Model: CDCFModel

Place Attributes:

Place Names	Initial Markings
Decision	2
Fallback	1
FallbackErratic	0
FallbackFPorFN	0
FallbackFailed	0
FallbackSilent	0
Monitoring	1
MonitoringErratic	0
MonitoringFailed	0
MonitoringSilent	0
SAEL2	1
SAEL2Erratic	0
SAEL2FPorFN	0
SAEL2Failed	0
SAEL2Silent	0
SafeState	0
UnsafeState	0

Timed Activity:	CCF
Distribution Parameters	**Rate** fr_complex * (1-p_individual) * (SAEL2->Mark()+Monitoring->Mark()+Fallback->Mark())
Activation Predicate	(none)
Reactivation Predicate	(none)

Case Distributions	**case 1**
	(1-p_individual-p_ccf3of3)/(1-p_individual)
	case 2
	p_ccf3of3/(1-p_individual)

Timed Activity:	DecisionFailure
Distribution Parameters	**Rate** fr_simple * Decision->Mark()
Activation Predicate	(none)
Reactivation Predicate	(none)

Timed Activity:	FallbackFailure
Distribution Parameters	**Rate** fr_complex * p_individual
Activation Predicate	(none)
Reactivation Predicate	(none)

Timed Activity:	FallbackMRM
Distribution Parameters	**Rate** r_MRM
Activation Predicate	(none)
Reactivation Predicate	(none)

Timed Activity:	MonitoringFailure
Distribution Parameters	**Rate** fr_complex * p_individual
Activation Predicate	(none)
Reactivation Predicate	(none)

Timed Activity:	SAEL2Failure
Distribution Parameters	**Rate** fr_complex * p_individual
Activation Predicate	(none)
Reactivation Predicate	(none)

Timed Activity:	SAEL2MRM
Distribution Parameters	**Rate** r_MRM
Activation Predicate	(none)
Reactivation Predicate	(none)

Instantaneous Activity:	FallbackFailureType

Case Distributions	case 1
	1-p_erratic
	case 2
	p_erratic

Instantaneous Activity:	MonitoringFailureType

Case Distributions	case 1
	p_erratic
	case 2
	1-p_erratic

Instantaneous Activity:	SAEL2FailureType

Case Distributions	case 1
	1-p_erratic
	case 2
	p_erratic

Instantaneous Activity:	ValidationError

Case Distributions	case 1
	p_singlemisvalidation
	case 2
	1-p_singlemisvalidation*2
	case 3
	p_singlemisvalidation

Instantaneous Activity:	prebufferedMRM

Case Distributions	case 1
	1-p_MRM
	case 2
	p_MRM

Instantaneous Activities Without Cases:
CatastrophicFailure

<table>
<tr><th>Input Gate:</th><th>CheckCatastrophicFailure</th></tr>
<tr><td>Predicate</td><td>SafeState->Mark()+UnsafeState->Mark()==0 &&
 (SAEL2Erratic->Mark()+SAEL2FPorFN->Mark()==2 ||
  (FallbackErratic->Mark()+FallbackFPorFN->Mark()==2 &&
   !(SAEL2->Mark()==1 && SAEL2FPorFN->Mark()==0)))</td></tr>
<tr><td>Function</td><td>;</td></tr>
</table>

<table>
<tr><th>Input Gate:</th><th>CheckFallbackMRM</th></tr>
<tr><td>Predicate</td><td>SafeState->Mark()+UnsafeState->Mark()==0 && Fallback->Mark()==1 && FallbackFPorFN->Mark()==0 &&
 (SAEL2Silent->Mark()+Monitoring->Mark()==2 ||
  SAEL2->Mark()+SAEL2FPorFN->Mark()==2 ||
   SAEL2Erratic->Mark()+Monitoring->Mark()==2)</td></tr>
<tr><td>Function</td><td>;</td></tr>
</table>

