

Univerza v Ljubljani
Fakulteta za računalništvo
in informatiko



9. Programska orodja za določanje zanesljivosti (2013/2014)

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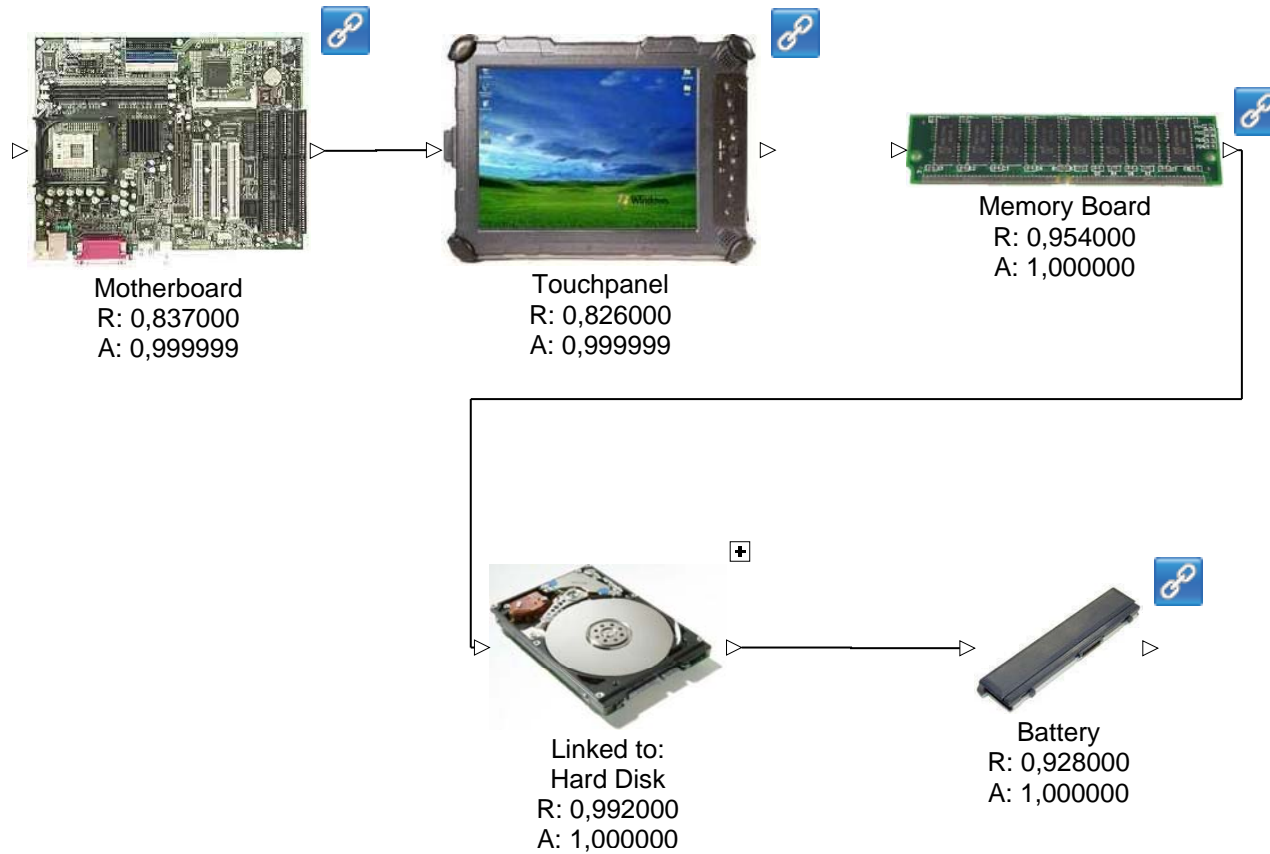


9.1. Primer orodja: PTC Windchill Quality solutions (predhodno Relex)

- Projektna usmerjenost orodja
- Vgrajene funkcije (naštete po vrstnem redu smiselnega kreiranja projekta):
 - RBD
 - λ prediction (MIL217F, ostali standardi, DB)
 - Markovski model
 - Weibull predikcija
 - FMEA
 - FTA
 - Ostale funkcije: Event tree, ALT, FRACAS, LCC



