

Contents

Part I Introductory Overview

1	Introduction	3
1.1	The Importance of Risk Analysis	3
1.2	Asset Identification	4
1.3	Risk Modelling	5
1.4	The CORAS Approach	5
1.4.1	The CORAS Language	6
1.4.2	The CORAS Tool	6
1.4.3	The CORAS Method	6
1.5	The Generality of CORAS	7
1.6	Overall Aim and Emphasis	8
1.7	Organisation	8
1.7.1	Part I: Introductory Overview	9
1.7.2	Part II: Core Approach	9
1.7.3	Part III: Selected Issues	11
1.7.4	Appendices	12
1.8	Colours in CORAS and in this Book	13
2	Background and Related Approaches	15
2.1	Basic Terminology	15
2.2	Related Approaches	17
2.2.1	Risk Analysis Methods	17
2.2.2	Table-based Risk Analysis Techniques	18
2.2.3	Tree-based Risk Analysis Techniques	18
2.2.4	Graph-based Risk Analysis Techniques	19
2.2.5	Situating CORAS Within this Picture	20
3	A Guided Tour of the CORAS Method	23
3.1	Preparations for the Analysis	23
3.2	Customer Presentation of the Target	25
3.3	Refining the Target Description Using Asset Diagrams	26

3.4	Approval of the Target Description	31
3.5	Risk Identification Using Threat Diagrams	33
3.6	Risk Estimation Using Threat Diagrams	37
3.7	Risk Evaluation Using Risk Diagrams	39
3.8	Risk Treatment Using Treatment Diagrams	41
Part II Core Approach		
4	The CORAS Risk Modelling Language	47
4.1	Central Concepts	48
4.1.1	What is a Threat?	48
4.1.2	What is a Threat Scenario?	49
4.1.3	What is a Vulnerability?	51
4.1.4	What is an Unwanted Incident?	53
4.1.5	What is an Asset?	55
4.2	The Diagrams of the CORAS language	56
4.2.1	Asset Diagrams	56
4.2.2	Threat Diagrams	58
4.2.3	Risk Diagrams	60
4.2.4	Treatment Diagrams	62
4.2.5	Treatment Overview Diagrams	64
4.3	How to Schematically Translate CORAS Diagrams into English Prose	65
4.3.1	How to Translate Asset Diagrams	65
4.3.2	How to Translate Threat Diagrams	67
4.3.3	How to Translate Risk Diagrams	69
4.3.4	How to Translate Treatment Diagrams	69
4.3.5	How to Translate Treatment Overview Diagrams	70
4.4	Summary	71
5	Preparations for the Analysis	73
5.1	Overview of Step 1	73
5.2	Conducting the Tasks of Step 1	76
5.3	Summary of Step 1	78
6	Customer Presentation of the Target	81
6.1	Overview of Step 2	81
6.2	Conducting the Tasks of Step 2	83
6.2.1	Presentation of the CORAS Terminology and Method	83
6.2.2	Presentation of the Goals and Target of the Analysis	86
6.2.3	Setting the Focus and Scope of the Analysis	89
6.2.4	Determining the Meeting Plan	91
6.3	Summary of Step 2	94
7	Refining the Target Description Using Asset Diagrams	95
7.1	Overview of Step 3	95

7.2	Conducting the Tasks of Step 3	97
7.2.1	Presentation of the Target by the Analysis Team	97
7.2.2	Asset Identification	101
7.2.3	High-level Analysis	106
7.3	Summary of Step 3	109
8	Approval of the Target Description	111
8.1	Overview of Step 4	111
8.2	Conducting the Tasks of Step 4	113
8.2.1	Approval of the Target Description	114
8.2.2	Ranking of Assets	115
8.2.3	Setting the Consequence Scales	116
8.2.4	Setting the Likelihood Scale	118
8.2.5	Defining the Risk Function	120
8.2.6	Deciding the Risk Evaluation Criteria	122
8.3	Summary of Step 4	124
9	Risk Identification Using Threat Diagrams	125
9.1	Overview of Step 5	125
9.2	Conducting the Tasks of Step 5	128
9.2.1	Categorising Threat Diagrams	128
9.2.2	Identification of Threats and Unwanted Incidents	129
9.2.3	Identification of Threat Scenarios	133
9.2.4	Identification of Vulnerabilities	137
9.3	Summary of Step 5	144
10	Risk Estimation Using Threat Diagrams	147
10.1	Overview of Step 6	147
10.2	Conducting the Tasks of Step 6	149
10.2.1	Likelihood Estimation	150
10.2.2	Consequence Estimation	154
10.2.3	Risk Estimation	157
10.3	Summary of Step 6	163
11	Risk Evaluation Using Risk Diagrams	165
11.1	Overview of Step 7	165
11.2	Conducting the Tasks of Step 7	167
11.2.1	Confirming the Risk Estimates	167
11.2.2	Confirming the Risk Evaluation Criteria	168
11.2.3	Providing a Risk Overview	169
11.2.4	Accumulating Risks	170
11.2.5	Estimating Risks with Respect to Indirect Assets	173
11.2.6	Evaluating the Risks	182
11.3	Summary of Step 7	185

