

## 5.62 common

	DESCRIPTION	LINKS	GRAPH
<b>Origin</b>	N. Beldiceanu		
<b>Constraint</b>	<code>common(NCOMMON1, NCOMMON2, VARIABLES1, VARIABLES2)</code>		
<b>Arguments</b>	<pre> NCOMMON1   : dvar NCOMMON2   : dvar VARIABLES1 : collection(var-dvar) VARIABLES2 : collection(var-dvar) </pre>		
<b>Restrictions</b>	<pre> NCOMMON1 ≥ 0 NCOMMON1 ≤  VARIABLES1  NCOMMON2 ≥ 0 NCOMMON2 ≤  VARIABLES2  required(VARIABLES1, var) required(VARIABLES2, var) </pre>		
<b>Purpose</b>	<p>NCOMMON1 is the number of variables of the collection of variables VARIABLES1 taking a value in VARIABLES2.</p> <p>NCOMMON2 is the number of variables of the collection of variables VARIABLES2 taking a value in VARIABLES1.</p>		
<b>Example</b>	$\left( \begin{array}{c} 3, 4, \langle 1, 9, 1, 5 \rangle, \\ \text{var} - 2, \\ \text{var} - 1, \\ \langle \text{var} - 9, \rangle \\ \text{var} - 9, \\ \text{var} - 6, \\ \text{var} - 9 \end{array} \right)$ <p>The common constraint holds since:</p> <ul style="list-style-type: none"> <li>• Its first argument <math>NCOMMON1 = 3</math> corresponds to the number of values of the collection <math>\langle 1, 9, 1, 5 \rangle</math> that occur within <math>\langle 2, 1, 9, 9, 6, 9 \rangle</math>.</li> <li>• Its second argument <math>NCOMMON2 = 4</math> corresponds to the number of values of the collection <math>\langle 2, 1, 9, 9, 6, 9 \rangle</math> that occur within <math>\langle 1, 9, 1, 5 \rangle</math>.</li> </ul>		
<b>Typical</b>	<pre>  VARIABLES1  &gt; 1 range(VARIABLES1.var) &gt; 1  VARIABLES2  &gt; 1 range(VARIABLES2.var) &gt; 1 </pre>		

**Symmetries**

- Arguments are [permutable](#) w.r.t. permutation (NCOMMON1, NCOMMON2) (VARIABLES1, VARIABLES2).
- Items of VARIABLES1 are [permutable](#).
- Items of VARIABLES2 are [permutable](#).
- All occurrences of two distinct values in VARIABLES1.var or VARIABLES2.var can be [swapped](#); all occurrences of a value in VARIABLES1.var or VARIABLES2.var can be [renamed](#) to any unused value.

**Remark**

It was shown in [64] that, finding out whether the common constraint has a solution or not is NP-hard. This was achieved by reduction from 3-SAT.

**See also**

**common keyword:** [alldifferent\\_on\\_intersection](#), [nvalue\\_on\\_intersection](#), [same\\_intersection](#) (*constraint on the intersection*).

**generalisation:** [common\\_interval](#) (variable replaced by variable/constant), [common\\_modulo](#) (variable replaced by variable mod constant), [common\\_partition](#) (variable replaced by variable  $\in$  partition).

**related:** [among\\_var](#), [roots](#).

**root concept:** [among](#).

**specialisation:** [uses](#) (NCOMMON2=|VARIABLES2|).

**Keywords**

**complexity:** 3-SAT.

**constraint arguments:** constraint between two collections of variables.

**constraint type:** constraint on the intersection.

**final graph structure:** acyclic, bipartite, no loop.

<b>Arc input(s)</b>	VARIABLES1 VARIABLES2
<b>Arc generator</b>	<i>PRODUCT</i> $\mapsto$ <code>collection(variables1, variables2)</code>
<b>Arc arity</b>	2
<b>Arc constraint(s)</b>	<code>variables1.var = variables2.var</code>
<b>Graph property(ies)</b>	<ul style="list-style-type: none"> <li>• <b>NSOURCE</b>= NCOMMON1</li> <li>• <b>NSINK</b>= NCOMMON2</li> </ul>
<b>Graph class</b>	<ul style="list-style-type: none"> <li>• <b>ACYCLIC</b></li> <li>• <b>BIPARTITE</b></li> <li>• <b>NO_LOOP</b></li> </ul>

**Graph model**

Parts (A) and (B) of Figure 5.133 respectively show the initial and final graph associated with the **Example** slot. Since we use the **NSOURCE** and **NSINK** graph properties, the source and sink vertices of the final graph are stressed with a double circle. Since the final graph has only 3 sources and 4 sinks the variables NCOMMON1 and NCOMMON2 are respectively equal to 3 and 4. Note that all the vertices corresponding to the variables that take values 5, 2 or 6 were removed from the final graph since there is no arc for which the associated equality constraint holds.

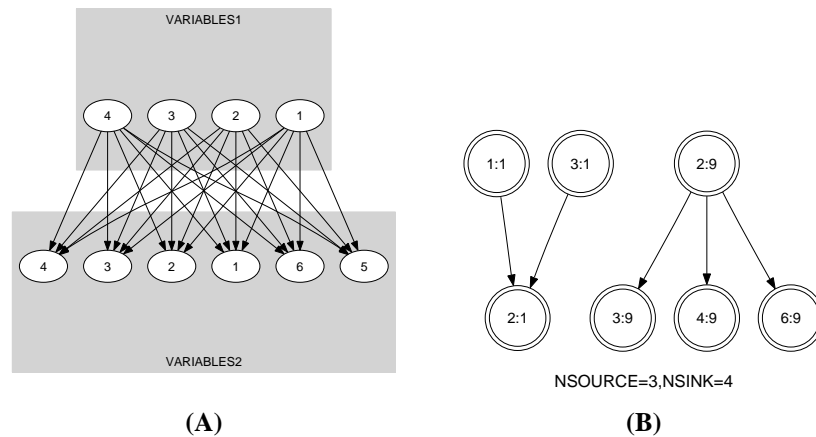


Figure 5.133: Initial and final graph of the common constraint

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