RBD diagram (Tablet PC)



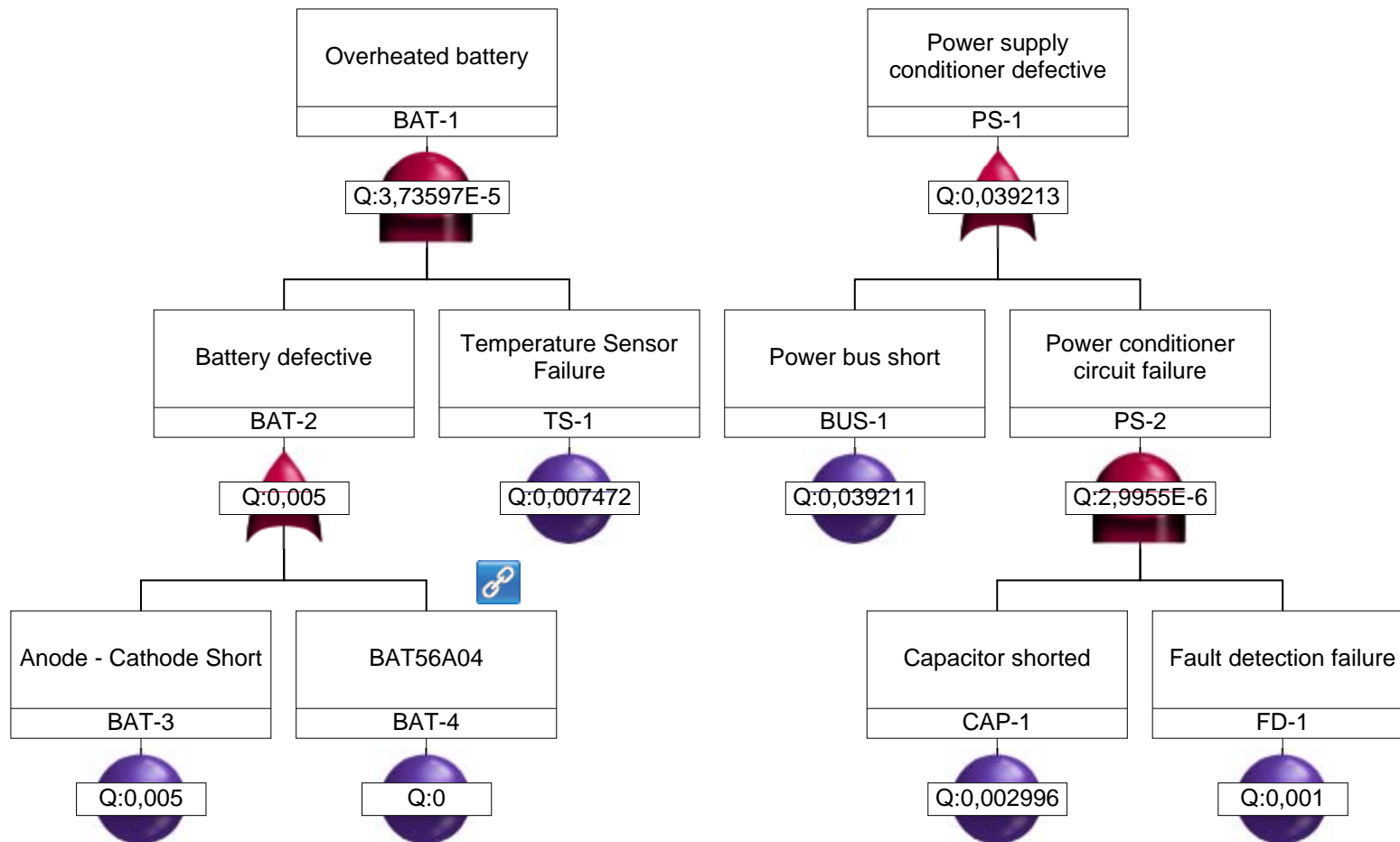


λ prediction

Name	Part Number	System Tree Identifier	Reference Designator	Description	Manufacturer	Failure Rate, Predicted	MTBF, Predicted	Tag
Industrial Tablet PC	PC070101	S1	S1	Tuf-Tablet	Tuf-Tablet International	23,117593	43257	
Battery	BAT56A04	A5	A5	Li-Ion tablet ...	Superior Power Devices	2,242700	445891	
Motherboard	MB060415	A1	A1	Motherboard	iTronics	5,240445	190823	
Microprocessor	MIC870A	A1U1	U1	Dual core mic...	AB Electronics	4,670594	214106	
Static RAM	SRAM031	A1U3-U6	U3-U6	60 ns SRAM	Memory Unlimited	0,512888	2e+006	
Clock Generator	CLKS04	A1U7	U7	DDS-based d...	AB Electronics	0,027967	4e+007	
Video Processor	VP899011	A1U8	U8	Digital video ...	AB Electronics	0,028996	3e+007	
Touchpanel	TP55401A	A2	A2	12.1" touch ...	Clear Display Technologies	6,550000	152672	
Memory Board	MEM061789	A3	A3	DRAM memo...	Tuf-Tablet International	1,355120	737942	
DRAM Controller	DRAMC7001	A3U1	U1	DRAM contro...	Memory Unlimited	0,958604	1e+006	
Dynamic RAM	DRAM512-31	A3U2-U3	U2-U3	31ns DRAM	Memory Unlimited	0,396516	3e+006	
Hard Disk Assembly	HD061455	A4	A4	Hard disk ass...	Tuf-Tablet International	7,729327	129377	
RAID Controller	RAID-023C	A4U1	U1	SATA RAID ...	Megastorage Corporation	0,229327	4e+006	
Hard Disk	HD70AS-500	A4HD1-HD2	HD1-HD2	500 GB Hard ...	Megastorage Corporation	7,500000	133333	