12 Risk Treatment Using Treatment Diagrams	187
12.1 Overview of Step 8	187
12.2 Conducting the Risk Treatment	188
12.2.1 Grouping of Risks	189
12.2.2 Treatment Identification	191
12.2.3 Treatment Evaluation	196
12.3 Summary of Step 8	203
Part III Selected Issues	
13 Analysing Likelihood Using CORAS Diagrams	207
13.1 Using CORAS Diagrams to Calculate Likelihood	208
13.1.1 Specifying Likelihood Using CORAS Diagrams	208
13.1.2 Rules for Calculating Probability in CORAS Diagrams	210
13.1.3 Rules for Calculating Frequency in CORAS Diagrams	222
13.1.4 Likelihood as Probability or Frequency	226
13.1.5 Generalisation to Intervals and Distributions	227
13.2 Using CORAS Diagrams to Check Consistency	229
13.3 Using CORAS to Analyse Scenarios with Logical Connectives	233
13.3.1 Using CORAS to Analyse Scenarios with Logical Conjunction	233
13.3.2 Using CORAS to Analyse Scenarios with Logical Disjunction	236
13.4 How to Structure a Threat Diagram to Exploit the Potential for Likelihood Analysis	237
13.4.1 Enabling Application of Rules by Composition	237
13.4.2 Enabling Application of Rules by Decomposition	239
13.5 Summary	243
14 The High-level CORAS Language	245
14.1 Referring Elements and Referenced Diagrams	246
14.1.1 Threat Scenarios	247
14.1.2 Unwanted Incidents	250
14.1.3 Risks	251
14.1.4 Treatment Scenarios	253
14.2 Likelihoods in High-level CORAS	257
14.2.1 Reasoning About the Likelihoods in a High-level Diagram	260
14.2.2 Reasoning About the Likelihoods in a Referenced Diagram	261
14.2.3 Analysing the Relation Between the Likelihoods of a Referring Element and the Likelihoods in the Referenced Diagrams	263
14.3 Consequences in High-level CORAS	264
14.4 Risk Levels in High-level CORAS	266
14.5 How to Schematically Translate High-level CORAS Diagrams into English Prose	267

14.5.1 Referring Elements	267
14.5.2 Referenced Diagrams	270
14.6 Example Case in High-level CORAS	271
14.6.1 Threat Diagram	272
14.6.2 Risk Diagram	275
14.6.3 Treatment Diagram	277
14.7 Summary	279
15 Using CORAS to Support Change Management	283
15.1 Classification of Changes	283
15.1.1 Target of Analysis	284
15.1.2 Scope and Focus	285
15.1.3 Environment	285
15.1.4 Assumptions	285
15.1.5 Parties and Assets	286
15.1.6 Context	286
15.1.7 Changes in our Knowledge	287
15.2 Managing Change	287
15.2.1 Maintenance Perspective	288
15.2.2 Before-after Perspective	290
15.2.3 Continuous Evolution Perspective	294
15.3 Summary	296
16 The Dependent CORAS Language	297
16.1 Modelling Dependencies Using the CORAS Language	298
16.1.1 Dependent CORAS Diagrams	299
16.1.2 Representing Assumptions Using Dependent CORAS Diagrams	300
16.1.3 How to Schematically Translate Dependent CORAS Diagrams into English Prose	303
16.2 Reasoning and Analysis Using Dependent CORAS Diagrams	305
16.2.1 Assumption Independence	307
16.2.2 Assumption Simplification	308
16.2.3 Target Simplification	309
16.2.4 Assumption Consequence	310
16.3 Example Case in Dependent CORAS	311
16.3.1 Creating Dependent Threat Diagrams	311
16.3.2 Combining Dependent Threat Diagrams	313
16.4 Summary	316
17 Using CORAS to Analyse Legal Aspects	319
17.1 Legal Risk	319
17.2 Uncertainty of Legal Aspects	321
17.2.1 Legal Uncertainty	322
17.2.2 Factual Uncertainty	323
17.2.3 Combining Legal and Factual Uncertainty	324

