence | checking | between | A1 | and | A7... | NOT EQUIVALENT |
| Weak | observational | equivalence | checking | between | A1 | and | A8... | NOT EQUIVALENT |
| Weak | observational | equivalence | checking | between | A1 | and | A9... | NOT EQUIVALENT |
| Weak | observational | equivalence | checking | between | A1 | and | A10... | NOT EQUIVALENT |
| Weak | observational | equivalence | checking | between | A2 | and | A3... | OK |
| Weak | observational | equivalence | checking | between | A2 | and | A4... | OK |
| Weak | observational | equivalence | checking | between | A2 | and | A5... | NOT EQUIVALENT |
| Weak | observational | equivalence | checking | between | A2 | and | A6... | NOT EQUIVALENT |
| Weak | observational | equivalence | checking | between | A2 | and | A7... | NOT EQUIVALENT |
| Weak | observational | equivalence | checking | between | A2 | and | A8... | NOT EQUIVALENT |
| Weak | observational | equivalence | checking | between | A2 | and | A9... | NOT EQUIVALENT |

Testing equivalence checking between A9 and A10... NOT EQUIVALENT

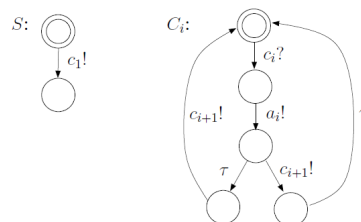
TRACE EQUIVALENCE

Trace equivalence checking between A1 and A2... OK
 Trace equivalence checking between A1 and A3... OK
 Trace equivalence checking between A1 and A4... OK
 Trace equivalence checking between A1 and A5... OK
 Trace equivalence checking between A1 and A6... OK
 Trace equivalence checking between A1 and A7... OK
 Trace equivalence checking between A1 and A8... OK
 Trace equivalence checking between A1 and A9... OK
 Trace equivalence checking between A1 and A10... OK
 Trace equivalence checking between A2 and A3... OK
 Trace equivalence checking between A2 and A4... OK
 Trace equivalence checking between A2 and A5... OK
 Trace equivalence checking between A2 and A6... OK
 Trace equivalence checking between A2 and A7... OK
 Trace equivalence checking between A2 and A8... OK
 Trace equivalence checking between A2 and A9... OK
 Trace equivalence checking between A2 and A10... OK
 Trace equivalence checking between A3 and A4... OK
 Trace equivalence checking between A3 and A5... OK
 Trace equivalence checking between A3 and A6... OK
 Trace equivalence checking between A3 and A7... OK
 Trace equivalence checking between A3 and A8... OK
 Trace equivalence checking between A3 and A9... OK
 Trace equivalence checking between A3 and A10... OK
 Trace equivalence checking between A4 and A5... OK
 Trace equivalence checking between A4 and A6... OK
 Trace equivalence checking between A4 and A7... OK
 Trace equivalence checking between A4 and A8... OK
 Trace equivalence checking between A4 and A9... OK
 Trace equivalence checking between A4 and A10... OK
 Trace equivalence checking between A5 and A6... OK
 Trace equivalence checking between A5 and A7... OK
 Trace equivalence checking between A5 and A8... OK
 Trace equivalence checking between A5 and A9... OK
 Trace equivalence checking between A5 and A10... OK
 Trace equivalence checking between A6 and A7... OK
 Trace equivalence checking between A6 and A8... OK
 Trace equivalence checking between A6 and A9... OK
 Trace equivalence checking between A6 and A10... OK
 Trace equivalence checking between A7 and A8... OK
 Trace equivalence checking between A7 and A9... OK
 Trace equivalence checking between A7 and A10... OK
 Trace equivalence checking between A8 and A9... OK
 Trace equivalence checking between A8 and A10... OK
 Trace equivalence checking between A9 and A10... OK

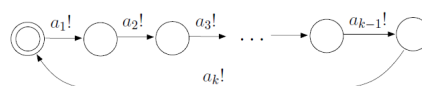
Files **scheduler4.dat**,..., **scheduler32.dat** are descriptions of simple schedulers.

Milner's simple distributed scheduler consists of

- starter S ,
- cyclers C_i .



