

CONTENTS

PREFACE TO THE BOOK	11
PART 1: CONCEPTUAL MODELS OF SYSTEMS / ARCHITECTURE	
PREFACE TO PART 1 OF THE BOOK	15
1 INTRODUCTION	17
2 ARTIFICIAL INTELLIGENCE AS A TOOL IN MODELING / OPTIMIZATION OF LOCAL AREA NETWORK TOPOLOGY	18
2.1 Introduction to the issue.....	19
2.2 Local Area Network.....	20
2.3 Scope / Objective.....	22
2.4 Implementation.....	22
2.4.1 The Genetic Algorithm.....	22
2.4.1.1 Model overview.....	22
2.4.1.2 Evolutionary techniques.....	23
2.4.1.3 Model evaluation method – the fitness function.....	25
2.4.2 Input data / data preparation.....	26
2.4.3 Analysis.....	28
2.4.4 Result.....	29
2.5 Conclusion to the issue.....	34
3 ARTIFICIAL INTELLIGENCE: DEVELOPMENT, CHANCE AND HAZARD	35
3.1 Introduction to the issue.....	35
3.2 Scope of Artificial Intelligence.....	38
3.3 Selected AI Projects.....	43
3.4 Threats of using Artificial Intelligence.....	46
3.5 Project of system using Artificial Intelligence.....	47
3.6 Conclusion to the issue – Summary of the Project.....	53
4 THE ARCHITECTURE OF MICRO-SERVICES WITHIN THE ACCESS TO THE RESOURCES	56
4.1 Introduction to the issue.....	56
4.2 Model overview.....	58
4.3 Model implementation.....	59
4.4 Model tests.....	64
4.5 Conclusion to the issue.....	65
5 SCALING MICROSERVICES ON CLOUD INFRASTRUCTURE	66
5.1 Introduction to the issue.....	66
5.2 The purpose of the study.....	66
5.3 Cloud computing.....	66
5.4 Microservices architecture.....	68
5.5 Scaling microservices.....	70
5.6 Docker containers.....	72
5.7 Project of scaling microservices.....	75
5.8 Conclusion to the issue.....	83

6	WEB TRAFFIC ANALYZER IN NETWORK AND MICROSERVICES	84
6.1	Introduction to the issue	84
6.2	Theoretical Framework	85
6.2.1	Network traffic	85
6.2.1.1	TCP.....	85
6.2.1.2	HTTP.....	86
6.2.2	Network analyzer	86
6.2.2.1	Wireshark	86
6.2.2.2	Network simulator	86
6.2.3	Determining possibilities of development and motivation	87
6.3	Evaluation parameters for network traffic.....	87
6.3.1	Tools available for traffic analysis.....	87
6.3.2	Existing solutions.....	88
6.3.2.1	Explaining advantages and disadvantages using Wireshark – GNS3... ..	89
6.3.3	Alternative solutions.....	89
6.4	Microservices.....	90
6.4.1	Service.....	90
6.4.2	Microservices.....	90
6.4.2.1	Monolith application problems.....	93
6.4.2.2	Features of microservice based architecture	94
6.4.2.2.1	High cohesion	94
6.4.2.2.2	Resilience	94
6.4.2.3	Hosting microservices	95
6.5	Analysis and Design Project.....	95
6.5.1	Diagrams – Microservices.....	95
6.5.2	Design for testing – Web traffic	99
6.5.3	Test and results	102
6.6	Conclusion to the issue and recommendation.....	111
7	DOCKER AS A CONTAINER BASED VIRTUALIZATION FOR MICROSERVICES	112
7.1	Introduction to the issue	112
7.2	Background.....	113
7.2.1	Virtualization	113
7.2.1.1	Hypervisor and virtual machines	113
7.2.1.2	QEMU/KVM.....	114
7.2.2	Containers as a successors of “standard” virtualization	115
7.3	Docker.....	115
7.3.1	Docker Daemon.....	116
7.3.2	Libcontainer	116
7.3.3	Docker Filesystem	117
7.3.4	Docker Image.....	118
7.4	Conclusion to the issue	118
8	SECURE COMMUNICATOR	120
8.1	Introduction to the issue	120
8.2	Comparisons.....	120
8.3	Model Building	121
8.3.1	Assumptions.....	121
8.3.2	Use Case diagrams.....	122
8.3.3	Proof of Concept	124
8.3.4	Class Diagrams for proof of concept	125
8.3.5	Sequence Diagrams for proof of concept	126
8.3.6	Developing our application in Java environment	129
8.4	Conclusions to the issue.....	130

