

Safety Designer: Utilities

User's Guide Appendix



V5R20 – BPA SD9 Delivery 8

Abstract

This chapter deals with all utilities (translator, comparator, ...) of BPA DAS which enable easy use.

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Compare 2 MCS files

Comparison of two set of minimal cuts

Introduction

MCS is abbreviation of Minimal Cut Set.

diff is the name of historical program that compare 2 files.

Diff MCS allows comparison of 2 minimal cut set.

A simple file comparison doesn't allow efficient MCS comparison, for two reasons:

- There are many different save/display formats.
- Order inside MCS is not unique (no order, lexicographic order, increasing probability, ...)

This utility has been improved in last version, it can also compare Minimal Sequence Set. Files format specify if data must deal with minimal cuts or minimal sequences.

Different formats

Sets of minimal cuts can come from different sources.

This utility can read following formats:

- Cecilia ARBOR - Export of minimal cuts into Text format [`*.txt`]

Example 1.

```
Document produit par CECILIA ARBOR
COUPES MINIMALES
<DATE>07/03/06
...
COUPES MINIMALES D'ORDRE ( 1 2 )
COUPES MINIMALES
Numéro Occurrence Nom Commentaire Loi Périodicité Temps d'exposition Propriétés Attributs
1 0.000E00 bt_2.panne exponential 1.000E-06 - - U
    equ1.cst10.panne exponential 1.000E-06 - - U
2 0.000E00 equ1.cst10.panne exponential 1.000E-06 - - U
    equ2.cst10.panne exponential 1.000E-06 - - U
...
```

- Cecilia ARBOR - Export of minimal cuts into XML format [`*.xml`]

Example 2.

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE EXPORT SYSTEM "file:///R:\Site\App\Arbor\V3.7\data\properties.dtd">
<EXPORT>
  <MINIMAL_CUT> <IDENTIFICATION_LIST .../>
    <PROJECT> <IDENTIFICATION .../>
      <SYSTEM> <IDENTIFICATION .../>
        <TREE CREATION_DATE="06-Mar-2006 19:16:45"> <IDENTIFICATION .../>
          <CUT>
            <EVENT NAME="bt_2.panne">
              <EXPONENTIAL> <VALUE_PARAMETER VALUE="1.000E-06"></VALUE_PARAMETER>
            </EXPONENTIAL>
          </EVENT>
            <EVENT NAME="equ1.cst10.panne">
              <EXPONENTIAL> <VALUE_PARAMETER VALUE="1.000E-06"></VALUE_PARAMETER>
            </EXPONENTIAL>
          </EVENT>
        </CUT>
      </CUT>
    </PROJECT>
  </MINIMAL_CUT>
</EXPORT>
```

- *Aralia* - Command result display products ... [* .mcs | * .seq]

With MCS format, **Sequences generation (Generic)** products a result file in same syntax.

Example 3.

```
products(MRS('cst12.s.false')) =
{'equ2.cst10.panne', 'bt_2.panne', 'equ1.cst10.panne'}
{'equ2.cst10.panne', 'equ1.cst10.panne'}
{'bt_2.panne', 'equ1.cst10.panne'}
end
```

- **Sequences generation (Generic)** with XML format for result file [* .xml]

Example 4.

