

Table of Contents

Preface	ix
Chapter 1. Object-Oriented, Component-Based, Agent-Oriented and Service-Oriented Paradigms in Software Architectures	1
Abdelkrim AMIRAT, Anthony HOCK-KOON and Mourad Chabane OUSSALAH	
1.1. Introduction.	2
1.2. History.	3
1.2.1. Object-oriented paradigm	3
1.2.2. Component-based paradigm	4
1.2.3. Agent-oriented paradigm	4
1.2.4. Service-oriented paradigm	5
1.3. Software architecture	8
1.3.1. Object-oriented software architecture	8
1.3.2. Component-based software architecture	10
1.3.3. Agent-oriented software architecture	11
1.3.4. Service-oriented architecture	13
1.4. The two dimensions of the conceptual framework for comparison: quantitative and qualitative	15
1.4.1. Conceptual differences.	16
1.4.2. Quantitative dimension	25
1.4.3. Qualitative dimension	32
1.5. Approaches for integrating development paradigms.	43
1.6. Summary and discussion	45
1.7. Conclusion	48
1.8. Bibliography	48

Chapter 2. Reference Architectures	55
Elisa Yumi NAKAGAWA, Flavio OQUENDO and José Carlos MALDONADO	
2.1. Introduction.	55
2.2. Definition of reference architecture.	56
2.2.1. Reference architecture versus reference model	57
2.2.2. Reference architecture versus product line architecture	57
2.3. A model for reference architectures	59
2.4. Reference architecture engineering.	63
2.4.1. Information source investigation.	64
2.4.2. Architectural requirements establishment	66
2.4.3. Reference architecture design.	67
2.4.4. Reference architecture evaluation	69
2.5. Uses of reference architectures	70
2.6. Examples of reference architectures	74
2.7. Future perspectives of reference architectures	75
2.8. Final remarks.	78
2.9. Bibliography	78
 Chapter 3. Multihierarchy/Multiview Software Architectures	 83
Ahmad KHEIR, Hala NAJA and Mourad Chabane OUSSALAH	
3.1. Introduction.	83
3.2. Existing viewpoint approaches	84
3.2.1. Introduction	84
3.2.2. Views in requirements specifications	85
3.2.3. Views in systems modeling	85
3.2.4. Views within programming.	86
3.3. Views in software architecture	87
3.3.1. Contributions of the views in software architecture.	87
3.3.2. “4+1” view model	88
3.3.3. ISO/IEC/IEEE 42010	89
3.3.4. The views and beyond approach	91
3.3.5. Summary.	93
3.3.6. Limitation of current approaches to software architecture.	96
3.4. Definitions and basic concepts of multihierarchy/multiview software architectures	96
3.4.1. Definitions	96
3.4.2. Concepts and basics	98
3.5. MoVAL: architecture based on models, views and levels of abstraction	107
3.5.1. Introduction	107

3.5.2. MoVAL	108
3.5.3. MoVAL metamodel	112
3.5.4. Case study	114
3.6. Conclusion	117
3.7. Bibliography	118
Chapter 4. Software Architecture and Tools: Distributed and Coordinated Dynamic Reconfiguration Management	121
Mohamed ZOUARI, Maria-Teresa SEGARRA and Khalil DRIRA	
4.1. Introduction.	122
4.2. Context	123
4.3. Dynamic reconfiguration management mechanisms of distributed applications.	125
4.3.1. Centralized dynamic reconfiguration management	126
4.3.2. Limitations of the centralized solution for distributed systems	129
4.3.3. The stakes of distributed reconfiguration management.	130
4.3.4. Existing coordination mechanisms.	131
4.4. Specialization of reconfiguration infrastructures	134
4.4.1. Specialization of behavior.	134
4.4.2. Specialization of the distribution of adaptation mechanisms	135
4.5. Summary of the limitations and challenges of dynamic reconfiguration of distributed systems.	137
4.6. An approach for the implementation of reconfiguration management mechanisms	138
4.7. Architectural model for distributed dynamic reconfiguration management	140
4.7.1. Component types for adaptation management	141
4.7.2. Distribution of dynamic reconfiguration management	142
4.7.3. Architectural model of the adaptation manager	144
4.7.4. Specialization of reconfiguration mechanisms.	146
4.7.5. Coordination of reconfiguration processes	149
4.8. Conclusion	164
4.9. Bibliography	165
Chapter 5. Software Architecture for Product Lines	171
Hugo ARBOLEDA, Rubby CASALLAS, Jaime CHAVARRIAGA and Jean-Claude ROYER	
5.1. Introduction to software product lines	171
5.1.1. Three development styles	174
5.1.2. Variability management	175
5.1.3. The concept of architecture in product lines	177

5.2. The music store example	179
5.2.1. The field	179
5.2.2. The SongStock product line.	180
5.2.3. Functional requirements	180
5.2.4. The other main requirements	181
5.3. Domain engineering.	182
5.3.1. Domain analysis	182
5.3.2. Use case with integrated variability	183
5.3.3. The features model	184
5.3.4. Domain design	185
5.3.5. Designing the architecture of the line	186
5.4. Product engineering	190
5.4.1. The configuration of a product	191
5.4.2. Product derivation	193
5.5. The reference architecture design process	194
5.6. Further reading.	197
5.6.1. PLA and reference architecture.	198
5.6.2. Influential older works.	200
5.7. Conclusion	203
5.8. Bibliography	204
Chapter 6. Software Architecture: Service Adaptation Techniques in the Context of Web Services Composition	211
Kamel BARKAOUI and Maryam ESLAMICHALANDAR	
6.1. Introduction.	211
6.2. Web service composition and verification.	214
6.3. Web service incompatibility and adaptation	219
6.4. Adaptation approaches	222
6.5. Conclusion	234
6.6. Bibliography	234
List of Authors	241
Index	243