9	RFID TECHNOLOGY AS A HELPFUL TECHNOLOGY IN SUPPLY CHAIN MANAGEMENT	131
9.1	Introduction to the issue	131
9.2	Advantages of RFID	132
9.3	Modern benefits	133
9.4	Example of usage	134
9.5	Conclusion to the issue	135
10	OVERVIEW OF X.509-BASED AUTHENTICATION, ITS STRENGTHS AND WEAKNESSES AS IMPLEMENTED IN CERTGEN	138
10.1	Introduction to the issue	138
10.2	Public Key Infrastructure	139
10.2.1	PKI Components	139
10.2.2	Certificate Revocation Lists	141
10.2.3	Certificate Authorities	141
10.3	Example PKI Usage	141
10.3.1	SSL/TLS	141
10.3.2	IPSEC	141
10.4	X.509v3 Caveats	142
10.4.1	The "CA" Flag	143
10.4.2	OCSP Threats	143
10.5	Deprecation of Signature Algorithms	143
10.6	Certificate Authority Systems	144
10.6.1	Basic CA Requirements	145
10.7	Conclusion to the issue	145
11	PROJECT MANAGEMENT SYSTEM	146
11.1	Introduction to the issue	146
11.1.1	Project Management	147
11.1.2	Scrum	148
11.1.3	Existing Solutions	149
11.2	Literature Review	149
11.2.1	Review of: "Distributed Scrum: Agile Project Management with Outsourced Development Teams"	150
11.2.2	Review of: 'SCRUM model for agile methodology'	150
11.3	Problem definition	151
11.4	System Introduction	152
11.5	Functionalities of the System with Presentation of the use Cases and Scenarios	153
11.6	Chosen Technologies for Development and Testing	155
11.7	Application Architecture	156
11.7.1	Overview	156
11.7.2	Database Structure	156
11.8	Continuous Integration	157
11.9	Infrastructure as Code	158
11.10	Production Deployment	158
11.11	Conclusion to the issue	159
11.11.1	Aim and Results	159
11.11.2	Future work potential	160
12	SAP ARIBA	161
12.1	Introduction to the issue	161
12.2	Literature Review	161
12.2.1	Supply Chain Management (SCM)	161
12.2.2	Supplier Relationship Management (SRM)	161
12.2.3	SAP Ariba	162

12.2.4	SAP Ariba Supplier Management	163
12.3	System description	163
12.4	SAP Ariba Supplier Management Information	165
12.5	Architecture	166
12.6	System Security	166
12.6.1	Commerce Extensible Markup Language (cXML)	166
12.6.2	Demilitarized Zone (DMZ)	167
12.7	Conclusion to the issue	168
13	WAREHOUSE INFORMATION MANAGEMENT SYSTEM	169
13.1	Introduction to the issue	169
13.1.1	Information Management Systems	169
13.1.2	Enterprise Information Management Systems	169
13.2	Architecture of Storage / Warehousing Enterprise Management System	170
13.2.1	Problem description	170
13.2.2	Solution	170
13.2.3	Architecture/Concept development	170
13.2.3.1	Project components	170
13.2.3.2	Deployment diagram	170
13.2.4	Use cases	172
13.3	Module implementation and testing/verification	173
13.3.1	Basic working of Server	173
13.3.2	Basic working of Client Solutions	175
13.3.3	Data Exchange and Synchronization	178
13.3.4	Client Application	179
13.4	Conclusion to the issue	180
14	ONLINE BANKING SYSTEM	181
14.1	Introduction to the issue	181
14.2	Banking System	181
14.3	Funds Transfers	181
14.3.1	Same Bank	182
14.3.2	Different banks	182
14.3.3	First approach	182
14.3.4	Real-time gross settlement (RTGS) systems	182
14.3.5	TARGET2	183
14.4	UML Diagrams	184
14.4.1	Class Diagram of a System	184
14.4.2	Use case Diagram	184
14.4.3	Activity Diagrams	186
14.4.4	Deployment Diagram	186
14.5	Conclusion to the issue	187
15	CONCLUSION	188
	SUMMARY TO PART 1 OF THE BOOK	189
	REFERENCES	190
 PART 2: INDUSTRIAL USE-CASE SCENARIOS		
	PREFACE TO PART 2 OF THE BOOK	201
1	INTRODUCTION	203
2	E-COMMERCE SALES PREDICTION WITH ARTIFICIAL NEURAL NETWORKS	204
2.1	Introduction to the issue	205
2.2	Literature Review	205