External behaviour of the system with k cyclers



Here is log from executing **scheduler.tcl**:

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Initialization of Process_Algebra package... OK
Initialization of Versis package... OK
Initialization of Model checking package... OK
Initialization of Strucval package... OK
Initialization of CCS package... OK
Ready.

```
>cd "/home/meolic/est/est-2ed/data/versis"; source "scheduler.tcl"; cd "/home/meolic/est/est-2ed/data"
```

Reading file: scheduler4.dat

Sort sortSCH4 ... OK
Process starter ... OK
Process S1 ... OK
Process S2 ... OK
Process S3 ... OK
Process S4 ... OK
Process SCH4 ... OK

Parallel composition (1): scheduler4...

Weak observational equivalence checking between scheduler4 and SCH4... OK

Reading file: scheduler6.dat

Sort sortSCH6 ... OK
Process starter ... OK
Process S1 ... OK
Process S2 ... OK
Process S3 ... OK
Process S4 ... OK
Process S5 ... OK
Process S6 ... OK
Process SCH6 ... OK

Parallel composition (1): scheduler6...

Weak observational equivalence checking between scheduler6 and SCH6... OK

Reading file: scheduler8.dat

Sort sortSCH8 ... OK
Process starter ... OK
Process S1 ... OK
Process S2 ... OK
Process S3 ... OK
Process S4 ... OK
Process S5 ... OK
Process S6 ... OK
Process S7 ... OK
Process S8 ... OK
Process SCH8 ... OK

Parallel composition (1): scheduler8...

Weak observational equivalence checking between scheduler8 and SCH8... OK

Reading file: scheduler10.dat

Sort sortSCH10 ... OK
Process starter ... OK
Process S1 ... OK
Process S2 ... OK
Process S3 ... OK
Process S4 ... OK
Process S5 ... OK
Process S6 ... OK
Process S7 ... OK
Process S8 ... OK
Process S9 ... OK
Process S10 ... OK
Process SCH10 ... OK

Parallel composition (1): scheduler10...

Weak observational equivalence checking between scheduler10 and SCH10... OK
Reading file: scheduler12.dat

Sort sortSCH12 ... OK
Process starter ... OK
Process S1 ... OK
Process S2 ... OK
Process S3 ... OK
Process S4 ... OK
Process S5 ... OK
Process S6 ... OK
Process S7 ... OK
Process S8 ... OK
Process S9 ... OK
Process S10 ... OK
Process S11 ... OK
Process S12 ... OK
Process SCH12 ... OK

Parallel composition (1): scheduler12...

Weak observational equivalence checking between scheduler12 and SCH12... OK
Reading file: scheduler14.dat

Sort sortSCH14 ... OK
Process starter ... OK
Process S1 ... OK
Process S2 ... OK
Process S3 ... OK
Process S4 ... OK
Process S5 ... OK
Process S6 ... OK
Process S7 ... OK
Process S8 ... OK
Process S9 ... OK
Process S10 ... OK
Process S11 ... OK
Process S12 ... OK
Process S13 ... OK
Process S14 ... OK
Process SCH14 ... OK

Parallel composition (1): scheduler14...

Weak observational equivalence checking between scheduler14 and SCH14... OK
Reading file: scheduler16.dat

Sort sortSCH16 ... OK
Process starter ... OK
Process S1 ... OK
Process S2 ... OK
Process S3 ... OK
Process S4 ... OK
Process S5 ... OK
Process S6 ... OK
Process S7 ... OK
Process S8 ... OK
Process S9 ... OK
Process S10 ... OK
Process S11 ... OK
Process S12 ... OK
Process S13 ... OK
Process S14 ... OK
Process S15 ... OK
Process S16 ... OK
Process SCH16 ... OK

Parallel composition (1): scheduler16...

Weak observational equivalence checking between scheduler16 and SCH16... OK
Reading file: scheduler20.dat

Sort sortSCH20 ... OK
Process starter ... OK
Process S1 ... OK
Process S2 ... OK
Process S3 ... OK
Process S4 ... OK
Process S5 ... OK
Process S6 ... OK
Process S7 ... OK
Process S8 ... OK

Process S9 ... OK
Process S10 ... OK
Process S11 ... OK
Process S12 ... OK
Process S13 ... OK
Process S14 ... OK
Process S15 ... OK
Process S16 ... OK
Process S17 ... OK
Process S18 ... OK
Process S19 ... OK
Process S20 ... OK
Process SCH20 ... OK

Parallel composition (1): scheduler20...