<table>
<tr><th>Input Gate:</th><th>CheckNonCatastrophicFailure</th></tr>
<tr><td>Predicate</td><td>SafeState->Mark()+UnsafeState->Mark()==0 &&
 (Decision->Mark()==0 ||
  MonitoringSilent->Mark()==1 ||
   SAEL2Silent->Mark()+FallbackSilent->Mark()==2 ||
    (SAEL2Silent->Mark()==1 && ((Monitoring->Mark()==1 && Fallback->Mark()==0) || Fallback->Mark()+FallbackFPorFN->Mark()==2)) ||
     (SAEL2Erratic->Mark()==1 && SAEL2FPorFN->Mark()==0 && ((Monitoring->Mark()==1 && Fallback->Mark()==0) || Fallback->Mark()+FallbackFPorFN->Mark()==2)) ||
      (SAEL2->Mark()+SAEL2FPorFN->Mark()==2 && (Fallback->Mark()+FallbackFPorFN->Mark()==2 || FallbackSilent->Mark()==1 || (FallbackErratic->Mark()==1 && FallbackFPorFN->Mark()==0))))</td></tr>
<tr><td>Function</td><td>;</td></tr>
</table>

<table>
<tr><th>Input Gate:</th><th>CheckSAEL2MRM</th></tr>
<tr><td>Predicate</td><td>SafeState->Mark()+UnsafeState->Mark()==0 && SAEL2->Mark()==1 && SAEL2FPorFN->Mark()==0 &&
 (FallbackSilent->Mark()+Monitoring->Mark()==2 ||
  Fallback->Mark()+FallbackFPorFN->Mark()==2 ||
   FallbackErratic->Mark()+Monitoring->Mark()==2)</td></tr>
<tr><td>Function</td><td>;</td></tr>
</table>

<table>
<tr><th>Output Gate:</th><th>CCF2of3</th></tr>
<tr><td>Function</td><td>int a = (SAEL2->Mark() + Fallback->Mark() == 2);
int b = (SAEL2->Mark() + Monitoring->Mark() == 2);
int c = (Fallback->Mark() + Monitoring->Mark() == 2);
int n = a + b + c;
int e = 3;
if (n) {
    int r = rand() % n;
    if (a && r-- == 0)   e = 0;
    else if (b && r-- == 0) e = 1;
    else if (c && r-- == 0) e = 2;
}
if (e==0) { SAEL2->Mark()=0; Fallback->Mark()=0; SAEL2Failed->Mark()=1; FallbackFailed->Mark()=1; }
else if (e==1) { SAEL2->Mark()=0; Monitoring->Mark()=0; SAEL2Failed->Mark()=1; MonitoringFailed->Mark()=1; }
else if (e==2) { Fallback->Mark()=0; Monitoring->Mark()=0; FallbackFailed->Mark()=1; MonitoringFailed->Mark()=1; }</td></tr>
</table>

<table>
<tr><th>Output Gate:</th><th>CCF3of3</th></tr>
<tr><td>Function</td><td>if (SAEL2->Mark()+Fallback->Mark()+Monitoring->Mark()==3)
{
Fallback->Mark()=0;
SAEL2->Mark()=0;
Monitoring->Mark()=0;
FallbackFailed->Mark()=1;
SAEL2Failed->Mark()=1;
MonitoringFailed->Mark()=1;
}</td></tr>
</table>

<table>
<tr><th>Output Gate:</th><th>FallbackNonSilent</th></tr>
<tr><td>Function</td><td>if (FallbackSilent->Mark()==1)
{
 Monitoring->Mark()=1;
}
else
{
 FallbackFPorFN->Mark()=1;
}</td></tr>
</table>

