

Contents

1	Introduction (Filip Malý, Antonín Slabý)	13
2	Mobile technological innovation (Jiří Kysela)	17
2.1	Basic definitions	17
2.1.1	Information Communication Technologies	17
2.1.2	Mobile ICT	17
2.2	Introduction to the issue	17
2.3	Technological innovation and mobility as a business phenomenon	19
2.4	The multi-purpose mobile devices	21
2.4.1	Mobile and Smart Phone	21
2.4.2	Tablet	21
2.4.3	A portable computer (laptop / notebook / ultrabook / netbook / convertible notebook)	22
2.5	Mobile data technology in the Czech Republic	25
2.6	Mobile operating systems and applications	28
2.7	Locational technologies	31
3	Mobility in corporate architectures (Tomáš Kozel)	33
3.1	Enterprise Architecture	33
3.2	Description of selected representatives of enterprise architectures	35
3.2.1	Zachman's Framework	35
3.2.2	The Open Group Architecture Framework (TOGAF)	37
3.3	Service Oriented Architecture (SOA)	40
3.4	Mobility in enterprise architectures	42
3.5	Mobility and service oriented architecture	44
3.6	Mobility in business processes	46
3.6.1	Basic characteristics of mobile processes	46
3.6.2	Types of Mobile Objects	46
3.7	Mobilizing business processes	48
3.7.1	Mobile Opportunities	48

3.7.2	Method “Process Landscaping”	49
3.7.3	Modified method	51
3.8	Metrics mobility	51
3.8.1	The degree of dependence	51
3.8.2	The degree of severity/power	52
3.8.3	Duration	52
3.8.4	The level of relation/connection	52
3.8.5	The degree of location dependence	53
3.9	Models using mobile access	53
3.9.1	Communication Headquarters	54
3.9.2	Organization of activities.....	54
3.9.3	Disclosure of internal systems.....	55
3.9.4	Support for the relationship – company – B2C customer.....	56
3.9.5	Data collection	56
3.9.6	Knowledge Management	56
3.9.7	M-Commerce	57
3.9.8	Replacement of distributed approach	57
4	Mobility in the enterprise information systems (Tomáš Kozel).....	59
4.1	Types of Information Systems	59
4.1.1	ERP systems	60
4.1.2	ERP II	61
4.1.2.1	<i>Supply Chain Management</i>	62
4.1.2.2	<i>Customer Relationship Management</i>	63
4.1.2.3	<i>Business Intelligence</i>	64
4.1.2.4	<i>Enterprise Content Management</i>	64
4.2	Potential mobilization parts of business IS	65
4.2.1	Finance Management.....	65
4.2.2	Sales	66
4.2.3	SCM	66

4.2.4	Production.....	67
4.2.5	Human Resources Management.....	68
4.2.6	CRM.....	68
4.2.7	Business Intelligence.....	69
4.2.8	ECM.....	69
4.3	Software Mobility.....	69
4.4	Methodology of implementation and support of mobile access in IS	70
5	Mobile processes and their modelling (Tomáš Kozel, Filip Malý)	75
5.1	Modelling.....	75
5.1.1	Business Process Model and Notation (BPMN)	75
5.1.2	Extending BPMN.....	78
5.1.3	Mobility in basic BPMN.....	80
5.1.4	Time and space	82
5.2	Completion of the mobility into BPMN.....	83
5.2.1	Examples of use.....	86
5.3	Metamodel of BPMN extension.....	87
5.3.1	Extending the metamodel set of events	88
5.3.1.1	<i>The strict approach</i>	88
5.3.1.2	<i>Elements extension</i>	89
5.3.2	Extension of metamodel activities.....	90
5.3.3	Extending the metamodel participants (Pool)	90
5.3.4	Extending the data objects	91
6	Mobile Client (Ondřej Berger, Filip Malý)	95
6.1	Thin Client.....	95
6.2	Thick client.....	95
6.3	Hybrid Client.....	95
6.4	Communication protocols	97
6.4.1	Lightweight protocols.....	97
6.4.1.1	<i>Hessian</i>	99

6.4.2	Web services	99
6.4.2.1	J2ME WSA	99
6.4.2.2	KSOAP	100
6.4.3	RMI	101
6.4.4	REST architecture	101
6.5	Security	103
6.5.1	RMI using SSL	103
6.5.2	SSL on Tomcat	104
6.6	The issue of asynchronous communication	104
7	Mobile design patterns, mobile, usable design patterns (Tomáš Chlouba)	107
7.1	Design patterns in mobile architectures	108
7.2	Differences of design patterns in the mobile environment	110
7.2.1	Mobile usable design patterns	110
7.2.2	Modifiable design patterns	110
7.2.3	Design patterns, not possible to use in a mobile environment	110
7.3	Classic design patterns and their use in a mobile environment	111
7.3.1	Inversion of Control	111
7.3.1.1	Constructor Injection	112
7.3.1.2	Setter Injection	112
7.3.1.3	Interface Injection	112
7.3.2	Dependency Injection	112
7.3.3	Factory method	113
7.3.4	Flyweight	114
7.3.5	Facade	114
7.3.6	Other patterns	115
7.4	Design patterns specific to the mobile environment	115
7.4.1	AddNew	115
7.4.2	Edit	115