Weak observational equivalence checking between scheduler20 and SCH20... OK

Reading file: scheduler24.dat

Sort sortSCH24 ... OK
Process starter ... OK
Process S1 ... OK
Process S2 ... OK
Process S3 ... OK
Process S4 ... OK
Process S5 ... OK
Process S6 ... OK
Process S7 ... OK
Process S8 ... OK
Process S9 ... OK
Process S10 ... OK
Process S11 ... OK
Process S12 ... OK
Process S13 ... OK
Process S14 ... OK
Process S15 ... OK
Process S16 ... OK
Process S17 ... OK
Process S18 ... OK
Process S19 ... OK
Process S20 ... OK
Process S21 ... OK
Process S22 ... OK
Process S23 ... OK
Process S24 ... OK
Process SCH24 ... OK

Parallel composition (1): scheduler24...

Weak observational equivalence checking between scheduler24 and SCH24... OK

Reading file: scheduler28.dat

Sort sortSCH28 ... OK
Process starter ... OK
Process S1 ... OK
Process S2 ... OK
Process S3 ... OK
Process S4 ... OK
Process S5 ... OK
Process S6 ... OK
Process S7 ... OK
Process S8 ... OK
Process S9 ... OK
Process S10 ... OK
Process S11 ... OK
Process S12 ... OK
Process S13 ... OK
Process S14 ... OK
Process S15 ... OK
Process S16 ... OK
Process S17 ... OK
Process S18 ... OK
Process S19 ... OK
Process S20 ... OK
Process S21 ... OK
Process S22 ... OK
Process S23 ... OK
Process S24 ... OK
Process S25 ... OK

Process S26 ... OK
Process S27 ... OK
Process S28 ... OK
Process SCH28 ... OK

Parallel composition (1): scheduler28...

Weak observational equivalence checking between scheduler28 and SCH28... OK

Reading file: scheduler30.dat

Sort sortSCH30 ... OK
Process starter ... OK
Process S1 ... OK
Process S2 ... OK
Process S3 ... OK
Process S4 ... OK
Process S5 ... OK
Process S6 ... OK
Process S7 ... OK
Process S8 ... OK
Process S9 ... OK
Process S10 ... OK
Process S11 ... OK
Process S12 ... OK
Process S13 ... OK
Process S14 ... OK
Process S15 ... OK
Process S16 ... OK
Process S17 ... OK
Process S18 ... OK
Process S19 ... OK
Process S20 ... OK
Process S21 ... OK
Process S22 ... OK
Process S23 ... OK
Process S24 ... OK
Process S25 ... OK
Process S26 ... OK
Process S27 ... OK
Process S28 ... OK
Process S29 ... OK
Process S30 ... OK
Process SCH30 ... OK

Parallel composition (1): scheduler30...

Weak observational equivalence checking between scheduler30 and SCH30... OK

Reading file: scheduler32.dat

Sort sortSCH32 ... OK
Process starter ... OK
Process S1 ... OK
Process S2 ... OK
Process S3 ... OK
Process S4 ... OK
Process S5 ... OK
Process S6 ... OK
Process S7 ... OK
Process S8 ... OK
Process S9 ... OK
Process S10 ... OK
Process S11 ... OK
Process S12 ... OK
Process S13 ... OK
Process S14 ... OK
Process S15 ... OK
Process S16 ... OK
Process S17 ... OK
Process S18 ... OK
Process S19 ... OK
Process S20 ... OK
Process S21 ... OK
Process S22 ... OK
Process S23 ... OK
Process S24 ... OK
Process S25 ... OK
Process S26 ... OK
Process S27 ... OK
Process S28 ... OK

Process S29 ... OK
Process S30 ... OK
Process S31 ... OK
Process S32 ... OK
Process SCH32 ... OK

Parallel composition (1): scheduler32...

Weak observational equivalence checking between scheduler32 and SCH32... OK