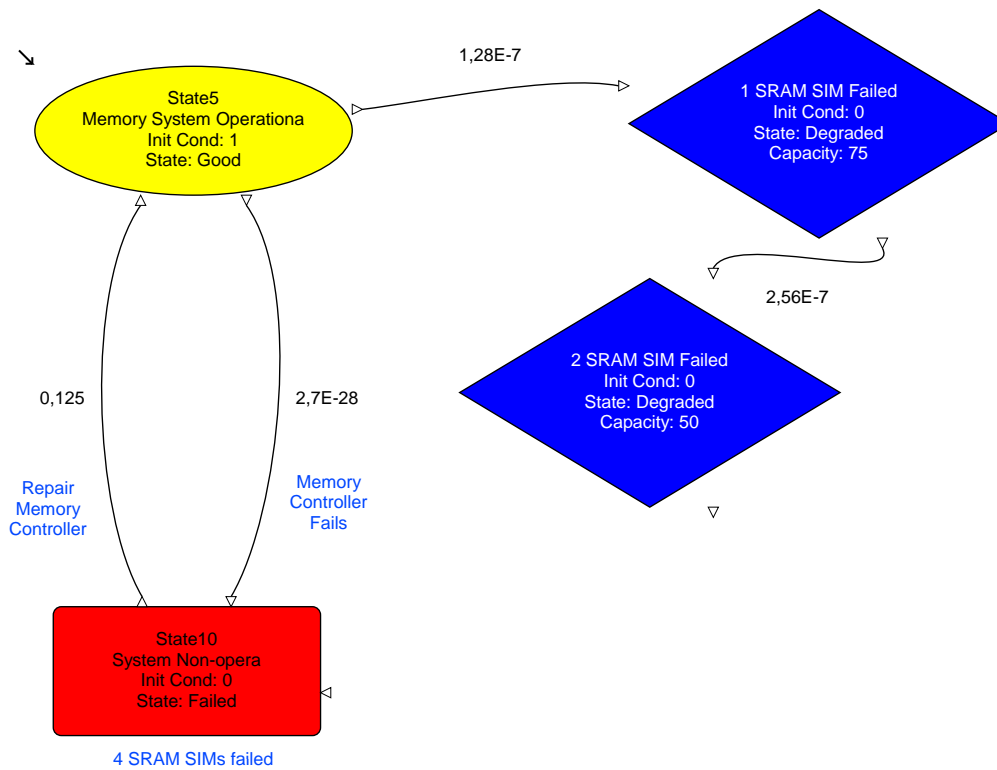
FTA model





Markovski model podsklopa

Memory System Model
with Load Sharing and Performance/Capacity Analysis



-- Markov Calculation Results --

Steady state results
Availability: 0,363636
Capacity: 63,63634
MTBF: 2,14844E+7
Mean time to first failure: 7812500
Unavailability: 0,636364

Results at time 30000,000000
Availability: 0,996167
Capacity: 99,903815
Failure rate: 0,128
Mean availability: 0,998082
Mean capacity: 99,951938
Mean unavailability: 0,001918
Number of failures: 0,003833
Number of repairs: 7,26745E-11
Reliability: 0,996167
Total capacity: 2998558,142315
Total downtime: 57,525974
Total uptime: 29942,474026
Unavailability: 0,003833
Unreliability: 0,003833



Končno poročilo

View Calculation Results

RBD Results

- General
- Costs
- Spares
- Optimizations
- Equation
- FTA Results
- Markov Results
- Weibull Results

RBD General Results

Results for Tablet PC:

Steady state results:

MTBF: 64030,432569
MTTF (simulated): 64496,390229
Calculation method: Monte Carlo Simulation
1000 Iterations Completed
Reliability accounts for repairs

Results at Time 30000,00:

Reliability: 0,612
Unreliability: 0,388
Failure rate: 12,297572
Availability: 0,999998
Unavailability: 2,13755E-6
Total downtime: 0,064126
Number of failures: 0,468527

Time	Reliability	Unreliability	Failure rate	Availability	Unavailability
0	1,000000	0,000000	NA	1,000000	0,000000