7.4.3	Search.....	115
7.4.4	Erase.....	116
7.5	Possibilities of using and developing design patterns for the mobile architectures.....	116
8	Intelligence and mobility, ambiency, mobile agents (Pavel Kríž)	117
8.1	Multi-agent systems in the mobile environment.....	117
8.1.1	Architecture of JADE	117
8.1.2	Extending the JADE-LEAP to support mobile environment	118
8.2	Mobile Agents	120
8.2.1	Implementation of mobile agents in JADE framework.....	121
9	Mobile positioning technology for LBS (Miroslav Zvířecí)	125
9.1	Technology and principles of radio navigation.....	125
9.2	GSM Technology	126
9.3	GSM data transmission.....	128
9.4	Methods for determining position using GSM.....	129
9.4.1	The most significant methods of determining the location of mobile devices.....	130
9.5	Wi-Fi technology.....	131
9.6	Technology of satellite navigation	132
9.6.1	The space segment.....	134
9.6.2	Management segment	135
9.6.3	User segment	136
9.7	The principle of positioning in satellite navigation.....	136
9.7.1	Calculation of the pseudorange	137
9.7.2	Composition of the satellite signals.....	137
9.7.3	C/A code	139
9.7.4	P-code	140
9.7.5	Y-code.....	140
9.7.6	The navigation message.....	140

9.8	Methods of measuring distances in satellite navigation.....	142
9.8.1	Code measurements.....	142
9.8.2	Phase measurement.....	143
9.8.3	Doppler measurements	144
9.9	Factors affecting the accuracy of satellite navigation	145
9.9.1	The accuracy of atomic clocks on board satellites	145
9.9.2	Accuracy of the signal receiver clock	145
9.9.3	Effect of the ionosphere and troposphere.....	146
9.9.4	Tropospheric refraction	146
9.9.5	Ionospheric refraction.....	146
9.10	A-GPS.....	147
9.11	Determining the direction of movement	148
9.11.1	Measuring the signal at the radio navigation.....	148
9.11.2	Electronic compass	148
9.11.3	Tracking history routes	148
9.12	The use of LBS	149
9.13	Use of instruments and services of GIS for LBS	152
10	Context-driven modular mobile applications in scientific work (Ondřej Berger).....	155
10.1	Context.....	155
10.1.1	Communication between devices	157
10.2	Contextual data	158
10.2.1	Location	158
10.2.2	Indoor Navigation.....	159
10.2.3	Orientation of the device in space	160
10.2.4	Light sensor	160
10.2.5	The camera image.....	160
10.2.6	Time	161
10.2.7	Persons	161
10.2.8	System Resources	161

10.2.9	Statements.....	162
10.2.9.1	<i>RDF</i>	162
10.2.10	High-level information on the context	163
10.2.10.1	<i>The user's intention/plan</i>	164
10.2.10.1.1	<i>The formalization</i>	164
10.2.10.2	<i>The user status</i>	165
10.2.11	Endurance and caching the contexts.....	165
10.3	Use of contexts	166
10.3.1	Passive user support.....	166
10.3.2	Active use of context	166
10.4	Reconfiguring of mobile applications	167
10.4.1	Types of clients.....	167
10.4.2	Application reconfiguration.....	168
10.4.2.1	<i>Current models of context-driven dynamic reconfiguration</i>	168
10.5	Modular mobile application	169
10.5.1	Evaluation of conditions.....	171
10.5.2	Management of modules	172
10.5.2.1	<i>Limitations of the model in a particular implementation</i>	173
10.6	Applications in scientific work.....	174
10.6.1	Data collection in the field.....	174
10.6.2	Communication.....	175
10.6.3	Other Applications.....	176
11	Mobility in community wireless networks (Pavel Kříž).....	177
11.1	Characteristics of community wireless networks.....	177
11.2	Currently used technologies	178
11.3	The mobility of users.....	180
11.3.1	Authentication and authorization of users, security	181
11.4	Mobility of users in the network	182
11.5	Mobility of users between networks	183

11.6	System architecture with the support of WLAN roaming	185
11.7	The safety aspects of mobility	187
11.8	Mobility in social networks in the Czech Republic	188
12	Management of community and research wireless networks (Pavel Kříž, Filip Malý).....	191
12.1	Description of surveyed area	191
12.2	Requirements and application design	193
12.3	Solution design	196
12.4	Implementation details	197
13	Mobility in the teaching process (Filip Malý)	201
13.1	The teaching process	201
13.2	E-learning	202
13.3	The issue of learning environment (LMS)	203
13.4	Mobile teaching process	206
13.5	Instrument to support Research teamwork.....	208
14	Potential for mobility in the work of researchers (Antonín Slabý).....	211
14.1	Scientometry and publication and citation database	218
15	Case Studies	229
15.1	Notes application	229
15.2	Access to catalogues Science/libraries	236
15.3	Team communication with mobile devices	252
15.4	Chat with message synchronization	258
15.5	Mobile test client of e-learning application.....	264
15.6	Applications for interactive direct communication within the team (mobile chat)	274
16	References	282
17	List of Figures.....	293
18	List of Tables	299