

## A Mapping tables for the DCR Analysis pruning step

This appendix details all the simplifications done on the arc pattern tables according to the pre-optimization rules that determine if a type of place is needed or not.

### A.1 Event mapping table given missing places

See Fig. 1.

index $\delta$ on transition $t_e^\delta$	index $\gamma$ on place $p_e^\gamma$		
	In	Ex	Re
<i>event</i>		—	o—
<i>init</i>	o—>		o—
<i>initpend</i>	o—>		<—
<i>pend</i>		—	<—

(a) No included place

index $\delta$ on transition $t_e^\delta$	index $\gamma$ on place $p_e^\gamma$		
	In	Ex	Re
<i>event</i>	—		o—
<i>init</i>			
<i>initpend</i>			
<i>pend</i>	—		<—

(b) No executed place

index $\delta$ on transition $t_e^\delta$	index $\gamma$ on place $p_e^\gamma$		
	In	Ex	Re
<i>event</i>	—	—	
<i>init</i>	—	o—>	
<i>initpend</i>			
<i>pend</i>			

(c) No pending place

index $\delta$ on transition $t_e^\delta$	index $\gamma$ on place $p_e^\gamma$		
	In	Ex	Re
<i>event</i>	—		
<i>init</i>			
<i>initpend</i>			
<i>pend</i>			

(d) No executed and pending place

index $\delta$ on transition $t_e^\delta$	index $\gamma$ on place $p_e^\gamma$		
	In	Ex	Re
<i>event</i>			
<i>init</i>			
<i>initpend</i>			
<i>pend</i>			

(e) No places - only one event transition is created

Table 1: Event mappings given missing places

### A.2 Relations given missing executed place

Effect relations do not use the executed place and by definition an executed place is created when there is a condition from the event to another, therefore there are no optimizations possible based on a missing executed place.

### A.3 A note on the pending excluded place

The pending excluded place is mapped as a formalism for satisfying the acceptance criteria of the *PNip*. Unlike the other types of places its existence is dependant on also the existence of a pending and an included place. Therefore when we do not map either a pending or include place it also implies that we do not map a pending excluded place. Formally:  $\neg(Re_x = In \wedge Re) \iff \neg Re_x = \neg In \vee \neg Re$ . For the remaining part of this appendix this implication is assumed.

### A.4 Relations given missing included place

According to the mapping there is no included place only if the event is always included. Therefore there are no inclusion or exclusion relations. The remaining relation mappings are in Table 2.

$\bullet \rightarrow$	$p_{e'}^{In}$	$p_{e'}^{Re}$	$p_{e'}^{Re_x}$
$t_e^{0,\delta}$		$0 \rightarrow$	
$t_e^{1,\delta}$		—	
$t_e^{2,\delta}$			
$t_e^{3,\delta}$			

(a) Arc patterns for  $\bullet \rightarrow$

$\bullet \leftarrow$	$p_{e'}^{In}$	$p_{e'}^{Ex}$
$t_e^{0,\delta}$		—
$t_e^{1,\delta}$		
$t_e^{2,\delta}$		

(b) Arc patterns for  $\bullet \leftarrow$

$\bullet \leftarrow \wedge \bullet \rightarrow$	$p_{e'}^{In}$	$p_{e'}^{Ex}$	$p_{e'}^{Re}$	$p_{e'}^{Re_x}$
$t_e^{0,\delta}$		—	$0 \rightarrow$	
$t_e^{1,\delta}$		—	—	
$t_e^{2,\delta}$				
$t_e^{3,\delta}$				
$t_e^{4,\delta}$				
$t_e^{5,\delta}$				

(c) Arc patterns for  $e' \bullet \leftarrow$   
 $e \wedge e' \bullet \rightarrow e$

Table 2: Missing included place

### A.5 Relations given missing pending place

Not mapping a pending place means by definition that the event can never become pending and is not pending in the initial marking. We look at Table 3 containing include or exclude relations.

### A.6 Relations given missing pending excluded place

If there is no pending excluded place it means the event is always included and it either has a response relation to it or is pending in the initial marking. Since the event is always included it also means it does not need an included place, therefore this scenario is equivalent to A.4.