```
<?xml version='1.0' encoding='iso-8859-15'?>
<seqgen>
  <define>
    <target name="cst12.s" value="false">
      <param name="resultset" value="minseqs"/>
      ...
    </target>
  </define>
  <abstract>
/* Order of products :
    ...
*/
  </abstract>
  <result>
    <seq><tr id="1" evt="equ2.cst10.panne"/>
      <tr id="16" evt="bt_2.panne"/>
      <tr id="19" evt="equ1.cst10.panne"/></seq>
    <seq><tr id="1" evt="equ2.cst10.panne"/>
      <tr id="19" evt="equ1.cst10.panne"/></seq>
    <seq><tr id="16" evt="bt_2.panne"/>
      <tr id="19" evt="equ1.cst10.panne"/></seq>
  </result>
  <model>
    <flow name="cst12.s" domain="bool" orientation="out"></flow>
    <state name="cst12.stt" domain="{no_ok, ok}">
      <init value="ok"/></state>
    ...
    <event name="equ2.cst10.panne">
      <law value="exponential(1.0E-4)" aralia="exponential 1.0E-4" moca="exp 1.0E-4"/></event>
    ...
  </model>
</seqgen>
```

The `resultset` parameter in XML file enables to distinguish between minimal cuts and minimal sequences.

- The *alta-seq* sequences generation with control automaton creates XML file compatible with this utility. [`*.xml`]

Example 5.

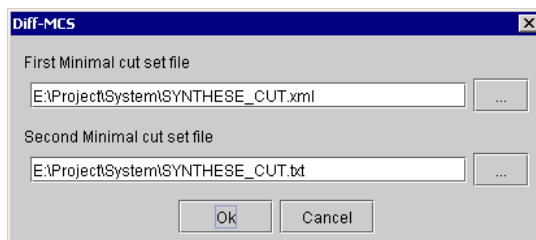
```
<?xml version="1.0"?>
<!--
#sequences: 3
running time: ...
-->
<sequences name="sequences.main.automaton1" >
  <sequence >
    <transition event="equ2.cst10.panne" />
    <transition event="bt_2.panne" />
    <transition event="equ1.cst10.panne" />
  </sequence>
  <sequence >
    <transition event="equ2.cst10.panne" />
    <transition event="equ1.cst10.panne" />
  </sequence>
  <sequence >
    <transition event="bt_2.panne" />
    <transition event="equ1.cst10.panne" />
  </sequence>
</sequences>
```

Launch a comparison



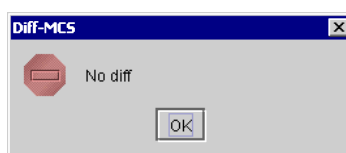
In order to launch a comparison between two sets of minimal cuts, use the **Diff. MCS** command.

The following window enables to select two files containing MCS to be compared.

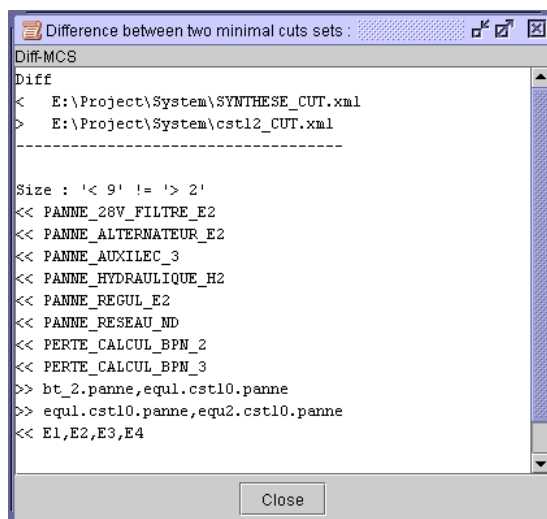


Comparison result

If the two sets are equivalent, the following message is displayed:



If they are not equivalent, a window displays differences:



Cuts that are in the first file but not in the second one are noticed with a << sign.

Cuts that are in the second file but not in the first one are noticed with a >> sign.

Command line

This utility can be launched without user interface with the following command line:

```
<JavaPath>/java.exe -classpath <ToolsPath>/plugins/MCSUtil.jar  
dassault.mcslib.McsDiff <file1> <file2>
```

where

- <JavaPath> : Java installation directory
- <ToolsPath> : BPA DAS installation directory
- <file1> <file2> : the 2 files to be compared

Translation of MCS into Aralia equation

Translation of minimal cuts set into *Aralia* boolean formula

Introduction

MCS is abbreviation of Minimal Cut Set.

The *Aralia* is reference software in Safety community. This enables processing of boolean formulae with probability.

Each minimal cut is translated into boolean conjunction (AND gate). The set of minimal cuts is considered as a disjunction (OR gate).

In order to ease reading by *Aralia* or other softwares that can import MCS, minimal cuts are chunked in fixe size packets.

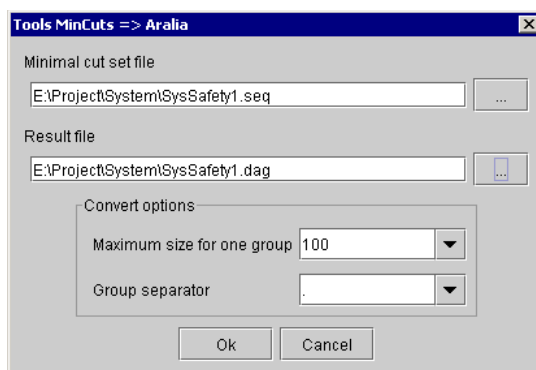
A separator character is used in order to create variables for each minimal cut and for each packet of minimal cuts.

Launching of translation



In order to launch translation, use the **Tools MinCuts => Aralia** command.

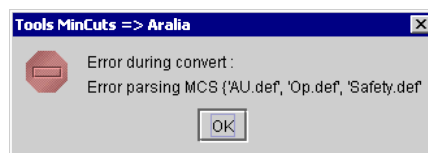
The following window enables to select an input file containing minimal cuts, and a result file.



The input file containing minimal cuts must be in one know format described in previous chapter.

Options enable to define maximum size of each group (packet) of minimal cuts and separator character.

If an issue occurs during input file reading, an error message is displayed.



Command line

This utility can be launched without user interface with the following command line:

```
<JavaPath>/java.exe -classpath <ToolsPath>/plugins/MCSUtil.jar  
dassault.mcslib.McsToAralia <input-file> <output-file>
```

where

- <JavaPath> : Java installation directory
- <ToolsPath> : BPA DAS installation directory
- <input-file> : input file containing minimal cuts
- <output-file> : result file

Default separator is the dot '.' and group size is set to 100.