17.3	Modelling Legal Aspects Using the CORAS Language	326
17.3.1	Legal CORAS Diagrams	326
17.3.2	How to Schematically Translate Legal CORAS Diagrams into English Prose	328
17.4	Analysing Legal Aspects through the Eight Steps of CORAS	330
17.5	Summary	337
18	The CORAS Tool	339
18.1	Main Functionality of the CORAS Tool	339
18.2	How to Use the CORAS Tool During Risk Analysis	341
18.2.1	Initial Modelling Before a Meeting	341
18.2.2	On-the-fly Modelling During a Meeting	342
18.2.3	Revising and Analysing Diagrams After a Meeting	344
18.3	Integration with Other Tools	344
18.4	Summary	345
19	Relating CORAS to the State of the Art	347
19.1	Risk Modelling	347
19.2	Risk Analysis Methods	350
19.3	Likelihood Analysis	351
19.4	High-level Risk Modelling	353
19.5	Change Management	354
19.6	Dependency Analysis	355
19.7	Legal Risk Management	356
Appendix A	The CORAS Language Grammar	359
A.1	Basic CORAS	359
A.1.1	Meta-model	359
A.1.2	EBNF Grammar	364
A.1.3	Examples	366
A.2	High-level CORAS	370
A.2.1	Meta-model	370
A.2.2	EBNF Grammar	374
A.2.3	Examples	377
A.3	Dependent CORAS	383
A.3.1	Meta-model	383
A.3.2	EBNF Grammar	385
A.3.3	Example	386
A.4	Legal CORAS	387
A.4.1	Meta-model	387
A.4.2	EBNF Grammar	388
A.4.3	Example	389
Appendix B	The CORAS Language Semantics	391
B.1	Basic CORAS	391
B.1.1	Elements	392

B.1.2	Relations	392
B.1.3	Diagrams	393
B.1.4	Examples	394
B.2	High-level CORAS	398
B.2.1	Referring Elements	398
B.2.2	Relations	399
B.2.3	Referenced Diagrams	402
B.2.4	Examples	403
B.3	Dependent CORAS	410
B.3.1	Border	410
B.3.2	Dependent Diagrams	411
B.3.3	Example	411
B.4	Legal CORAS	412
B.4.1	Elements	412
B.4.2	Relations	412
B.4.3	Example	415
A	Appendix C The CORAS Guidelines	417
C.1	Step 1: Preparations for the Analysis	418
C.2	Step 2: Customer Presentation of the Target	418
C.2.1	Step 2a: Presentation of the CORAS Terminology and Method	419
C.2.2	Step 2b: Presentation of the Goals and Target of the Analysis	419
C.2.3	Step 2c: Setting the Focus and Scope of the Analysis	420
C.2.4	Step 2d: Determining the Meeting Plan	420
C.3	Step 3: Refining the Target Description Using Asset Diagrams	421
C.3.1	Step 3a: Presentation of the Target by the Analysis Team	422
C.3.2	Step 3b: Asset Identification	422
C.3.3	Step 3c: High-level Analysis	422
C.4	Step 4: Approval of the Target Description	423
C.4.1	Step 4a: Approval of the Target Description	423
C.4.2	Step 4b: Ranking of Assets	424
C.4.3	Step 4c: Setting the Consequence Scales	424
C.4.4	Step 4d: Setting the Likelihood Scale	424
C.4.5	Step 4e: Defining the Risk Function	424
C.4.6	Step 4f: Deciding the Risk Evaluation Criteria	425
C.5	Step 5: Risk Identification Using Threat Diagrams	425
C.5.1	Step 5a: Categorising Threat Diagrams	426
C.5.2	Step 5b: Identification of Threats and Unwanted Incidents	427
C.5.3	Step 5c: Identification of Threat Scenarios	427
C.5.4	Step 5d: Identification of Vulnerabilities	428
C.6	Step 6: Risk Estimation Using Threat Diagrams	428
C.6.1	Step 6a: Likelihood Estimation	429
C.6.2	Step 6b: Consequence Estimation	429

C.6.3 Step 6c: Risk Estimation	430
C.7 Step 7: Risk Evaluation Using Risk Diagrams	430
C.7.1 Step 7a: Confirming the Risk Estimates	431
C.7.2 Step 7b: Confirming the Risk Evaluation Criteria	431
C.7.3 Step 7c: Providing a Risk Overview	432
C.7.4 Step 7d: Accumulating Risks	432
C.7.5 Step 7e: Estimating Risks with Respect to Indirect Assets .	432
C.7.6 Step 7f: Evaluating the Risks	433
C.8 Step 8: Risk Treatment Using Treatment Diagrams	433
C.8.1 Step 8a: Grouping of Risks	434
C.8.2 Step 8b: Treatment Identification	434
C.8.3 Step 8c: Treatment Evaluation	435
Appendix D The CORAS Terminology	437
Appendix E Glossary of Terms	445
E.1 Logic	445
E.2 Sets	445
E.3 Likelihoods	445
E.4 Likelihood Intervals	446
E.5 Deductions	447
E.6 Extended Backus-Naur Form	447
E.7 Semantics	448
E.8 Miscellaneous	448
Acronyms	449
References	451
Index	455



<http://www.springer.com/978-3-642-12322-1>

Model-Driven Risk Analysis

The CORAS Approach

Lund, M.S.; Solhaug, B.; Stolen, K.

2011, XVI, 460 p., Hardcover

ISBN: 978-3-642-12322-1