The remaining pre-optimizations cover scenarios where do not map two or more places.

$\rightarrow\vdash$	$p_{e'}^{In}$	$p_{e'}^{Re}$	$p_{e'}^{Rex}$
$t_e^{0,\delta}$	—		
$t_e^{1,\delta}$	$o \rightarrow$		
$t_e^{2,\delta}$			

(a) Arc patterns for  $\rightarrow\vdash$ 

$\rightarrow\%_0$	$p_{e'}^{In}$	$p_{e'}^{Re}$	$p_{e'}^{Rex}$
$t_e^{0,\delta}$	$o \rightarrow$		
$t_e^{1,\delta}$	$< \rightarrow$		
$t_e^{2,\delta}$			

(b) Arc patterns for  $\rightarrow\%_0$ 

$\bullet\leftarrow \wedge \rightarrow\vdash$	$p_{e'}^{In}$	$p_{e'}^{Ex}$	$p_{e'}^{Re}$	$p_{e'}^{Rex}$
$t_e^{0,\delta}$	—	—		
$t_e^{1,\delta}$	$o \rightarrow$	$o \rightarrow$		
$t_e^{2,\delta}$				
$t_e^{3,\delta}$	$o \rightarrow$	$\rightarrow$		
$t_e^{4,\delta}$				

(c) Arc patterns for  $e' \bullet\leftarrow e \wedge e' \rightarrow\vdash e$ 

$\bullet\leftarrow \wedge \rightarrow\%_0$	$p_{e'}^{In}$	$p_{e'}^{Ex}$	$p_{e'}^{Re}$	$p_{e'}^{Rex}$
$t_e^{0,\delta}$	$< \rightarrow$	—		
$t_e^{1,\delta}$				
$t_e^{2,\delta}$	$o \rightarrow$	$o \rightarrow$		
$t_e^{3,\delta}$	$o \rightarrow$	—		

(d) Arc patterns for  $e' \bullet\leftarrow e \wedge e' \rightarrow\%_0 e$ 

Table 3: Arc patterns for missing pending place

### A.7 Relations given missing included and pending places

If both included and pending places are missing this means that we may only apply a condition relation as in Table 4.

$\bullet\leftarrow$	$p_{e'}^{In}$	$p_{e'}^{Ex}$
$t_e^{0,\delta}$		—
$t_e^{1,\delta}$		
$t_e^{2,\delta}$		

(a) Arc patterns for  $\bullet\leftarrow$ 

Table 4: Arc patterns for missing included and pending places

### A.8 Relations given missing included and executed places

This means that only a response relation may be applied on the event as in Table 5.

### A.9 Relations given missing pending and executed places

This means that only include and exclude relations may be applied, as in Table 6.

### A.10 Relations given missing included, pending and executed places

This means that only a single transition is needed as the event is a passive event. The transition can only fire or be constrained by a condition relation.

$\bullet \rightarrow$	$p_{e'}^{In}$	$p_{e'}^{Re}$	$p_{e'}^{Rex}$
$t_e^{0,\delta}$		$o \rightarrow$	
$t_e^{1,\delta}$		$—$	
$t_e^{2,\delta}$			
$t_e^{3,\delta}$			

(a) Arc patterns for  $\bullet \rightarrow$ 

Table 5

$\rightarrow +$	$p_{e'}^{In}$	$p_{e'}^{Re}$	$p_{e'}^{Rex}$
$t_e^{0,\delta}$	$—$		
$t_e^{1,\delta}$	$o \rightarrow$		
$t_e^{2,\delta}$			

(a) Arc patterns for  $\rightarrow +$ 

$\rightarrow \%$	$p_{e'}^{In}$	$p_{e'}^{Re}$	$p_{e'}^{Rex}$
$t_e^{0,\delta}$	$o \rightarrow$		
$t_e^{1,\delta}$	$< \rightarrow$		
$t_e^{2,\delta}$			

(b) Arc patterns for  $\rightarrow \%$ 

Table 6: Missing pending and executed places