3000,00	0,956000	0,044000	14,999122	0,999998	0,000002
6000,00	0,912000	0,088000	15,705974	0,999998	0,000002
9000,00	0,862000	0,138000	18,794906	0,999998	0,000002
12000,00	0,820000	0,180000	16,650310	0,999998	0,000002
15000,00	0,782000	0,218000	15,816533	0,999998	0,000002
18000,00	0,738000	0,262000	19,303639	0,999998	0,000002
21000,00	0,699000	0,301000	18,097694	0,999998	0,000002
24000,00	0,662000	0,338000	18,128395	0,999998	0,000002
27000,00	0,635000	0,365000	13,880186	0,999998	0,000002
30000,00	0,612000	0,388000	12,297572	0,999998	0,000002

Excel Print...

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9.2. Pregled vgrajenih funkcij izbranih orodij

Orodje	Proizvajalec	RBD	MIL217 F	IEC 62380	NSWC- 98	China 299	Telcordi a SR 332	Markov	FTA	FME(C) A	Weibull	Databas e	EventTr ee	ALTA
Reliability workbench	Isograph Ltd	DA	DA	DA	DA	DA	DA	DA	DA	DA	DA	90.000	DA	
Reliasoft BQR - Izrael	Reliasoft corp.	DA	DA		DA		DA		DA	DA	DA	300.000		DA
PTC Windchill prediction	BQR	DA	DA	DA		DA	DA	DA	DA	DA				
	PTC	DA	DA	DA		DA	DA	DA	DA	DA	DA	DA		



- http://www.reliasoft.com/predict/part_libraries.htm
(knjižnica intenzivnosti odpovedovanja elektronskih komponent)
- Weibull model:
 - Analizator zgodovinskih časov odpovedi
 - Prediktor matematičnih modelov intenzivnosti odpovedovanja
- NSWC-98: predikcija zanesljivosti mehanskih komponent (aktuatorji, črpalke, filtri, kompresorji, električni motorji, itd.)
- Alta: Accelerated life testing analysis