2.2.1	Classical Time-Series Models	205
2.2.2	Artificial Neural Network	206
2.2.3	Neuron Training.....	207
2.2.4	Multilayer Neural Network.....	207
2.2.5	Convolutional Neural Networks.....	209
2.2.6	Linear Regression.....	211
2.3	Model Building	212
2.3.1	System Design	212
2.3.2	Data Preparation	212
2.4	Result	213
2.5	Conclusion to the issue	214
3	NEURAL NETWORK FOR FORECASTING REGIONAL LOGISTIC DEMAND	215
3.1	Introduction to the issue	215
3.1.1	Background.....	215
3.1.2	Objective.....	216
3.1.3	Terms and Scope.....	216
3.2	Literature Review	216
3.2.1	Regional Logistic Demand Forecasting.....	216
3.2.2	Artificial Neural Network	218
3.2.3	Neuron Training.....	218
3.2.4	Multilayer Neural Network.....	219
3.2.5	Multilayer Feedforward Neural Network.....	221
3.2.6	Neural network for non-linear data	222
3.2.7	Cross-Validation	223
3.3	Model Building	225
3.3.1	System Design	225
3.3.2	Data Preparation	226
3.4	Result	227
3.5	Conclusion to the issue	229
4	INCREASING TRANSPARENCY OF VOTING SYSTEMS WITH USAGE OF BLOCKCHAIN TECHNOLOGY AND SMART CONTRACTS.....	230
4.1	Introduction to the Blockchain Technology	230
4.2	Election and Voting in General.....	231
4.3	Proposed System	232
4.4	Model Structure.....	232
4.5	Model Evaluation	235
4.6	Conclusion to the issue	236
5	BLOCKCHAIN IN THE CONTEXT OF FOREIGN TRANSFERS IN THE BANKING SYSTEMS	237
5.1	Introduction to the Blockchain in Banking System	237
5.2	New Payment Innovations.....	238
5.3	SWIFT as a Traditional Way to Transfer Money between Countries	238
5.4	Software Development Model.....	238
5.5	The proposed Model.....	239
5.6	Use Case Diagram.....	240
5.7	User Interface	241
5.8	Test cases	242
5.9	SWIFT vs our proposed Solution using Blockchain – Payment processing.....	243
5.10	Conclusion to the issue	244
6	CLASSIFICATION OF BANK DIRECT MARKETING CAMPAIGN DATASET USING KNN ALGORITHM	245
6.1	Introduction to the issue	245

6.2	Model	247
6.3	Evaluation parameters for network traffic.....	252
6.4	Conclusion to the issue	255
7	TIME REPORTER APPLICATION FOR GOOD MANAGEMENT OF PROJECTS	256
7.1	Introduction to the issue	256
7.2	Proper time tracking application.....	258
7.3	Roles in Time Reporter Application	258
7.4	Using the Application.....	260
7.5	Business use cases	261
7.5.1	Create new user	261
7.5.2	Create new working project.....	262
7.5.3	Management of working project.....	263
7.5.4	Management of working hours of workers.....	264
7.6	Architecture of Application.....	265
7.7	Tests of Time Reporter Application	266
7.8	Conclusion to the issue	267
8	EASY DIET APP	268
8.1	Introduction to the issue	269
8.2	Main views easydiet	269
8.3	Main Part	275
8.4	Model Building	275
8.5	Model Testing.....	281
8.6	Summary.....	282
8.6.1	Problems	282
8.7	Conclusions to the issue.....	283
9	SMART HOME MANAGEMENT SOLUTION	284
9.1	Introduction to the issue	284
9.1.1	Purpose	285
9.2	Background.....	285
9.2.1	Smart Home	286
9.2.2	Nest Labs	289
9.2.3	Development	290
9.2.4	Philips Hue	290
9.3	Method.....	291
9.3.1	Design process	291
9.3.2	Literature study.....	291
9.3.3	Smart Home application	291
9.3.3.1	Prototype development	292
9.3.4	Boundaries.....	293
9.4	Result.....	293
9.4.1	Prototype development	293
9.4.1.1	Structure sketches.....	293
9.4.1.2	Mockup sketches.....	295
9.4.1.3	Functional diagrams	298
9.4.1.4	Screenshots	301
9.5	Conclusions to the issue.....	302
9.5.1	Smart Home applications	302
9.5.2	Future work.....	302
10	CAR FLEET MANAGEMENT SYSTEM FOR A DELIVERY CENTER.....	304
10.1	Introduction to the issue	304
10.2	Existing applications.....	304
10.3	Theoretical Description of the System	305