<table>
<tr><th>Output Gate:</th><th>SAEL2FallbackNonSilent</th></tr>
<tr><td>Function</td><td>if (FallbackSilent->Mark()+SAEL2Silent->Mark()==0)
{
 SAEL2FPorFN->Mark()=1;
 FallbackFPorFN->Mark()=1;
}
else
{
 Monitoring->Mark()=1;
}</td></tr>
</table>

Output Gate:	SAEL2NonSilent

Function	if (SAEL2Silent->Mark()==1)
	{
	 Monitoring->Mark()=1;
	}
	else
	{
	 SAEL2FPorFN->Mark()=1;
	}

Range Study Variable Assignments for Study *CDCFParameter* in Project *CDCF* :

Variable	Type	Range Type	Range	Increment	Increment Type	Function	n
fr_complex	double	Fixed	1.0E-5	-	-	-	-
fr_simple	double	Fixed	1.0E-6	-	-	-	-
p_MRM	double	Manual	[0.75, 0.85, 0.95]	-	-	-	-
p_ccf3of3	double	Fixed	0.025	-	-	-	-
p_erratic	double	Manual	[0.1, 0.3, 0.5]	-	-	-	-
p_individual	double	Manual	[0.8, 0.875, 0.95]	-	-	-	-
p_singlemisvalidation	double	Fixed	0.47230194888030885	-	-	-	-
r_MRM	double	Fixed	6.0	-	-	-	-

Performance Variable Model: CDCFReward		
Top Level Model Information	Child Model Name	CDCFModel
	Model Type	SAN Model

Performance Variable : p_safestate			
Affecting Models	CDCFModel		
Impulse Functions			
Reward Function	*(Reward is over all Available Models)* if (CDCFModel->SafeState->Mark()==1) return 1;		
Simulator Statistics	Type	Instant of Time	
	Options	Estimate Mean	
		Include Lower Bound on Interval Estimate	
		Include Upper Bound on Interval Estimate	
		Estimate out of Range Probabilities	
		Confidence Level is Relative	
	Parameters	Start Time	5000.0,15000.0,25000.0,35000.0,
	Confidence	Confidence Level	0.95
		Confidence Interval	0.1

Performance Variable : p_unsafestate			
Affecting Models	CDCFModel		
Impulse Functions			
Reward Function	*(Reward is over all Available Models)* if (CDCFModel->UnsafeState->Mark()==1) return 1;		
Simulator Statistics	Type	Instant of Time	
	Options	Estimate Mean	
		Include Lower Bound on Interval Estimate	
		Include Upper Bound on Interval Estimate	
		Estimate out of Range Probabilities	
		Confidence Level is Relative	
	Parameters	Start Time	5000.0,15000.0,25000.0,35000.0,
	Confidence	Confidence Level	0.95
		Confidence Interval	0.1

Performance Variable : p_safestate_steadystate			
Affecting Models	CDCFModel		
Impulse Functions			
Reward Function	*(Reward is over all Available Models)* if (CDCFModel->SafeState->Mark()==1) return 1;		
Simulator Statistics	Type	Steady State	
	Options	Estimate Mean	
		Include Lower Bound on Interval Estimate	
		Include Upper Bound on Interval Estimate	
		Estimate out of Range Probabilities	
		Confidence Level is Relative	
	Parameters	Initial Transient	0.0
		Batch Size	1.0
	Confidence	Confidence Level	0.95
		Confidence Interval	0.1

Performance Variable : p_unsafestate_steadystate			
Affecting Models	CDCFModel		
Impulse Functions			
Reward Function	*(Reward is over all Available Models)* if (CDCFModel->UnsafeState->Mark()==1) return 1;		
Simulator Statistics	Type	Steady State	
	Options	Estimate Mean	
		Include Lower Bound on Interval Estimate	
		Include Upper Bound on Interval Estimate	
		Estimate out of Range Probabilities	
		Confidence Level is Relative	
	Parameters	Initial Transient	0.0
		Batch Size	1.0
	Confidence	Confidence Level	0.95
		Confidence Interval	0.1

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