10.4	Technical Model of the System	307
10.5	Visualization of the Proposed Application	308
10.6	Future Development	310
10.7	Conclusion to the issue	310
11	SWIFT WEATHER APPLICATION	312
11.1	Introduction to the issue	312
11.1.1	Framework / Context.....	312
11.1.2	Problem Description	313
11.1.2.1	Approach.....	313
11.1.3	Work methodology.....	314
11.1.4	Planning.....	314
11.1.5	Report structure.....	315
11.2	State of the Art.....	316
11.2.1	Weather.....	316
11.2.2	Existing Technologies	316
11.3	Analysis and Design of the Solution.....	317
11.3.1	Problem Domain	317
11.3.2	Functional and non-functional requirements	318
11.3.2.1	Functional requirements.....	318
11.3.2.2	Non-functional requirements	319
11.3.3	Vision of the solution.....	319
11.3.3.1	RESTful	319
11.3.3.2	Tiered architecture – DDD	320
11.3.3.3	MVC (Model-View-Controller)	321
11.4	Implementing the Solution.....	321
11.4.1	Settings	321
11.4.2	CocoaPods.....	322
11.4.2.1	Alamofire.....	322
11.4.2.2	SwiftyJSON	322
11.4.3	Implementation description.....	323
11.4.4	Solution Evaluation.....	326
11.4.4.1	Usability	326
11.5	Conclusion to the issue	326
12	USAGE OF DATA MINING TECHNIQUES FOR WEATHER FORECASTING.....	327
12.1	Introduction to the issue	327
12.1.1	Data mining and weather prediction	327
12.1.2	Related work.....	328
12.2	Data model.....	328
12.3	Data Collection	328
12.4	Result	329
12.5	Conclusion to the issue	330
13	ELECTRIC SCOOTERS RENTAL SYSTEM	331
13.1	Introduction to the issue	331
13.2	Scooter Rental System Model.....	332
13.3	Visualization of Graphical Interface.....	339
13.4	Comparative analysis	343
13.5	Conclusion to the issue	345
14	BUILDING ONLINE E-COMMERCE PLATFORM AS A SERVICE.....	347
14.1	Introduction to the issue	347
14.2	Data model.....	349
14.2.1	B2B Commerce	349
14.2.1.1	User and Account Data.....	349

14.2.1.2	Product Data.....	350
14.2.1.3	Pricing and Entitlements Data	350
14.2.1.4	Cart Data.....	351
14.2.1.5	Orders Data.....	351
14.2.1.6	Configuration Data.....	352
14.2.2	Customization	353
14.2.2.1	Suggested cart.....	353
14.2.2.2	Inventory stock.....	354
14.2.2.3	Loyalty Points	357
14.3	User journey	357
14.3.1	Suggested cart	358
14.3.2	Inventory stock	360
14.3.3	Loyalty Points.....	364
14.4	Conclusion to the issue	366
15	ONLINE GAME FOR LEARNING ENGLISH.....	367
15.1	Introduction to the issue	367
15.1.1	Purpose of application	368
15.1.2	Scope – DoD	368
15.2	Model.....	368
15.2.1	Architecture.....	368
15.2.2	Roles.....	370
15.2.3	Main components	371
15.3	Model visualization	372
15.4	Practical part.....	377
15.4.1	Similar Apps comparison.....	377
15.4.2	Testing	379
15.5	Conclusion to the issue	379
16	MOBILESHOPPING APP.....	380
16.1	Introduction to the issue	380
16.2	Purpose of the application.....	380
16.3	Architecture	381
16.4	Comparison with other applications available on the market.....	383
16.5	Model visualization.....	383
16.6	Testing.....	385
16.7	Future steps	387
16.8	Conclusions to the issue.....	387
17	MOBILE APPLICATION FOR ADVERTISEMENT PURPOSES FOR ANDROID PHONES	388
17.1	Introduction to the issue	388
17.1.1	Reasoning	388
17.2	Prototype	389
17.2.1	Use cases	389
17.2.2	Architecture.....	390
17.2.3	Stack.....	390
17.2.4	User interface	391
17.3	Testing.....	393
17.3.1	Unit testing.....	393
17.3.2	Manual testing	393
17.4	Conclusion to the issue	394
18	CONCLUSION.....	395
	SUMMARY TO PART 2 OF THE BOOK.....	396
	REFERENCES.....	397
	SUMMARY TO THE BOOK.....	408